

Birds of the Auckland Islands, New Zealand subantarctic

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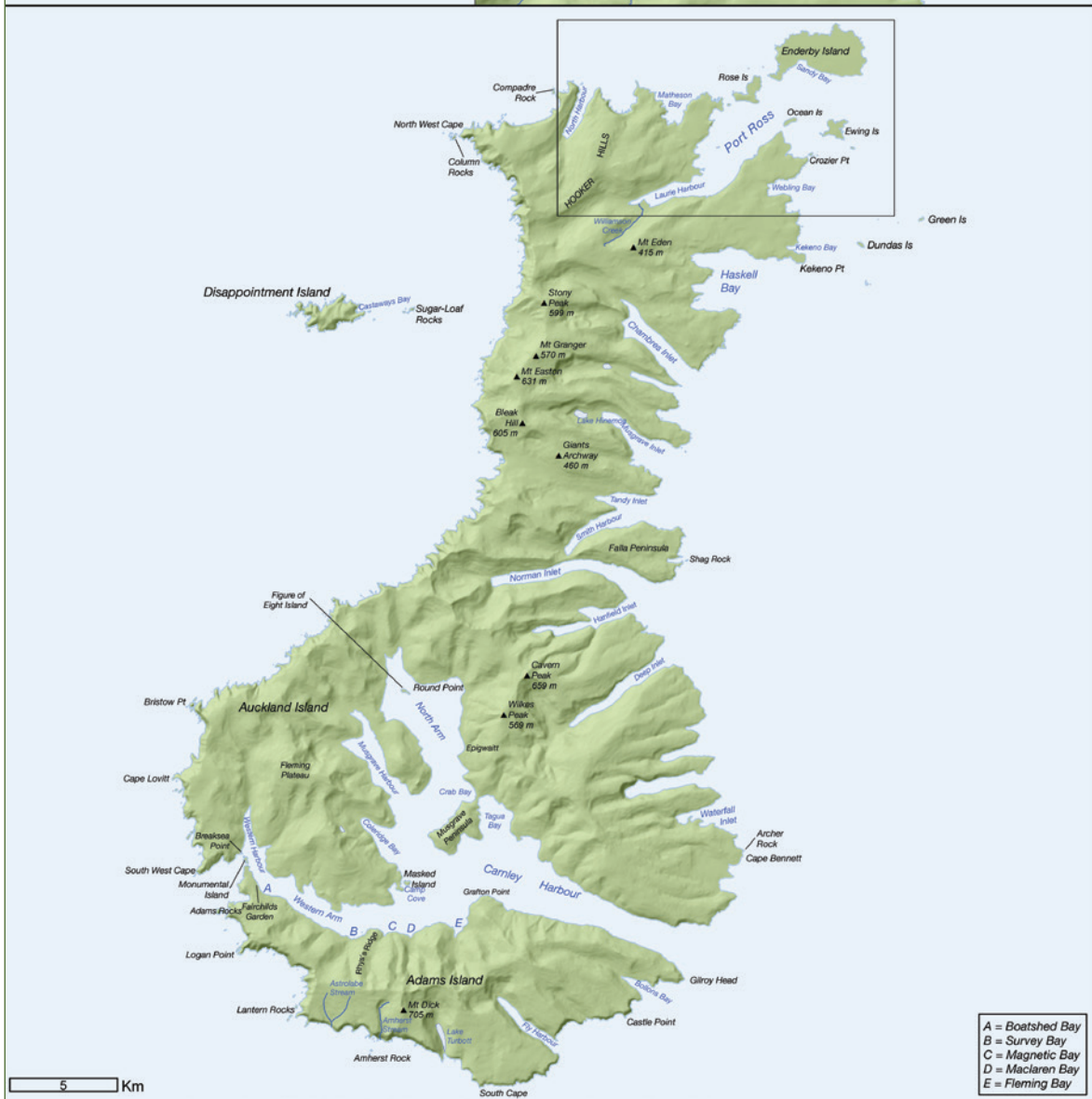
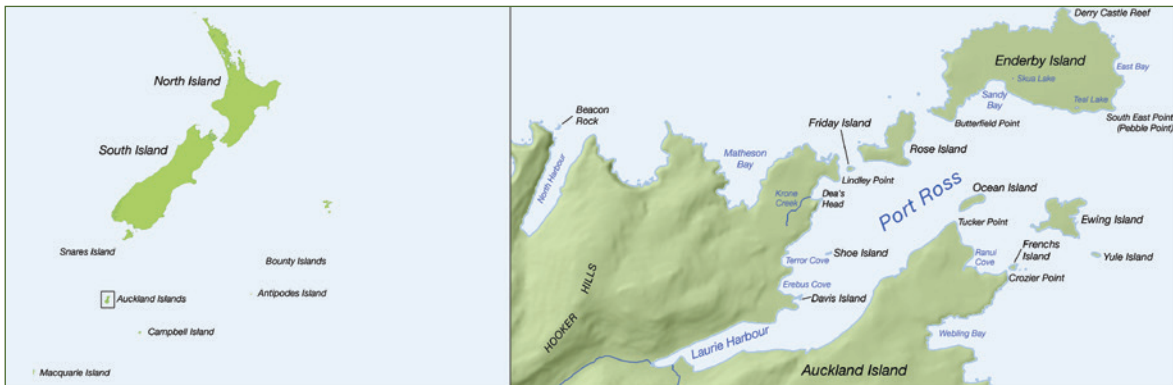
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ABSTRACT: The Auckland Islands are the largest island group in the New Zealand subantarctic region, and have the most diverse avifauna, including eight endemic taxa. We present the first comprehensive review of the avifauna of the Auckland Islands, based on a database of 23,028 unique bird records made between 1807 and 2019. At least 45 species breed (or bred) on the islands, with a further 77 species recorded as visiting the group as migrants, vagrants, or failed colonisers. Information on the occurrence of each species on the different islands in the group is presented, along with population estimates, a summary of breeding chronology and other reproductive parameters, and diet where known. The frequency at which 33 bird species were encountered during visits to the seven largest islands is compared graphically to facilitate comparison of each island's bird fauna in relation to habitat differences and the history of introduced mammals. Disappointment Island (284 ha) is the least modified island in the group. However, it lacks forest, and so has a very restricted land bird fauna, lacking ten species that breed on other islands in the group. Auckland Island (45,889 ha) is the only major island in the group where introduced mammals are still present. As a result, it also has a depauperate bird fauna, with at least 11 species completely absent and a further seven species reported at lower frequencies than on the next largest islands (Adams and Enderby Islands).

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Introduction

The Auckland Islands (Maukahuka/Motu Maha, 50°44'S, 166°05'E; Fig. 1) are the largest and biologically most diverse island group in the New Zealand subantarctic region (Russ & Terauds 2009). However, there is little published information summarising the bird species recorded from the group, or the differences in bird communities between islands within the group (Oliver 1955; Turbott 2002; Shirihihi 2008). The history of ornithological research on the Auckland Islands was summarised by Miskelly & Taylor (2020 – Chapter 1 in this book). Pioneering information was gathered during three main phases: 1840 (three brief visits by northern-hemisphere-based exploring expeditions), 1888–1929 (even shorter visits by scientists and naturalists travelling on New Zealand government steamers that were searching for shipwreck survivors and maintaining castaway depots), and 1941–45 (naturalists enlisted in the New Zealand military who were based on the islands as part of the 'Cape Expedition' to watch for enemy vessels). Much information was gathered subsequently by New Zealand government and museum research expeditions in 1954, 1962–63, 1966, 1972–73, 1978, and 1989, and bird records (mainly unpublished) have accumulated rapidly during the more regular ecotourism and research visits that have occurred in the austral summer since the early 1990s (Miskelly & Taylor 2020 – Chapter 1).

Soon after the Second World War, Oliver (1955) commented that '*The general account of the birds [of Auckland and Campbell Islands] has not yet been written*'. Several accounts of Campbell Island birds appeared over the following 14 years (Westerskov 1960; Bailey & Sorensen 1962; Kinsky 1969), but the Auckland Island story has remained untold until now. We summarise information on all breeding, migrant, and vagrant bird species recorded from the Auckland Islands, based on a comprehensive database of bird records derived from both published and unpublished sources. Information on breeding chronology and diet are summarised where known, along with

population estimates for the few species where this is known. Comparisons are made between the bird faunas of the seven largest islands in the group, and between the Auckland Islands and other island groups in the New Zealand subantarctic region.

Physical description of the Auckland Islands

The Auckland Islands are the rugged, eroded remnants of Early to Middle Miocene basaltic volcanoes, reaching heights of 705 m above sea level (a.s.l.) on Adams Island and 659 m a.s.l. on Auckland Island, and with sheer sea cliffs reaching 500 m a.s.l. along their exposed southern and western coasts (Adams 1983; Quilty 2007; Scott & Turnbull 2019). Covering c. 56,750 ha, the islands extend 51 km north to south, with the highest peaks around Carnley Harbour in the south (Fig. 1). There are six islands that exceed 15 ha, and about a dozen smaller islands. The islands in Port Ross are low lying, with a maximum height of 48 m a.s.l. (on Rose Island).

Below 500 m a.s.l., the gentler slopes are blanketed with peat up to 10 m thick, with skeletal or non-existent soil on the highest peaks and ridges (McGlone 2002). The more sheltered north and east coasts of Auckland Island (45,889 ha) are fringed with a narrow (c. 50 m wide) belt of southern rātā (*Metrosideros umbellata*) forest, 6–14 m tall, which grades altitudinally into shrubland (dominated by rātā, *Dracophyllum longifolium*, *D. cockayneanum* and *Myrsine divaricata*), then through *Chionochloa* tussock grassland to upland tundra and fellfield (Godley 1965; Johnson & Campbell 1975). At sites inaccessible to browsing mammals, dense megaherb fields dominated by *Anisotome*, *Stilbocarpa*, and *Pleurophyllum* species grow more than 1.5 m tall in nutrient-rich coastal sites, and in more-stunted form in upland tundra.

Adams Island (9,693 ha) has similar vegetation to the main island, but with extensive *Chionochloa* tussock meadows on the southern flanks, and *Dracophyllum* is more prominent in the coastal rātā belt (Elliott *et al.* 2020 – Chapter 3 in this book). Disappointment Island (284 ha) to the west lacks forest, and is almost entirely covered in tall *Poa litorosa* and *P. foliosa* tussock grassland and megaherb fields dominated by *Anisotome latifolia* (Walker *et al.* 2020 – Chapter 5 in this book).

FIGURE 1 (OPPOSITE). Map of the Auckland Islands, showing places named in the text.

The vegetation differs on each of the three larger islands in Port Ross (R.H. Taylor 1971; Wilmschurst *et al.* 2015). Enderby Island (695 ha) has an extensive stand of rātā forest on the southern and eastern slopes, with an adjacent belt of *Ozothamnus vauvilliersii* shrubland along the low central ridge. The north-western plateau of Enderby Island is covered with an almost pure stand of the lily *Bulbinella rossii*, with *Poa litorosa* tussock grassland recovering around Sandy Bay and on the north-eastern headlands (R.H. Taylor 1971; French *et al.* 2020 – Chapter 4 in this book). Rose Island (78 ha) has a small patch of rātā forest on the south-east coast, with most of the island covered in tall *Poa litorosa* grassland (Godley 1965; R.H. Taylor 1971). Ewing Island (58 ha) is almost entirely covered by the tree daisy *Olearia lyallii* (introduced from southern New Zealand), with a small area of rātā forest in the centre (Wilmschurst *et al.* 2015).

Situated between the subtropical front and the Antarctic convergence, the islands are exposed to persistent gale-force winds predominantly from the westerly quarter (de Lisle 1965). Year-round weather records were collected at Port Ross and Carnley Harbour during 1941–45 (de Lisle 1965). Rainfall was moderate (1,500 mm per annum), and spread over c. 310 days a year at Port Ross, with a slight autumn maximum. Orographic effects created higher rainfall at Carnley Harbour (2,100 mm per annum), spread over c. 330 days a year. Mean daily temperatures were c. 11°C in Jan–Feb at Port Ross and 10.3°C at Carnley Harbour, with winter (June) mean daily temperatures of 5.4°C and 5.7°C, respectively. The highest temperature recorded during 1941–45 was 18.3°C. Sea temperatures ranged from 7.3°C in Aug to 10.6°C in Feb (de Lisle 1965).

The islands are considered to have had an ice cap 384,000 ± 26,000 years ago, and show extensive evidence of glaciation 72,000–62,000 years ago (Rainsley *et al.* 2019), including the creation of more than a dozen steep-sided fjords along the east coast of Auckland Island and the south-east coast of Adams Island (Fig. 1). However, there is no evidence of glaciers during the Last Glacial Maximum and subsequent Antarctic Cold Reversal 28,000–13,000 years ago (Rainsley *et al.* 2019), and so forest, shrublands, and grasslands are likely to have persisted throughout this period (McGlone 2002; Wilmschurst *et al.* 2015).

Human history, and the presence of introduced mammals

Evidence of early Māori has been found on Enderby Island (Anderson 2005, 2009); however, the islands were uninhabited when discovered by Europeans in 1806. The discoverer (Abraham Bristow) returned the following year, releasing pigs (*Sus scrofa*) on Enderby Island and possibly Auckland Island, and precipitating several decades of intense harvest of New Zealand fur seal (*Arctocephalus forsteri*) skins (R.H. Taylor 1968; Prickett 2009). Cats (*Felis catus*) and house mice (*Mus musculus*) were established on Auckland Island by the time the first naturalists visited in 1840 (Russell *et al.* 2020 – Chapter 6 in this book). The sealers and whalers were followed by short-lived settlements of Māori and British at Port Ross 1842–56 (Fraser 2014), resulting in 50 years of intense hunting pressure on birds for subsistence (Miskelly & Taylor 2020 – Chapter 1). The settlers also introduced farm stock (including further pigs, cattle *Bos taurus*, and sheep *Ovis aries*), rabbits (*Oryctolagus cuniculus*), and dogs (*Canis familiaris*) (R.H. Taylor 1968; Russell *et al.* 2020 – Chapter 6).

At least eight shipwrecks occurred at the Auckland Islands during 1864–1907, and further sheep and goats (*Capra hircus*) were liberated during this period in an attempt to provide a food resource for shipwreck survivors (Egerton *et al.* 2009). Three attempts at pastoral farming between 1874 and 1910 resulted in further liberations of sheep and cattle (Dingwall 2009), and coastwatchers introduced sheep to Ocean and Rose Islands to provide a source of fresh meat during the Second World War (Russell *et al.* 2020 – Chapter 6). Given the number of shipwrecks and attempts at settlement, it is fortuitous that rats (*Rattus* sp.) never established on any of the Auckland Islands.

Many of the mammal introductions failed, and other species died out after reaching high densities (e.g. pigs on Enderby and Ewing Islands, goats on Ewing Island, and sheep and cattle on Rose Island; Russell *et al.* 2020 – Chapter 6). By 1954, six species and eight populations remained, with pigs, cats, goats, and mice on Auckland Island, cattle, rabbits, and mice on Enderby Island, and rabbits on Rose Island (R.H. Taylor 1975a). Goats were confined to the northern headlands of Auckland Island, and were eradicated in 1992 (Russell *et al.* 2020 – Chapter 6). Cattle, rabbits, and mice were

eradicated from Enderby Island in 1993, along with rabbits on Rose Island (Torr 2002), leaving pigs, cats, and mice on Auckland Island, and mice on the nearby 6 ha Masked Island in Carnley Harbour, as the only introduced mammals remaining in the group. The New Zealand Department of Conservation (DOC) is investigating the feasibility of eradicating all three species (Russell *et al.* 2020 – Chapter 6).

The Auckland Islands are nature reserves administered by DOC. Licensed ecotourism operators are able to land passengers at Sandy Bay on Enderby Island and at a few sites on Auckland Island, including Erebus Cove and Ranui Cove in Port Ross, and Tagua Bay and Breaksea Point (providing access to South West Cape) in Carnley Harbour. All other islands in the group have strict access restrictions.

Methods

Records of birds on or around the Auckland Islands were collated from published and unpublished sources. Particular effort was put into locating original field records, including published diaries, and notebooks and diaries held in public archives and private ownership.

A major source of information was the Robert Falla archive in the Alexander Turnbull Library (ATL, Wellington), which included many records gathered by other members of the 1941–45 Cape Expedition, in addition to Falla's own 1943 to 1978 notebooks. The Falla Cape Expedition records were supplemented by additional diaries held by ATL (Alan Paine and Jack Sorensen) and Auckland Museum (Graham Turbott), and copies of Ron Balham's and Laurie Pollock's diaries held by the DOC Invercargill Office.

Field notes from 1954 onwards are largely in private ownership, apart from those in the Robert Falla archive (ATL), and New Zealand sea lion (*Phocarcos hookeri*) research logbooks held by DOC Marine Unit, National Office. Field notes compiled included those from Mar & Nov 1954 (Rowley Taylor), 1962–63 (Brian Bell and Robert Falla), 1966 (Robert Falla, John Kendrick, and Rowley Taylor), 1972–73 (Brian Bell, Rodney Russ, Rowley Taylor, and Kerry-Jayne Wilson), Jan & Nov 1978 (Robert Falla and Rowley Taylor), and Feb

1985 (Rowley Taylor). Martin Cawthorn provided a summary of records from Enderby Island 1975–91. Diaries or notebooks (or extracts from them) were also provided by Murray Williams (Mar 1982, Apr 1983, 1991–92, and Nov–Dec 1996), Noel Hyde (Nov 1993), Alan Tennyson (Jun 1998), Rebecca French and Chris Muller (Enderby Island 2011–18), Kerry-Jayne Wilson (Nov–Dec 2013), Graham Parker and Kalinka Rexer-Huber (2015–19), Colin Miskelly and Alan Tennyson (Jan–Feb 2018), and James Russell and Rachael Sagar (Jan–Mar 2019).

The largest collection of private field notes was in logbooks provided by Graeme Elliott and Kath Walker, covering 32 expeditions to Adams Island from 1989 to 2018, plus Disappointment Island in 1993. These were supplemented by a spreadsheet of Feb 1991 records from Adams Island provided by Jean-Claude Stahl. Sea lion logbooks (held by DOC National Office) and the Enderby Island hut log (viewed *in situ* in Jan 2018) also contained many incidental bird records.

Unpublished reports to Lands and Survey Department, Wildlife Service, and DOC were accessed via Archives New Zealand (Wellington and Dunedin offices), DOC (Invercargill Office and National Office), and report authors. Notable among these were detailed reports by Graeme Taylor (Feb 1988) and Alan Tennyson (Jun 1998), and several reports summarising yellow-eyed penguin surveys from 2009 to 2014 (lead authors Kate Beer, Phred Dobbins, Jo Hiscock, Dave Houston, Sandy King, and Mel Young). Scientific names for all bird species are given in the species lists below.

Daily wildlife observations recorded by Heritage Expeditions staff during 134 visits to the Auckland Islands between 1992 and 2018 were accessed via the Heritage Expeditions and Strannik Ocean Voyages offices. Records of bird specimens from the Auckland Islands held by New Zealand museums were accessed via Emma Burns (Otago Museum), Colin Miskelly (Museum of New Zealand Te Papa Tongarewa), Matt Rayner (Auckland Museum), and Paul Scofield (Canterbury Museum). Records of vagrant birds from the Auckland Islands were obtained from a database maintained by Colin Miskelly as convener of the Birds New Zealand Records Appraisal Committee. Information on specific specimens or collections was sought from relevant international museums. However, we did not seek to undertake a review of

holdings of Auckland Islands bird specimens held offshore, as a sample of international museums revealed that few specimens retained locality data with greater precision than 'Auckland Island' or 'Auckland Islands'.

Internal reports published since 1987 were mainly accessed via the DOC website, including the Conservation Services Programme page, which contained links to numerous reports on Gibson's wandering albatross and white-capped mollymawk, and also on light-mantled sooty albatross, northern giant petrel, and white-chinned petrel. Additional reports on this same group of species were accessed via the Agreement on Conservation of Albatrosses and Petrels (ACAP) website. Records from the citizen science website eBird (1990 to Dec 2017) were accessed via Cornell Lab of Ornithology in Jun 2018.

Scientific papers and books containing information on birds of the Auckland Islands were identified mainly from our own working bibliographies, with an independent check on completeness provided by Elliot Dawson's comprehensive compilation of 5,440 publications referring to the Auckland Islands (Dawson 2012).

All bird records found were entered into a database, including (where known) information on species, number of individuals, date, location, observer, information source, and details of breeding activity or interactions with other species. Known or likely duplicate records were deleted from the database, with priority given to retaining the most accurate or detailed record (usually with respect to date or location, but also to information on breeding activity). Where two or more sources contained identical information, priority was given to published records, followed by the earliest record if choosing between identical published or unpublished records. The 23,028 unique records remaining in the database were the basis for the summaries and analyses in this paper. Individual observers are identified by their initials or abbreviations in the text, with their full names given in Appendix 1. The full dataset of sightings is presented in Supplementary materials <http://notornis.osnz.org.nz/node/4445>.

Each species was assigned to one of four categories: 1. 'Breeding species' (including locally or globally extinct taxa that are considered to have had a breeding population on the Auckland

Islands before human contact, and bird species introduced to mainland New Zealand that have self-colonised the Auckland Islands and established a resident breeding population); 2. 'Migrant and vagrant species, and failed colonists' (including species recorded breeding on a few occasions); 3. 'Failed introductions'; and 4. 'Unverified or invalid vagrant bird species'. For each breeding species, data on the earliest record of their presence on each island is presented, followed by information on maximum counts or estimates, and the earliest breeding record from each island. Information on breeding chronology is presented, along with information on clutch and brood sizes. Where available, information on foraging and diet, and interactions with other species, are presented. Each account concludes with a summary of the status of the taxon on other subantarctic island groups. A subset of the same information is similarly presented, and in the same sequence, for migrant and vagrant species and for failed colonists.

Abbreviations for localities in species record

summaries: Ad Adams Island, AIs Auckland Islands, Ak Auckland Island, AS at sea (beyond harbours and inlets), CH Carnley Harbour, Dn Dundas Island, Ds Disappointment Island, En Enderby Island, Ew Ewing Island, F8 Figure of Eight Island, Fri Friday Island, Frn Frenchs Island, In = inlets on Auckland Island (other than the two main harbours), Mn Monumental Island, Ms Masked Island, Oc Ocean Island, OI other islets, PR Port Ross, Ro Rose Island, Sh Shoe Island. For each species, sites are listed in a sequence based on the date of first record at each site.

Frequency of occurrence analyses

Each bird record was assessed as to whether it was part of a full list for each site and date, based on the range of other bird species reported simultaneously, and particularly whether the observer recorded most of the expected common species at that site (= a full list). If the list was adjudged incomplete, it was further tagged as a part list (3+ species) or an incidental sighting (1–2 species). Incidental sightings and part lists were excluded from bird community analyses as they over-estimated the frequency of occurrence of endemic taxa, and under-estimated the

occurrence of introduced species (Miskelly 2020a – Chapter 19 in this book). The full lists for each of the seven largest islands were grouped over time periods of 21 to 46 years, and were used to calculate the frequency of occurrence for each species as a measure of the likelihood that at least one individual of each species would be recorded during a day spent on the island. Records were grouped from 1998 to 2018 for three islands with either large numbers of full lists available for analysis (Enderby and Auckland Islands) and/or where introduced mammals had been eradicated in 1993 (Enderby and Rose Islands). For the remaining four islands (Adams, Disappointment, Ewing, and Ocean Islands) we used records from 1972 to 2018, as there were few full lists for these islands in the dataset. The number of full lists for each island included in the analyses was: Auckland Island 91, Adams Island 22, Enderby Island 122, Disappointment Island 9, Rose Island 5, Ewing Island 13, and Ocean Island 7.

All records (including part lists and incidental sightings) were used in summaries of the earliest records of each species on each island, the maximum number of birds recorded at one time on each island, and for breeding chronology, clutch and brood sizes, and observations of diet and interactions with other species.

Breeding species

We recognise 45 species with breeding populations on the Auckland Islands, including six species that were introduced to mainland New Zealand and naturally dispersed to the Auckland Islands (mallard, Eurasian blackbird, song thrush, common starling, dunnoek, and common redpoll). Of this total, one is globally extinct (Auckland Island merganser), and three are definitely or probably extinct within the Auckland Islands but survive elsewhere (South Georgian diving petrel, white-faced storm petrel, and shore plover).

Auckland Island merganser *Mergus australis*

24 records: PR 2, CH 5, AIs 8, Ak 1, In 5, Ad 1, En 2. Extinct. First collected in Port Ross by the naturalists of Dumont d'Urville's expedition in Mar 1840 (Hombron & Jacquinot 1841), and reported in

Laurie Harbour on 23 Nov 1840 (RM). A small flock was seen (and four shot) in Camp Cove, Carnley Harbour on 11 Jun 1864 by shipwreck survivor Francois Raynal (1874; see Miskelly & Taylor 2020 – Chapter 1). Two specimens (apparently a pair) bought by Anatole von Hügel in Invercargill in Dec 1874 were likely collected by associates of farm leaseholder Francis Monckton on the schooner *Mabel Jane* (Falla 1967; Miskelly & Taylor 2020 – Chapter 1). Hermann Krone collected a pair in Carnley Harbour in late 1874 (Kear & Scarlett 1970) and described them nesting at Dea's Head, Port Ross, '*Always rare, these nest on the steep rocky coast towards the north, and northeast too, above the wild surf around the large rock arch, where they live together with the cormorants*' (translated from German; Krone 1900). Joseph Burton, taxidermist at the Colonial Museum, collected one in 1880 (Hector 1881), and Andreas Reischek collected a pair from a likely family group of six in Waterfall Inlet on 26 Jan 1888 (Reischek 1889a; Williams 2012). Chapman (1891) collected a pair with four young (c. 1 week old) on the north coast of Adams Island on 12 Jan 1890, and Robert Wilson collected a pair on a deep pool inland from Waterfall Inlet on 30 Oct 1891 (Kear & Scarlett 1970). Walter Buller obtained two pairs collected in May 1894 and Feb 1895 (Kear & Scarlett 1970), and Leonard Kristensen shot one at the head of North Arm, Carnley Harbour, on 23 Jul 1894 (Bugayer accepted ms).

The death warrant for the Auckland Island merganser was signed in 1901, when the governor of New Zealand agreed to collect examples of rare New Zealand birds on behalf of the British Museum. The Earl of Ranfurly and his entourage (including the naturalist Frederick Hutton) visited the Auckland Islands on the government steamer *Hinemoa* on 3–8 Jan 1901. Hutton described collection of a merganser in Norman Inlet on 4 Jan, a likely pair (accompanied by two fledged young) in McLennan Inlet on 5 Jan, and a fourth specimen from the 'eastern sounds' on 6 Jan (Ogilvie-Grant 1905; FW Hutton notebook in Falla archive, ATL). At the Earl of Ranfurly's request, the officers of HMS *Archer* collected three further mergansers during their visit to service castaway depots 2–9 Jul 1901: Commander John Rolleston collected a female in Carnley Harbour on 9 Jul, and two additional birds were collected by Lieutenants

Kennett Dixon and Archibald Stewart (this voyage is discussed further by Miskelly & Cooper 2020 – Chapter 17 in this book, and see Ogilvie-Grant 1905; Williams 2012). Henry Travers acquired a merganser specimen collected in Dec 1901 (Kear & Scarlett 1970), and the last known birds were a pair shot by Mr Shattock, Lord Ranfurly's butler, in Carnley Harbour on 9 Jan 1902, when Ranfurly returned to the Auckland Islands on the government steamer *Tutanekai* (Alexander 1902).

The fate of the 27 known merganser specimens was investigated by Kear & Scarlett (1970) and Williams (2012). The merganser was granted absolute protection in May 1906, 4 years after the last known sighting (Miskelly 2014). Four bones probably representing two individuals were found on Enderby Island in 1998 and 2018 (Tennyson 2020 – Chapter 7 in this book).

No nests were ever described for the Auckland Island merganser. Two broods each of four young were observed in January, and a female carrying an egg was taken in February (Williams 2012). A specimen collected on the north coast of Adams Island in January had a 90 mm long kōaro (*Galaxias brevipennis*, a freshwater fish) in its bill, and analyses of stable isotopes from feathers and claws indicate that the mergansers foraged in both

marine and freshwater environments (Williams *et al.* 2012). Williams (2012) suggested that, due to restricted habitat and likely territoriality, there may have been as few as 20–30 breeding pairs present.

Mergansers formerly occurred on the New Zealand mainland and the Chatham Islands. Naming of the Chatham Island merganser (*M. milleneri*) in 2014 created uncertainty about the identity of the few merganser bones from the New Zealand mainland (previously considered to be *M. australis*), and so it is unclear whether *M. australis* was endemic to the Auckland Islands (Williams *et al.* 2014).

Auckland Island teal *Anas aucklandica*

905 records: AIs 15, PR 5, En 240, Ak 16, Ro 64, Ew 118, Sh 2, Ad 332, Mn 2, Ds 39, CH 5, Oc 50, Frn 5, Fri 1, Dn 10, AS 1. Abraham Bristow described teal as occurring in 'such plenty' following his exploration of the Auckland Islands in Oct–Dec 1807 (Miskelly & Taylor 2020 – Chapter 1), and Dumont d'Urville (1846) described a good-tasting small duck as being very abundant in Mar 1840 ('canards assez petits mais d'un goût excellent; ils paraissent se trouver sur les îles Auckland en

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FIGURE 2. Adult male Auckland Island teal, Enderby Island, January 2016. Image: Tony Whitehead, New Zealand Birds Online.

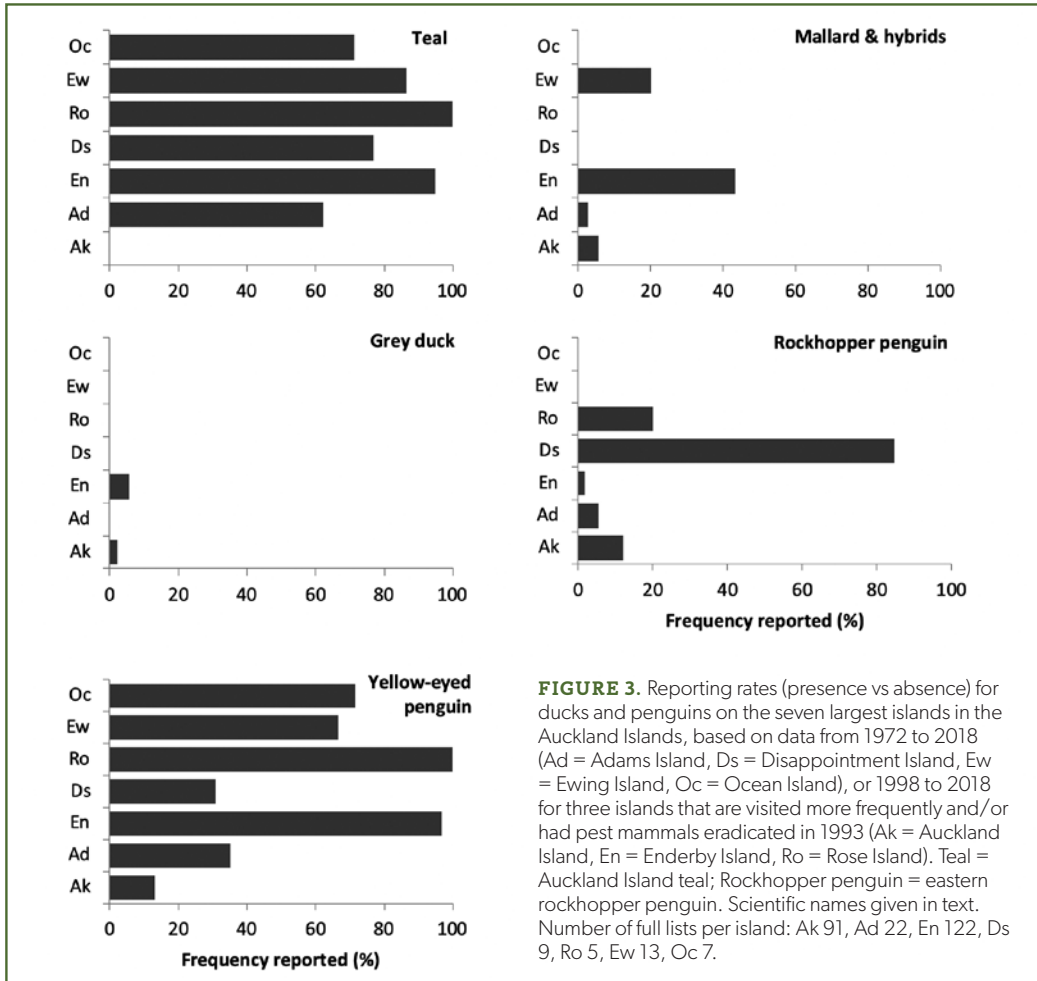


FIGURE 3. Reporting rates (presence vs absence) for ducks and penguins on the seven largest islands in the Auckland Islands, based on data from 1972 to 2018 (Ad = Adams Island, Ds = Disappointment Island, Ew = Ewing Island, Oc = Ocean Island), or 1998 to 2018 for three islands that are visited more frequently and/or had pest mammals eradicated in 1993 (Ak = Auckland Island, En = Enderby Island, Ro = Rose Island). Teal = Auckland Island teal; Rockhopper penguin = eastern rockhopper penguin. Scientific names given in text. Number of full lists per island: Ak 91, Ad 22, En 122, Ds 9, Ro 5, Ew 13, Oc 7.

grande quantité). A few were captured on Enderby Island on the same visit (CD); however, the type specimens were collected by McCormick (1884) in Laurie Harbour, Port Ross on 23 Nov 1840. At least six were seen (and 1–2 killed) on Rose Island in Sep 1864 by a survivor of the wreck of the *Invercauld* (RH in Allen 1997); teal were hunted at the mouth of Krone Creek, Dea's Head, Auckland Island in 1874–75, and a specimen was collected on Ewing Island during the same expedition (Krone 1900; Miskelly & Taylor 2020 – Chapter 1). They were found on Shoe, Adams, and Monumental Islands in Jan 1890 (Chapman 1891; Falla archive in ATL), and on Disappointment Island on 28 Nov 1907 (Waite 1909). The first report on Ocean Island was one on 24 Oct 1942 (CF in McEwen 2006), and five fledglings were found on Frenchs Island on

17 Jan 1984 (RAF, ED). The only record from Friday Island was a comment by Falla (1975) that they had been seen on 'Passage Islet' (an alternative name for Friday Island), presumably between 1941 and 1966. The first record from Dundas Island was eight seen (and ducklings heard) on 21 Jan 1978 (Falla *et al.* 1979).

No other bird species on the Auckland Islands reveals the impact of cats and pigs as clearly as Auckland Island teal (Fig. 2). There are no recent records from Auckland Island; however, teal were recorded on 62–100% of recent visits to the next six largest islands in the group (Fig. 3). Teal were recorded from the main island on about 15 occasions after first being collected there in 1840. Three were shot at the head of Carnley Harbour on 12 Feb 1864 (Raynal 1874), and they

were apparently still present at this location on 23 Jul 1894 (LK in Bugayer accepted ms). Teal were hunted in the bay at Dea's Head, Port Ross in 1874–75 (Krone 1900) and on 23 Mar 1904 (five shot; E. Wilson 1966). Teal were recorded along the south-east shoreline of Port Ross from Tucker Point to Crozier Point on at least nine occasions between 28 Oct 1942 and an unknown date in 1944 (Turbott 2002; McEwen 2006); these birds are likely to have swum from Ocean, Frenchs, or Ewing Islands 120–1200 m offshore. Of the latter records, 1–2 birds were seen at Ranui Cove (on four occasions between 17 Jan & 20 Nov 1943), and seven birds were feeding on masses of washed-up *Phronima* (hyperiid amphipods — adults, eggs, and young) on 19 & 21 Jun 1943 (RAF, JFJ). A teal at Ranui Cove in 1944 was seen catching and killing a mouse but did not eat it (Turbott 2002). The only subsequent sighting on Auckland Island was a single bird at Ranui Cove on 30 Jan 1973 (RT, BT).

The highest counts or estimates on eight islands were 300–700 on Disappointment Island in 1993 (Walker *et al.* 2020 – Chapter 5); 50+ pairs on Adams Island c. 1966 (Falla 1975), 78–162 (possibly up to 220) there in 1989 to the early 1990s (Moore & Walker 1990, 1991; MJW in McClelland 1993), and 97 counted on 19 Nov 2009 (JAH, SK, CDL, JL, KB, LT); 30–40 pairs on Enderby Island c. 1966 (Falla 1975), and c. 50 there in the early 1990s (MJW in McClelland 1993); 100 pairs on Rose Island, and 100–169 birds to 200 birds on Ewing Island in 1989 and 1991–92 (Moore & Walker 1990, 1991; Williams 1995); 10 pairs on Ocean Island, and 3 pairs on Frenchs Island in 1966 (Falla 1975); and at least 14 adults and 3 young on Dundas Island on 20 Feb 1985 (RT).

Auckland Island teal are observed mainly along sheltered shorelines fringed with *Durvillea* bull kelp or with *Macrocystis* kelp beds close offshore, where they forage for amphipods and kelp fly larvae among tidewrack and in the intertidal zone. A few pairs live and breed in island interiors on islands in Port Ross, mainly but not entirely along watercourses (Williams 1995). Teal on Disappointment Island have little access to the coast, and are found mainly inland in dry tussock-fern communities at substantial distances from water, and in damp gullies among megaherbs and broad-leaved tussocks (Walker *et al.* 2020

– Chapter 5). The abundance of teal in inland habitats is a feature of Disappointment Island, although teal also live in low numbers and breed in the extensive tussock and megaherb fields high on the southern flanks of Adams Island (Elliott *et al.* 2020 – Chapter 3).

In addition to Frenchs and Dundas Islands (see above), evidence of breeding by Auckland Island teal has been detected on six further islands. Family groups including fully feathered young were observed on Ewing Island on 28 Mar 1927 (Guthrie-Smith 1936), a female with five ducklings was on Ocean Island on 5 Jan 1943 (RAF, AP), and an old nest (with decomposed nestlings and egg shell) was found on Rose Island on 5 Feb 1943 (ED). The first breeding record for Adams Island was unusual in that it was a duck, caught at Fairchild's Garden, that laid an egg overnight while in captivity (13 Nov 1954; RAF, KAW, RT). A brood of ducklings was seen on Disappointment Island on 6 Jan 1973 (RR, BDB, MFS, RN), and two broods were observed on Enderby Island in Feb–Mar 1982 (MJW).

Fifty-three active nests have been reported, from four islands only. The first were two with 3 and 4 eggs found on Ocean Island on 12 Dec 1943 (one under *Dracophyllum* slash cleared by the coastwatchers, the other under dead leaves of a *Chionochloa* tussock; JFJ, RWB). A nest with 3 eggs was found in the middle of a small clump of fern under rātā 100 m from coast on Ewing Island on 21 Dec 1943 (RWB, RAF), and 4 eggs were found in a shallow nest lined with dense, dark grey down in *Blechnum* fern there on 6 Jan 1973 (Weller 1975). A dog previously trained to locate brown teal (*Anas chlorotis*) was used to locate teal and their nests in 1991–92 and 1996, resulting in the finding of 49 nests with eggs (27 on Ewing Island, 21 on Rose Island, and one on Enderby Island; Williams 1995 and *unpubl. data*). No nests have been found subsequently (and nests have yet to be found on Adams and Disappointment Islands).

Copulation was observed between 23 Oct (1942, Ewing Island; LS, GP, HH, NH in McEwen 2006) and 31 Dec (1996, Adams Island; KW, GPE). Eggs were recorded from 13 Nov (1954, from a female caught on Adams Island; RAF, KAW, RT) to 25 Jan (1992, nest with 4 eggs, Ewing Island; MJW). Based on recorded or estimated hatch dates, laying was estimated to commence in early-Nov and

peak in late-Nov, with late clutches hatching in late-Feb (Williams 1995). Egg size and colour, and nest sites and construction were described by Williams (1995). The mean size of 45 clutches was 3.4 eggs (range 1–6 eggs), with 71% of nests comprising 3 or 4 eggs; hatching success of 113 eggs was 93% (Williams 1995). Incubation was by the female only and took 30–35 days (Williams 1995). Ducklings were observed from 11 Dec (1991, brood of five ducklings on Ewing Island; MJW, JJA, DB) to 14 Apr (1944, a half-grown downy duckling collected on Ocean Island; EGT, Te Papa OR.13057). Most broods were reduced to a single duckling within 8 days; the probability of a duckling surviving to 30 days was 27%. The estimated brood size at fledging was 1.6, and only 14% of ducklings were estimated to survive to fledge, with up to two-thirds of pairs failing to raise any young (Williams 1995). Predators included southern skuas and southern black-backed gulls. Also, many ducklings became separated from adults and brood-mates (Williams 1995), and so probably did not survive. Auckland Island teal were taken by New Zealand falcons on Adams Island (Hyde & Worthy 2010), and this is likely to occur also on Enderby and Rose Islands.

In addition to the birds that apparently reached the coast of Auckland Island at or near Ranui Cove from populations on nearby islands (see above), a colour-banded teal seen on Dundas Island on 24 Feb 1988 (MC) is likely to have arrived from Ewing Island, 5 km away.

Auckland Island teal are endemic to the Auckland Islands. The closely related Campbell Island teal (*A. nesiotis*, endemic to the Campbell Island group) is the only other teal in the New Zealand subantarctic.

Mallard *Anas platyrhynchos*

147 records (including hybrids with grey duck): Ak 29, En 97, Frn 1, Ro 3, Ad 6, Ew 3, CH 4, PR 3, Mn 1. Introduced to mainland New Zealand, dispersed to the Auckland Islands. Turbott (2002) stated that mallards 'were recorded only rarely during the Cape Expedition'; however, we found no records before Dec 1962–Jan 1963, when one was seen at Keken Bay (north-east Auckland Island; JD), a feather was found at Laurie Harbour, and two were seen flying at Derry Castle Reef, Enderby Island (BDB). The first records on other islands were: Frenchs Island

on 5 Dec 1972 (RR), Rose Island during May–Jun 1986 (MC), Adams Island (Lake Turbott outlet) on 12 Nov 1989 (Buckingham *et al.* 1991), Ewing Island on 24 Jun 1998 (AT), and Monumental Island on 1 Feb 2018 (CMM, AT). The largest flock was c. 20 at Williamson Creek (head of Laurie Harbour) during 30 Jan–3 Feb 1986 (DJC). Other counts of ten or more were at Keken Bay (north-east Auckland Island) on 7 Dec 1972 (BDB), and on Enderby Island in Feb–Mar 1982 (P. Thomson 1986), 17 Mar 2003 (sea lion team), 3 Nov 2011 (HEX), 15 Dec 2011 (MY, JAH), and Jan 2015 (LA). Mallards or hybrids were reported on 43% of recent visits to Enderby Island and on 20% for Ewing Island, but were rarely reported in full bird lists from elsewhere in the group (Fig. 3).

No nests have been found. A duckling was seen with a female at Ranui Cove on 30 Dec 1972 (KJW), and two ducklings were there in Dec 2000 (DB, MW, JC). Two adults with ten young were on Teal Lake, Enderby Island, on 10 Jan 1985 (MC).

Mallards have established small populations on the Snares, Campbell, and Antipodes Islands (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002).

Grey duck *Anas superciliosa*

112 records: AIs 4, Ak 62, PR 3, En 26, CH 4, Ro 2, Oc 1, Ew 3, Frn 2, Dn 2, Ad 3. Abraham Bristow was probably referring to grey ducks when he contrasted 'shy' ducks with tame teal (and other species) following his exploratory visit in Oct–Dec 1807 (Miskelly & Taylor 2020 – Chapter 1). They were referred to as 'gray ducks' by Silas Holmes in Mar 1840 (Wilkes 1845), and were hunted by survivors of the *Grafton* and *Invercauld* wrecks in 1864–65 (Raynal 1874; Allen 1997). However, the first specimens were collected during the 1874–75 German Transit of Venus Expedition (Miskelly & Taylor 2020 – Chapter 1). Grey ducks were recorded mainly from stream mouths and bays on Auckland Island, and on the small lakes and at Derry Castle Reef on Enderby Island. The highest count was 30–40 at the head of Laurie Harbour in Jul 1942 (McEwen 2006). The only other counts of more than ten birds at a time were 17 on Teal Lake, Enderby Island, on 23 Feb 1943 (RAF, ED), and 20 at Musgrave Harbour (a branch of Carnley Harbour) on 30 May 1943 (LHP, AP). Of five islands visited in 1989, grey ducks were reported from Auckland Island only, whereas mallards were seen

on Auckland, Enderby, and Rose Islands (Moore & McClelland 1990). The decline of grey ducks, in terms of both flock sizes and the frequency of reporting, has coincided with the arrival and increase of mallards at the Auckland Islands (first reported in 1962–63). Reporting rates for grey ducks have been less than 6% of visits to Enderby and Auckland Islands since 1998, and there have been no records from the other large islands since 1972 (Fig. 3). The most recent grey duck record was one in North Arm, Carnley Harbour, on 16 Jan 2016 (HEX). There are no reports of nests or ducklings.

Mallards have also largely displaced grey ducks on the Snares and Campbell Islands, and have colonised Antipodes Island (Miskelly *et al.* 2001; authors, *pers. obs.*).

Eastern rockhopper penguin *Eudyptes filholi*

230 records: Fri 1, PR 22, CH 3, AIs 6, Ak 80, Ds 25, Oc 14, AS 22, Ew 1, En 30, Ad 24, Dn 1, Ro 1. Gaston de Roquemaurel probably found a dead rockhopper penguin in Port Ross in March 1840 (*'Nous en avons rencontré un [penguin], mort sur la grève,*

qui avait la tête surmontée d'une aigrette' [we met one, dead on the beach, its head was crowned with a plume]; Dumont d'Urville 1846). The first confirmed record was also the only record from Friday Island – a few reported (as *'Eudyptola minor'*) on 3 Mar 1875 (Krone 1900). This was likely the source of two specimens collected by the German Transit of Venus Expedition from the 'north side' of Port Ross, which are housed in the Senckenberg Natural History Collections of Dresden (Miskelly & Taylor 2020 – Chapter 1). Krone (1900) reported the same small penguins from Carnley Harbour. Breeding sites were first reported by Chapman (1891), who described 'vast rookeries' on the west coast of Auckland Island, with the identity of the birds confirmed by Cape Expeditioners in 1941–42 (CF in McEwen 2006). The first nests inspected were about 20 containing eggs under large boulders north of Chambres Inlet (Auckland Island east coast) on 30 Nov 1943 (RAF, RWB).

Rockhopper penguins were found on Disappointment Island on 28 Nov 1907 (Waite 1909), and breeding was confirmed there on 9 Dec 1944 (Turbott 2002; Fig. 4). Rockhopper penguins have

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FIGURE 4. Adult eastern rockhopper penguin on nest, Disappointment Island, January 2015. Image: Paul Sagar.

never been recorded breeding in the Port Ross area. However, the Cape Expeditioners frequently found single rockhopper penguins moulting on Ocean Island, with the first on 5 Mar 1942 (CF in McEwen 2006), and they observed individuals or small flocks foraging in Port Ross (e.g. three in Ranui Cove on 17 Feb 1943; LHP, TM, ED, JFJ). Single birds have also been recorded on Ewing Island (28 Feb 1943; RAF), Enderby Island (first record on 28 Dec 1972; KJW, BDB, MFS), and Dundas Island (one dead on 20 Jan 2012; sea lion team). Colonies at the foot of the southern cliffs on Adams Island were first noted on 19 Jan 1973 (opposite Amherst Rock; RR, BDB, RN, MFS).

The 1972–73 expedition located 14 colonies, with one on Disappointment Island, two on the south coast of Adams Island, and 11 on Auckland Island (three on the north-west coast, four north-east of Bristow Point (west coast), and four on east coast headlands between the north head of Chambres Inlet and Falla Peninsula) (B.D. Bell 1975; RR, *pers. obs.*). Although many of the colonies were viewed only from offshore or clifftops, Bell (1975) estimated the population at 5,000 to 10,000 pairs. Cooper (1992) reported at least 886 adults from eight colonies on the main island and one on Adams Island during 1–2 Jan 1990. Reporting rates are highest on Disappointment Island (Fig. 3), where the small eastern rockhopper penguin colony is above the main landing site. Reporting rates are much lower on Auckland and Adams Islands, where breeding colonies are distant from the usual landing sites used by people. The single bird reported from Rose Island was foraging close inshore.

Few observers have reported the stage of breeding of eastern rockhopper penguins at the Auckland Islands since the first record in Nov 1943. BDB & RN collected five eggs from Haskell Bay to Falla Peninsula (east coast of Auckland Island) on 8 Jan 1973 (measurements 70.5×52.2 , 60.8×44.3 , 67.6×53.8 , 66.6×48.8 , 62.2×47.2 mm). The following records are all from Disappointment Island. Nests with eggs were seen on 8 Dec (1983; Mayhill & Goulstone 1986), recently hatched chicks on 31 Dec 1980 (Wassilieff 1986), most nests had quite large chicks on 2 Jan 2015 but creching had not yet started (PS), there was a mix of large and small downy chicks on 20 Jan 1993 (Walker *et al.* 2020 – Chapter 5), with larger chicks on 8 Feb 1988

(8 fully grown downy chicks; GAT) and on 15 Feb 1973 (30; RR, CR, RN, SR). This breeding chronology is similar to records for the same taxon from the Antipodes and Campbell Islands (Warham 1972a; Morrison 2017).

Observations of rockhopper penguins at sea around the Auckland Islands have been made Aug–Mar, with the earliest being ‘a few’ in Carnley Harbour on 7 Aug 1943 (RAF). Most observations have been of individuals or small flocks up to eight. Higher counts have included two flocks of c. 12 & c. 20 feeding at the mouth of Port Ross (south-east of Enderby Island) on 31 Dec 1962 (BDB), 15+ between Enderby Island and Laurie Harbour on 1 Jan 2001 (sea lion team), 20 north of Enderby Island on 6 Jan 2006 (CMM), and c. 10 in Port Ross on 14 Jan 2018 (AT, CMM). RAF considered them to be always present in Port Ross during the 1962–63 expedition, with groups porpoising and apparently feeding between Ocean and Ewing Islands between 31 Dec 1962 and 2 Jan 1963. The only observations of diet are from 1943–44 in Port Ross: one or two ‘feeding on sardines/anchovies’ on 8 Nov 1943 (RAF, ED, JFJ), and an adult female collected on 20 Feb 1944 had been feeding on small fish (Turbott 2002).

Elsewhere in the New Zealand region, eastern rockhopper penguins breed on Antipodes and Campbell Islands (Morrison 2017).

Yellow-eyed penguin *Megadyptes antipodes*

969 records: AIs 21, PR 32, En 408, Fri 6, CH 117, Ak 127, Sh 8, Ad 84, Oc 66, AS 14, Ew 35, Ro 34, Frn 1, OI 1, Ms 1, Mn 1, Ds 12, Dn 1. The Reverend John Butler reported ‘a fine penguin’ from the Auckland Islands in Sep 1824 (Barton 1927); however, no yellow-eyed penguins had been collected (from anywhere in New Zealand) and the species was undescribed when the United States Exploring Expedition arrived in Port Ross on 7 Mar 1840. Dr Silas Holmes collected two specimens; however, publication delays allowed Jacques-Bernard Hombron and Honoré Jacquinot the honour of naming ‘*Catarrhactes antipodes*’, based on two specimens collected while the *Astrolabe* and *Zélée* were in Port Ross on 11–20 Mar 1840. The type locality was not recorded precisely, but the expedition found the penguins to be abundant on Enderby Island (Hombron & Jacquinot 1841; CD

in Dumont d'Urville 1846). Yellow-eyed penguins were found on Enderby and Friday Islands in Nov 1840 (RM). However, they were rare in Port Ross in 1874–75, when the German Transit of Venus Expedition collected specimens from Carnley Harbour (Miskelly & Taylor 2020 – Chapter 1). One was seen on Shoe Island on 28 Oct 1891 (RW); they were reported to breed on Adams Island in Jan 1901 (FH); and two were reported from Ocean Island on 28 Mar 1927 (GT). During the coast-watcher era, yellow-eyed penguins were reported for the first time from Dundas Island on 4 Sep 1941 (WW), Tagua Bay, Auckland Island on 2 Nov 1941 (LHP), Ewing Island in early-Jun 1942 (GA in McEwen 2006), and Rose Island on 3 Oct 1942 (CF in McEwen 2006). They were subsequently recorded from Frenchs Island on 5 Dec 1972 and Yule Island on 6 Dec 1972 (RR, BDB, MFS), Masked Island on 2 Feb 1973 and Monumental Island on 15 Feb 1985 (RT), Disappointment Island on 16 Jan 1993 (Walker *et al.* 2020 – Chapter 5), and Dundas Island on 21 Jan 2012 (sea lion team).

Yellow-eyed penguins occur throughout the Auckland Islands, with 115 landing sites identified in the north and south parts of the group in Nov–Dec 1989 (Moore 1990), and 301 landing sites identified in Nov 2009 (SK, JAH, CDL, JL, KB, LT). They were reported on 97–100% of recent visits to Enderby and Rose Islands, and 67–71% of visits to Ocean and Ewing Islands (Fig. 3). Population estimates for the entire group ranged from 80–150 pairs in 1972–73 (RR) to 520–570 pairs in 1989 (Moore 1992a), and averaged 577 pairs in 2012–17 (excluding the west coast; Muller *et al.* 2020 — Chapter 9 in this book). The highest counts from individual sites included 593 birds on Enderby Island in Nov 1989 (Moore 1992a), 183 at Waterfall Inlet, Auckland Island, 22–24 Jan 1995 (GC, CH, AG), 88 at North Harbour, 43 at Matheson Bay, at least 13 at Port Ross, 26 at Webling Bay and 3 at Tagua Bay, Auckland Island in Nov 1989 (Moore 1992a), 64 on Adams Island, in Nov 1989 (RB, GPE, KW in Moore 1992a), 64 on Ewing Island on 16 Nov 2012 (JAH and team), 41 on Rose Island in Nov 1989 (Moore 1992a), and 20 nests on Ocean Island on 23 Oct 1943 (RAF).

Eggs or chicks of yellow-eyed penguins were first reported from Enderby Island on 10 Oct 1906 (JB), Ocean Island on 7 Nov 1941 (DK), Rose Island on 12 Nov 1942 (LS, GP, HH, NH in McEwen 2006),

Auckland Island (Tagua Bay) c. 12 Jan 1943 (CF in McEwen 2006), Ewing Island on 28 Feb 1943 (RAF), Adams Island (Fly Harbour) on 29 Dec 1972 (RR, PC, RN, GRW, MWW), Friday Island on 21 Jan 1978 (NC, RAF), Shoe Island on 30 Nov 2009 (JAH, SK), and Disappointment Island on 13–16 Feb 2017 (Walker *et al.* 2020 – Chapter 5). The Ranui Cove coastwatching team monitored five yellow-eyed penguin nests on Ocean Island in 1943–44. Each pair laid two eggs during 11–17 Oct; these hatched 30 Nov–17 Dec after 48–52 days of incubation, and chicks fledged about the end of Feb (RAF). Eggs were recorded from 6 Oct (1942, Ocean Island; CF) to 10 Dec (1943, Ocean Island; RAF); eggs after this date were addled or infertile. Chicks were recorded from 24 Nov (2009, two nests each with two chicks, Ewing Island; JAH, JL, KB, LT) to 28 Feb (1943, young in last of down, Ewing Island; RAF, ED). These breeding dates are about 3 weeks later than for the same species on Otago Peninsula (J.T. Darby & Seddon 1990), and similar to Campbell Island, where the mean laying date at 40 monitored nests was 26 Nov (20 Nov–3 Dec 1987) and the mean fledge date was 13 Mar (28 Feb–28 Mar 1988; Moore 1992b).

Twenty-one nests were found in 1989 (all with two eggs). They were isolated from each other and ranged from the edge of the shoreline vegetation to about 1 km inland (Enderby Island). Nests were backed and sheltered by dense vegetation, tree trunks, logs, gully hollows, and in one case, a cave. Canopy vegetation included *rātā*, *Olearia*, *Myrsine*, *Poa litorosa*, *Stilbocarpa*, and *Blechnum* and *Histiopteris* ferns (Moore 1990).

Yellow-eyed penguins with entirely or partially white or pale plumage were recorded on Enderby Island on 38 occasions between 1944 and 2016 (examples in Everitt & Miskelly 2003). Two unusually coloured birds were seen on the same date on six occasions between Jan 1975 (MC) and 18 Dec 1995 (PG).

As well as being the most important breeding site for yellow-eyed penguins in the Auckland Islands, Enderby Island is one of the sites most visited by tourists. French *et al.* (2018) investigated yellow-eyed penguin behaviour on the island in relation to human disturbance, and found that the current ecotourism guidelines for permissible approach distances are insufficient to prevent disturbance of this timid species.

The only information on the diet of yellow-eyed penguins at the Auckland Islands was a report of several feeding on small fish in Carnley Harbour on 7 Jun 1943 (LHP, AP). The largest foraging flock reported was c. 35 in Port Ross on 11 Aug 2010 (Lalas & McConnell 2012). Yellow-eyed penguins are occasionally killed and eaten by New Zealand sea lions, both at sea and on land. Predation events were witnessed in Carnley Harbour on 7 Jun 1943 (LHP, AP), and on Enderby Island before 1984 (MC) and on 28 Dec 2011 (BLC, JAH, MY, SWC). Yellow-eyed penguin remains were found in five of 41 sea lion casts from the north of the group in Jan 2011 (CL, CS). One of eight pigs shot on the coast of Auckland Island in 1972–73 had the remains of a yellow-eyed penguin in its stomach (Challies 1975), and a pig scat full of penguin feathers was noted on the south side of Laurie Harbour on 29 Nov 2009 (SK in Beer 2010).

Yellow-eyed penguins also breed on Campbell Island and from Stewart Island north to Banks Peninsula. The only direct evidence of movement between subpopulations was a bird captured on Enderby Island on 18 Jan 2007 (KM, JAm) that had been banded as an adult at Boulder Beach, Otago Peninsula, on 8 Jan 2002. Vagrant birds have been recorded on the Snares and Chatham Islands (Miskelly *et al.* 2001; Miskelly, Bester *et al.* 2006).

Gibson's wandering albatross *Diomedea antipodensis gibsoni*

823 records: AIs 32, Ad 431, AS 167, Ak 91, Ds 23, CH 74, En 4, Mn 1. All early (1840–75) records of 'wandering albatrosses' at the Auckland Islands were from Enderby Island and the nearby Hooker Hills on Auckland Island, and all were likely to have been southern royal albatrosses (see next species). The first unequivocal record of what is now known as Gibson's wandering albatross (or Gibson's albatross) was birds on fresh eggs on Adams Island on 26 Jan 1888 (Reischek 1889a, b), although JBG reported 'wandering albatrosses' breeding on the south side of Adams Island some time during 1882–86 (letter in Falla archive, ATL). The survivors of the *Dundonald* wreck found Gibson's wandering albatrosses breeding on Disappointment Island Mar–May 1907 (Escott-Inman 1911), and this was confirmed by members of the Philosophical Institute of Canterbury on

28 Nov 1907 (Waite 1909). The earliest record on Auckland Island was an adult feeding a large chick on a spur leading to Wilkes Peak (east of Carnley Harbour) on 20 Jul 1941 (LHP, DK). One was ashore on Enderby Island for 10 days in early-Apr 1983 (MC). Although Gibson's wandering albatrosses are present year-round at breeding sites, the distance that they breed from the usual boat landing sites on Adams, Disappointment, and Auckland Islands results in them being recorded on only 10–84% of visits (Fig. 5).

Diomedea albatrosses breed biennially, and so approximately half the breeding adults attempt to breed per year. There were an estimated 7,250 pairs of Gibson's wandering albatrosses breeding in early 1973 (from an estimated total breeding population of 13,500 pairs), with 7,000 pairs on Adams Island, 200 on Disappointment Island, and 50 on Auckland Island in 1973 (Robertson 1975). Annual monitoring of part of the Adams Island population began in 1991, after which the estimated annual breeding population for the Auckland Islands grew slowly to a peak of about 8,700 pairs in 2004. There was a catastrophic drop in 2005 to about 3,360 pairs in 2006, followed by a gradual recovery (Elliott *et al.* 2016). Based on a count of 10% of the known population, there were an estimated 4,829 pairs breeding on Adams Island in early 2018 (Elliott *et al.* 2018).

The biology of Gibson's wandering albatross on Adams Island was summarised by Walker & Elliott (1999), here amended with more recent data. Annual research visits to the study area on Adams Island are timed to allow estimation of the number of eggs laid in a new breeding cycle, plus the number of chicks fledging from the previous cycle. As a result there are few data available on intermediate breeding parameters such as incubation length, hatch dates, the length of the guard period, or the duration of the nestling period, although some data can be gleaned remotely via satellite-tagged breeding adults. Eggs were laid 24 Dec–12 Feb (median lay dates 4–7 Jan). A fully emerged chick was recorded on 17 Mar 2005 (CW, PAT). Fledglings departed from early-Dec through to late-Jan. Half the chicks were estimated to have fledged by 20 Dec 2017 (KRH, GCP), but this varies considerably between years (KJW, GPE). Breeding success (the proportion of eggs laid that produced a fledgling) was 61–78% between 1991 and 1996,

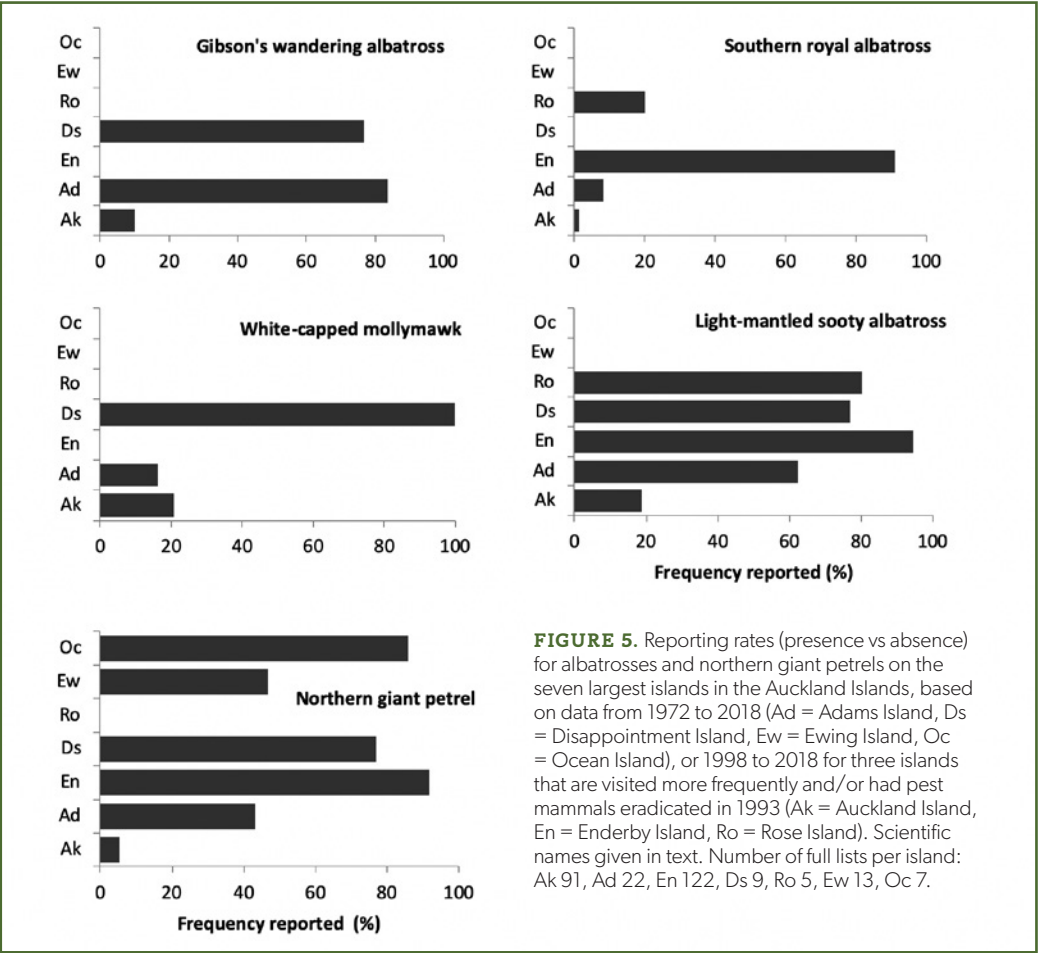


FIGURE 5. Reporting rates (presence vs absence) for albatrosses and northern giant petrels on the seven largest islands in the Auckland Islands, based on data from 1972 to 2018 (Ad = Adams Island, Ds = Disappointment Island, Ew = Ewing Island, Oc = Ocean Island), or 1998 to 2018 for three islands that are visited more frequently and/or had pest mammals eradicated in 1993 (Ak = Auckland Island, En = Enderby Island, Ro = Rose Island). Scientific names given in text. Number of full lists per island: Ak 91, Ad 22, En 122, Ds 9, Ro 5, Ew 13, Oc 7.

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but crashed to 22–31% during 2006–09, before climbing again to 68% in 2017 (Walker & Elliott 1999; Elliott *et al.* 2018). Breeders typically nested an average of 20–23 m from their previous nest site regardless of whether breeding was successful (Walker & Elliott 1999). Survival rates of females dipped to catastrophic lows of 82% during 2006–08; however, survival rates of breeding birds of both sexes has varied between 90% and 96% since 2009 (Elliott *et al.* 2018). The cause of the severe decline in survival of breeding females and associated very low breeding success in the years following 2005 remains unknown.

A Gibson's wandering albatross chick monitored and weighed on the slopes of Wilkes Peak, Auckland Island (east of Carnley Harbour) during 1942 regurgitated several times during handling. Food items recorded during May–Sep 1942

included squid beaks, cuttlefish, and fish (CF in McEwen 2006). Boluses regurgitated voluntarily by near-fledging chicks are the accumulation of hard parts in the chicks' diet in the preceeding months. During the summer of 2001–02, boluses were collected around albatross nests at Adams Island and the squid beaks in them identified. Gibson's wandering albatross was found to eat adults of at least 44 squid species (Xavier *et al.* 2014).

Gibson's wandering albatrosses forage largely in the Tasman Sea, along the continental shelf off southern and south-eastern Australia, and off eastern New Zealand (Walker & Elliott 2006). Since 2004, non-breeding females have made more extensive use of the area south of the Great Australian Bight (Walker *et al.* 2017). Around the Auckland Islands, high counts of Gibson's

wandering albatrosses are mainly recorded south and east of Adams Island, although most reports are imprecise (e.g. 'large numbers', 'plentiful', and 'very numerous'). The highest recorded count was 75 south of Adams Island on 12 Jan 2014 (HEX).

Gibson's wandering albatross breeds only on the Auckland Islands. The closely related Antipodean wandering albatross *D. a. antipodensis* breeds mainly on Antipodes Island, with a few pairs on Campbell Island and on the Chatham Islands (Walker & Elliott 2005; Miskelly *et al.* 2008). Other forms of wandering albatross (*D. exulans*, *D. dabbenena*, and *D. amsterdamensis*) breed on widely scattered islands around the Southern Ocean.

Southern royal albatross *Diomedea epomophora*

550 records: En 340, Ak 18, AIs 6, Ad 36, AS 128, CH 19, PR 1, Ro 2. Southern royal albatrosses were found nesting on Enderby Island 30 Nov–3 Dec 1840 (more than 100 nests reported; RM & McCormick 1884). Following presumed subsistence harvest by settlers at Maungahuka and Hardwicke during 1842–56 (Russell *et al.* 2020 – Chapter 6), there was no subsequent confirmed record on Enderby Island until Jun 1942 (at least two chicks present; McEwen 2006). Krone (1900) reported a 'wandering albatross' (more likely a southern royal albatross) nesting on the Hooker Hills, northern Auckland Island, in 1874–75, and two pairs were found breeding north of the Hooker Hills (above Lindley Point and east of North Harbour) on 1 & 12 Jan 1973 (DJC, MR, RR, RN, BDB, KJW; Robertson 1975). A pair was on an egg above Lindley Point on 6 & 10 Dec 1973 (RR, RBM), after which there were no further reports of breeding on Auckland Island until a bird was found on an egg on cliffs west of Lindley Point on 2 Feb 2019 (with a young chick being brooded there on 27 Feb & 7 Mar 2019; RLS).

Buller (1891, quoting JF) reported a colony of royal albatrosses at the Auckland Islands "occupying a separate locality, and quite apart from *Diomedea exulans* [= *D. a. gibsoni*]" (in Ogilvie-Grant 1905) reported this new colony to be at the eastern end of Adams Island (Gilroy Head), based on information from JB. Breeding at this rarely visited site was not confirmed until 1 Feb 1973 (RR, BDB, SR, CR, CC). At least ten pairs were nesting on Adams Island in Feb 1973, and there were six pairs

with eggs or chicks on 16 & 18 Feb 1991 at three different places including Gilroy Head and the basin above Fly Harbour (KW, GPE, PJD, JCS). The two reports from Rose Island were of single birds flying over on 15 & 23 Jan 2018 (CMM, AT, NKA; Fig. 5). The colony on Enderby Island recovered from 2–3 chicks in 1942–45 to a maximum of 69 nests in Dec 2001 (BLC, WH, Jam, BR), with the most recent estimate of 43 nests in 2018 (Childerhouse *et al.* 2003; Baker *et al.* 2020 – Chapter 10 in this book).

The earliest recorded eggs at the Auckland Islands were 12 on Enderby Island on 3 Dec (1840; McCormick 1884), although Robertson (1975) estimated lay dates of 27–31 Nov in 1972–73. The earliest recorded chick was one hatching on Enderby Island on 14 Feb 2016 (CGM), and four young chicks were seen on Adams Island on 18 Feb 1991 (KW, GPE, PJD, JCS). The latest egg reported was on 5 Mar 1943 (ED, WD, JFJ). Chicks are present from Feb until at least Dec, with late fledglings reported on 12 Dec 1973 (one on Adams Island; RR, RBM) and 30 Dec 1996 (three on Enderby Island; HEX). This is the same breeding chronology as on Campbell Island, where the main breeding population occurs (Bailey & Sorensen 1962; Moore *et al.* 2012).

The overlapping breeding cycles of the biennially breeding southern royal albatrosses mean that they are present year-round at the Auckland Islands. High counts of birds at sea included 50 around fishing boats to the north and east on 1 Mar 1981, and 70 there on 8 & 13 May 1981 (Robertson & Jenkins 1986), 14–15 in Carnley Harbour on 24 & 25 Nov 2001 (ACW & NMC in eBird), at least 20 off the entrance to Carnley Harbour on 24 Jan 1943 (CF in McEwen 2006), and 27 south of Adams Island on 24 Nov 2003, with 15 there on 13 Nov 2014 (HEX).

White-capped mollymawk *Thalassarche cauta steadi*

482 records: Ak 95, Ds 57, AIs 14, AS 229, CH 17, PR 19, Ad 32, Ro 2, Ew 2, OI 1, En 13, Dn 1. The white-capped mollymawk was not named until 1933, and its identity at its two main breeding colonies (at the Auckland Islands) was not confirmed until 1943 & 1944, and so all earlier reports of mollymawks at the Auckland Islands were either of incorrect or uncertain identity. Potts (1874) reported an egg of '*Diomedea melanophrys*' from

the Auckland Islands. Chapman (1891) described an immense colony of mollymawks at South West Cape, Auckland Island, on 11 Jan 1890, and RW reported thousands on Disappointment Island on 29 Oct 1891. The colony on Disappointment Island sustained the 15 survivors of the *Dundonald* shipwreck, who are estimated to have eaten more than 12,000 mollymawk chicks during Mar–Sep 1907 (Miskelly & Taylor 2020 – Chapter 1). Waite (1909) featured a photograph of an adult white-capped mollymawk on its nest on Disappointment Island, taken on 28 Nov 1907; however, the caption ‘*Diomedea melanophrys*’ [black-browed mollymawk] prolonged the misidentification of the birds. Falla (1933) named *Thalassarche cauta steadi* from specimens collected off Stewart Island, and suggested that it might be the form that bred on Disappointment Island. This was confirmed first at South West Cape on 22 Jan 1943 (hundreds, all on eggs or empty nests (no chicks); LHP), and then on 9 Dec 1944 at the larger colony on Disappointment Island (estimated 50,000 pairs on eggs; Turbott 2002). A third, much smaller, colony east of Logan Point, Adams Island, was discovered on 23 Jan 1973 (200+ nests; RR, BDB). The most recent (Jan 2017) population estimate was just over 91,000 pairs, with c. 85,510 pairs on Disappointment Island, 5,436 pairs at South West Cape, and 176 pairs on Adams Island (Baker *et al.* 2018). The massive colony on Disappointment Island is readily seen by all observers during the 10-month breeding season; however, the two other colonies are visited by fewer than 21% of visitors to Auckland and Adams Islands (Fig. 5). All records from other islands in the group have been dead birds or birds seen offshore.

White-capped mollymawks have been recorded at sea around the Auckland Islands in all months except Sep and Oct, which includes the approximate 1-month gap between breeding seasons (see below). Unfortunately there have been too few boat movements outside the two main harbours in those months (about 7 days in 1942 & 1943) to be confident that the birds are absent. The highest counts of birds at sea were 2,000–3,000 birds around fishing boats north and east of the islands on 1 & 2 Mar and 8 & 13 May 1981 (Robertson & Jenkins 1986). Most of the remaining high counts (100+ birds) were off the west coast or south of Adams Island between Nov and Feb. Exceptions

were 350 in Carnley Harbour on 25 Nov 2001 (NMC in eBird – possibly referring to South West Cape), 100 north of Enderby Island on 6 Jan 2006 (CMM), and 100+ there on 8 Dec 2014 (HEx).

Visits to breeding colonies have occurred in most months, but with 72% of visits during Dec–Jan. Nest cameras revealed that adults returned to the Disappointment Island colonies at the end of Sep (Rexer-Huber *et al.* 2019). Adults were apparently present at South West Cape on 24 Oct 1943 (colony seen from offshore; LHP). No eggs were present at Logan Point on 19 Nov 1989 (KW, GPE), but 12 eggs were noted at South West Cape on 22 Nov 2009 (most birds were yet to lay; CDL, JL, KB, LT). Two just-hatched (wet) chicks were seen on Disappointment Island on 18 Jan 2018, when c. 200 other adults were on eggs (CMM). The latest eggs reported were a few pipping on Disappointment Island on 13 Feb 2017 (KRH, GCP). Adults brood or guard young chicks; the earliest post-guard chicks reported were a few on Disappointment Island on 13 Feb 2017 (KRH, GCP). Most chicks are unguarded by 2–3 Mar on Disappointment Island (Flux 2002) and at South West Cape (2008; HEx). Chicks were large, with wing feathers showing through their down, at South West Cape on 10 May 1981 (Robertson & Jenkins 1986). Most of the chicks on Disappointment Island had fledged by mid-Aug 1907, and they were entirely gone by 7 Oct (Escott-Inman 1911). A nest-camera trial following a small number of nests on Disappointment Island showed chicks fledging 12 Jul–23 Aug 2018 (Rexer-Huber *et al.* 2019).

White-capped mollymawks from South West Cape tracked with GPS data-loggers during early chick-rearing in Feb 2006 (19 birds) showed that most birds foraged east of the Auckland Islands and within 50 km of the colony at that breeding stage (Torres *et al.* 2011). Year-round geolocator tracking (23 birds) has shown that during the non-breeding season, some white-capped mollymawks forage off southern Africa while others remain in Australasian waters (Thompson & Sagar 2008; Thompson *et al.* 2009).

Feral pigs depredate or destroy most or all accessible white-capped mollymawk nests at South West Cape (Flux 2002; Russell *et al.* 2020 – Chapter 6).

There is a small colony of white-capped mollymawks on Bollons Island, Antipodes Islands; a

pair has bred on the Forty Four Islands, Chatham Islands; and a male crossed with a female black-browed mollymawk (*T. melanophris*) on Bird Island, South Georgia, produced chicks each year from 2007–08 to 2009–10, with one fledging successfully (Robertson *et al.* 1997; Tennyson *et al.* 1998; Burton & Croxall 2012). The nominate subspecies breeds on islands off Tasmania (Marchant & Higgins 1990).

Light-mantled sooty albatross *Phoebastria palpebrata*

837 records: Ak 186, AIs 7, CH 87, Ad 154, PR 19, AS 151, En 177, Ew 6, Ds 22, Ro 25, OI 1, Oc 1, Mn 1. Krone (1875) referred to three species of albatross occurring at the Auckland Islands; however, the first unequivocal report of light-mantled sooty albatross was of birds breeding on the cliffs of Waterfall Inlet, Auckland Island, on 26 Jan 1888 (Reischek 1889a). Nests with chicks were reported from the shoreline of Adams Island on 29 Mar 1927 (WRO, HGS), and two birds were recorded on or from Ewing Island on 16 Mar 1943 (RWB, RAF). Turbott (2002) suspected they were breeding on Disappointment Island on 19 Dec 1944, and a pair with a large chick was observed on an inaccessible ledge on the north coast of Enderby Island on 17 Mar 1954 (PB, RT, DD). Three completed nests and two sitting birds were reported on Rose Island on 7–10 Nov 1954 (KAW, RT), and five nests with small chicks were found on the Sugar-Loaf Rocks (east of Disappointment Island) on 6 Jan 1973 (RR, RN, GvT). Breeding was confirmed on the southern cliffs of Disappointment Island on 15 Feb 1973 (RT), and there was a single nest on the north coast of Ewing Island in Dec 1991 (MJW, JJA, DB; this remains the only breeding record from the island). Light-mantled sooty albatrosses were reported on 62–94% of recent visits to Enderby, Rose, Disappointment, and Adams Islands (Fig. 5).

Light-mantled sooty albatrosses nest as scattered pairs and small colonies on cliff ledges, including at inland sites, making them a difficult species to census. Bell (1975) estimated a total population of c. 5,000 pairs based on observations made during the 1972–73 expedition. The highest counts at single sites were 52–103 chicks on the southern cliffs of Adams Island near Mt Dick on 7 Feb 1998, 15 Jan 2003, and 13 Jan 2017 (Rexer-Huber *et al.* 2020 – Chapter 12 in this book), 76

nests on Disappointment Island on 18–20 Jan 2014 (Baker & Jensz 2014), eight nests at Crozier Point, Auckland Island, on 28 Dec 1962 (RAF, BDB), seven chicks on Rose Island (north-west bay) on 18 Feb 1973 (RT), and 14 pairs on Enderby Island in 2014 (Baker & Jensz 2014).

The earliest egg reported was at Crozier Point on 26 Oct (1942; LS, GP, HH, NH in McEwen 2006) and the latest was an egg collected at Crozier Point on 20 Jan (1966; RAF). The earliest reported chicks were revealed by calls heard from brooding birds on two (of 40) nests on the southern cliffs of Adams Island on 27 Dec (2017; KRH, GCP), and a 2-day-old chick was seen at Crozier Point on 30 Dec (1962; BDB). The earliest unguarded chick was at Logan Point, Adams Island, on 20 Jan 2001, when most chicks were still being brooded by adults (SH, AJW). The latest reported chick was one almost fully fledged at Dea's Head, Auckland Island, on 28 May 1944, with the comment '*most chicks depart by 1st week of June*' (EGT, GP). Light-mantled sooty albatrosses vacate the Auckland Islands after breeding. The latest reported sighting was in Carnley Harbour on 5 Jun 1942 (CF), and the earliest reported birds over land were several singles and pairs wheeling 300 m above Hanfield Inlet, Auckland Island, on 9 Oct 1942 (CF in McEwen 2006). This breeding chronology is similar to birds breeding on Campbell Island (Bailey & Sorensen 1962). There is no information on diet at the Auckland Islands.

Light-mantled sooty albatrosses are regularly reported at sea around the Auckland Islands Oct–Jun. The highest reported counts were of 30 (or 30+) birds on five occasions: off the east coast on 16 Dec 1972 and 2 Feb 1994 (RR, HEx), in Carnley Harbour on 24 Nov 2001 (ACW in eBird) and 17 Jan 2017 '*two large rafts, the largest with 30 birds*' (KRH, GCP), and south of Adams Island on 24 Nov 2003 (HEx).

Elsewhere in the New Zealand region, light-mantled sooty albatrosses breed on Antipodes and Campbell Islands (Bailey & Sorensen 1962; Warham & Bell 1979).

Northern giant petrel *Macronectes halli*

780 records: Ak 58, PR 36, Ew 16, Ro 19, En 242, AIs 6, AS 147, Ad 106, CH 79, Mn 5, Dn 20, Oc 19, Ms 1, Frn 4, Ds 20, F8 1, Fri 1. Many of the giant petrel records

from the Auckland Islands do not distinguish the two species. Northern giant petrels breed in the Auckland Islands, and we have assumed that all records are of this species unless observers noted plumage or bill colour characteristics diagnostic for southern giant petrel (for which we recognise 42 records).

B. Morrell (1832) listed ‘*nellies*’ among the birds encountered at the Auckland Islands in Jan 1830, and CD (in Dumont d’Urville 1846) described ‘*des pétrels géants, de grands oiseaux gris*’ as easy to catch, nesting among shrubs at Port Ross in Mar 1840. McCormick (1884) collected an adult and three chicks on Ewing Island on 30 Nov 1840, and a description of three ‘*albatrosses*’ eating a killed seal on a hill on Rose Island and that ‘*started to run [until] the wind got under their wings*’ in Sep 1864 (RH in Allen 1997) is likely to refer to giant petrels. E. Wilson (1966) reported a few at Enderby Island on 19 Mar 1904, and one was eating a dead seal there on 27 Nov 1907 (Waite 1909). There was a 122-year gap in breeding records in Port Ross between 1840 and 28 Dec 1962, when three chicks were found on Ocean Island (BDB).

78 ‘Many’ young giant petrels were on Adams Island on 2 Feb 1907 (Waite 1909), but all reports from the main island before 1972 were of birds scavenging from marine mammal or bird corpses on the coastline (the first was at Tagua Bay, Carnley Harbour, on 8 Nov 1941; LHP). CF (in McEwen 2006) recorded 12 on Monumental Island on 25 Jun 1942, and large numbers over Dundas Island (seen from offshore) on 24 Sep & 20 Oct 1942. There were c. 30 at a seal carcass on Ocean Island on 30 Oct 1942 (CF in McEwen 2006), and several ‘*young birds*’ on the beach at Masked Island on 12 Mar 1943 (LHP, SB, AP). At least 50 were roosting on ridges on Disappointment Island on 6 Jan 1973, and four chicks were banded there (RR, BDB, MFS, RN). Breeding colonies were reported on Frenchs Island on 25 Nov 2009 (JAH, SK, CDL, JL, KB, LT) and on Friday Island sometime before 2015 (SC in Parker *et al.* 2020 – Chapter 13 in this book).

Further to the six breeding records listed above, the first breeding records on five other islands were: a nest on Monumental Island on 10 Sep 1942 (McEwen 2006), c. 30 nests on Dundas Island on 28 Oct 1943 (RAF, ED), 19 chicks on Rose Island on 27 Jan 1966 (RT), two nesting north of Keken

Point, Auckland Island, on 7 Dec 1972 (RR, MFS, BDB), and a fully grown chick on Enderby Island on 15 Dec 1972 (KJW, PC).

The highest counts of northern giant petrels at single sites at the Auckland Islands were c. 200 nests at Fairchild’s Garden, Adams Island, on 15 Sep 1942 (CF in McEwen 2006), and 200–300 birds on Dundas Island on 24 Oct 1943 (ED, RWB). There were 125 chicks on Enderby Island in Jan 2017 (Parker *et al.* 2020 – Chapter 13), and there have been seven HEx or eBird estimates of 100 or more northern giant petrels on Enderby Island during 2009–14. The highest chick counts on five further islands were: 53 chicks on Disappointment Island in Jan 2015 (Parker *et al.* 2020 – Chapter 13); 32 chicks on Dundas Island on 18 Jan 2016 (CGM in Parker *et al.* 2020 – Chapter 13); 30 chicks on Ewing Island in Nov 1989 (Moore & McClelland 1990); 18 chicks on Ocean Island on 30 Nov 1989 and on 4 Dec 2015 (Moore & McClelland 1990; Parker *et al.* 2016); and 17 chicks on Frenchs Island on 3 Dec 2015 (Parker *et al.* 2020 – Chapter 13). There has never been more than a single live chick recorded on Monumental Island (1942, and again on 18 Jan 1973; RR, BDB, RN, MFS). On Auckland Island, one chick was recorded at Breaksea Point, Western Harbour on 2 Feb 1973 (RR), and two at Crozier Point on 4 Dec 2018 (Parker *et al.* 2020 – Chapter 13). The most recent breeding record from Rose Island was of four chicks on 26 Dec 1999 (sea lion team); breeding giant petrels have not been found there on more recent visits. Parker *et al.* (2020 – Chapter 13) estimated 340 pairs breeding at the Auckland Islands in 2015–16. Within the Auckland Islands, northern giant petrels are most frequently encountered on Enderby, Ocean, and Disappointment Islands (Fig. 5).

The earliest egg reported was on Enderby Island on 14 Aug (2010; TW); however, six eggs collected on Adams Island on 15 Aug 1942 contained well-feathered embryos (CF). Two very addled eggs were collected on Dundas Island on 28 Oct 1943, along with three chicks about 2 weeks old (the earliest chicks recorded; RAF, ED), which indicates that most eggs at the Auckland Islands hatch in Oct. Chicks were still present on Enderby Island on 26 Feb 1995 (HEx), and so it is likely that the latest chicks depart in March. This breeding chronology is similar to that for Campbell Island (Westerskov 1960).

Northern giant petrels are present year-round at the Auckland Islands, and can be found feeding on dead marine mammals in any month. Other food items reported included a shot southern black-backed gull in Crab Bay, Carnley Harbour, on 28 Jun 1942 (CF in McEwen 2006), penguin remains in the stomach of a bird shot in Carnley Harbour on 8 Sep 1942 (CF), one carrying a small rabbit on Enderby Island in Nov 1954 (KAW, RT), and dead Gibson's wandering albatross chicks on the tops of Adams Island on 20 Jan 2006 & 6 Jan 2015 (KW, GPE, MP, PJM). Northern giant petrels were observed killing and eating fledgling sooty shearwaters in Carnley Harbour on 6 & 8 May 1943 and 7 Apr 1945 (RAF, HW), and two killed and then consumed a Gibson's wandering albatross chick that had a broken wing on Adams Island on 3 Jan 2007 (KW, GPE).

A northern giant petrel found dead on Dundas Island on 24 Jun 1998 had been banded as a chick on Macquarie Island on 26 Jan 1976 (AT). Two found dead by HM on Enderby Island on 1 Aug 2010 & 23 Jul 2011 had been banded as chicks on Macquarie Island on 21 Jan 1999 and 19 Jan 2004, respectively (Michelle Bradshaw, *pers. comm.* to CMM, 17 Jul 2019). The bird recovered in 2010 was one of four male giant petrels (species not specified) found dead on Enderby Island in 2010 that all tested positive for brodifacoum, which they are presumed to have been consumed through scavenging of poisoned rabbit carcasses on Macquarie Island (Springer & Carmichael 2012).

Elsewhere in the New Zealand region, northern giant petrels breed on the Sisters Islands and the Forty Fours in the Chatham Islands, and on the Antipodes and Campbell Islands (Parker & Bell 2017).

Cape petrel *Daption capense*

464 records: PR 73, AIs 5, En 20, AS 280, CH 55, In 7, Ak 5, OI 9, Ad 7, Ds 1, Ro 1, Oc 1. First recorded (as '*des damiers*') in '*large numbers*' feeding around a dead whale in Port Ross in Mar 1840 (CD in Dumont d'Urville 1846). Not confirmed breeding until at least 13 adults were found on eggs on Beacon Rock, at the entrance to North Harbour, on 27 Dec 1972 (BDB). Breeding suspected (but not confirmed) on Column Rocks off North West Cape on 19 Dec 1972 (KJW), on Adams Rocks and the innermost of the Lantern Rocks off the west

and south-west coasts of Adams Island on 19 Jan 1973 (Atkinson 2001; RR, BDB, RN, MFS), and on Compadre Rock (west of North Harbour) on 8 Feb 1988 ('*A few on ledges*'; GAT). About 200 pairs were estimated to breed on Beacon Rock (B.D. Bell 1975). Eggs were in the middle of hatching on 27 Dec 1972 (BDB). During a second landing on 12 Jan 1973, 48 nests were checked, of which three birds were incubating, 18 adults were guarding young chicks, 14 chicks were unguarded, four adults were on empty nests, and nine further nests were empty with no bird present (KJW, BDB, RN, RR, PC). This breeding chronology is very similar to the Snares Islands, where the mean hatching date was 25 Dec 1985 (Sagar *et al.* 1996).

Cape petrels have been recorded off the coast of the Auckland Islands in all calendar months, but high counts of >100 mainly occur during the breeding season (Sep–Mar). They are often recorded in large flocks during Oct–Feb feeding among the *Macrocystis* kelp beds at the eastern entrance to Port Ross.

The birds breeding at the Auckland Islands are of the endemic New Zealand form *D. c. australe*, of which an estimated 7400 pairs breed at the Snares Islands, with small numbers on the Bounty, Antipodes, Campbell, and Chatham Islands (Sagar *et al.* 1996; Miskelly *et al.* 2001).

White-headed petrel *Pterodroma lessonii*

501 records: AIs 6, Ds 20, Ad 138, Oc 27, AS 122, Ak 11, CH 14, F8 9, Ms 5, En 68, Ro 17, OI 3, Frn 10, Sh 5, Ew 31, Fri 4, PR 4, Mn 5, Dn 2. First recorded at the Auckland Islands by Reischek (1889a) following his visit in Jan 1888. The first records of birds in burrows were on Disappointment Island on 28 Nov 1907 (Waite 1909), Adams Island (Fairchild's Garden) on 4 Feb 1929 and Ocean Island on 6 Feb 1929 (ES), at Lindley Point, Auckland Island, on 28 Sep 1942 (a single bird in a burrow; CF & BP in McEwen 2006), Rose Island on 3 Oct 1942 (CF in McEwen 2006), Masked Island on 26 Aug 1942 (CF & BC in McEwen 2006), Frenchs Island on 1 Nov 1942 (CF in McEwen 2006), Ewing Island on 20 Jan 1943 (RAF, ED, WD), Figure of Eight Island on 5 Mar 1943 (LHP), Friday Island and Shoe Island on 26 Mar 1943 (RAF, ED), Davis Island on 5 Dec 1943 (RWB, ED), Enderby Island during Dec 1962–Jan 1963 (BDB), Sugar-Loaf Rocks on 6 Jan 1973

(RR, RN, GvT), Monumental Island on 20 Jan 1978 (RAF, RT), and Dundas Island on 18 Jan 2018 (AT, NKA). The only subsequent record from the main island was of a bird on an egg on 'Erebus Peninsula' (south of Erebus Cove) on 5 Dec 1943 (RWB; Canterbury Museum AV23657). White-headed petrels were heard calling in flight at night (a 'pair') on one occasion only (14 Feb 2006) during 22 nights camped at Western Harbour, with no evidence of birds on the ground there or at South West Cape (GAT).

The numbers of burrows on 11 islands were estimated by AT and CMM during Jan-Feb 2018 (Miskelly, Gilad *et al.* 2019): Rose, Ewing, and Masked Island all had 2,000 burrows per island; Enderby Island, <1,000; Figure of Eight Island, 300; Ocean Island, 200; Dundas and Monumental Islands, 100; and Friday, Frenchs, and Shoe Islands, 50. On Disappointment Island, KRH estimated 440,000 medium-sized burrows (Walker *et al.* 2020 – Chapter 5), and CMM estimated 80% of these to be white-headed petrels (Miskelly, Gilad *et al.* 2019), giving roughly 350,000 white-headed petrel burrows. The large population on Adams Island has not been estimated, but the population for the entire group is likely to exceed 300,000 pairs (as not every burrow will be occupied by a breeding pair). Elsewhere in New Zealand, an estimated 100,000–300,000 pairs breed on the Antipodes Islands (G.A. Taylor 2000; Tennyson *et al.* 2002); further afield the species breeds on Macquarie, Kerguelen, and Crozet Islands.

The earliest record of the start of the breeding season was of birds cleaning burrows at the western end of Adams Island on 15 Aug 1942 (CF). The earliest incubating birds or eggs were on Figure of Eight Island on 2 Dec 2013 (K.-J. Wilson *et al.* 2018), and Ewing Island on 3 Dec 1943 (RAF). Recently hatched chicks were recorded on 17 Jan (2018, Disappointment Island; CMM, KP), 22 Jan (2011, Adams Island; KW, GPE), 23 Jan (1993, Disappointment Island; Walker *et al.* 2020 – Chapter 6), and 24 Jan (2018, Ocean Island; CMM, AT, NKA). Records of chicks close to or at fledging include three ailing fledglings in Carnley Harbour on 11 May 1942 (CF in McEwen 2006), one in a burrow on Figure of Eight Island on 20 May 1945 (HW), one dead on Adams Island on 15 Jun 2001 (and birds still coming in at night; KW, GPE), and a bird killed by a skua on Enderby Island on 22

Jun 1998 (AT). This species has a similar breeding chronology on Antipodes and Macquarie Islands (Warham 1967; Warham & Bell 1979).

Few white-headed petrels have been seen close to the Auckland Islands during daylight, although 20 were in Carnley Harbour late in the day during stormy conditions on 6 Jan 2006 (CMM) and 4 Nov 2011 (SG in eBird). Further offshore, white-headed petrels have been recorded regularly during Nov–May, although there have been few observers at sea during Aug–Oct, when birds are known to be visiting breeding burrows. The highest counts have mainly been from south of Adams Island, including 100+ on 24 Nov 2003, 13 Nov 2008, and 13 Feb 2009 (all HEx), apart from 50 east of Auckland Island on 19 Nov 2015 (NA in eBird), and 45 south of Disappointment Island on 19 Jan 2018 (CMM, AT). Geolocator-tag tracking of ten breeding adults from Adams Island during 2011–13 revealed that the birds were in the southern Indian Ocean or the South Pacific Ocean between 25°S and 50°S during Jun–Jul (G.A. Taylor *et al.* 2020 – Chapter 14 in this book). The same study revealed that during incubation and chick-rearing the birds foraged mostly in the seas south of Australia or in the southern Indian Ocean between 40°S and 65°S.

Elsewhere in the New Zealand region, white-headed petrels breed only on the Antipodes Islands, and are anomalously absent from Campbell Island. Further afield they breed on Macquarie, Kerguelen, and Crozet Islands (Marchant & Higgins 1990).

Antarctic prion *Pachyptila desolata*

467 records: Ak 138, Sh 10, AIs 8, Ad 42, Ds 3, PR 26, AS 157, Oc 14, F8 6, Ro 5, Ew 14, OI 4, En 22, Frn 2, Mn 3, CH 8, Ms 3, Dn 2. First recorded at Terror Cove, Port Ross, on 3 Dec 1840, when RM 'dug out a blue petrel and egg from a hole in the bank' (McCormick 1884). The earliest records of birds in burrows at other sites were: Shoe Island on 10 Jan 1890 (Chapman 1891), Adams Island on 7 Jan 1901 (Ogilvie-Grant 1905), Camp Cove (Carnley Harbour) on 17 Nov 1907 (Waite 1909), Dea's Head (Port Ross) on 28 Sep 1942 (CF), Ranui Cove to Cape Crozier on 23 Oct 1942 and Ocean Island on 30 Oct 1942 (CF in McEwen 2006), Figure of Eight Island on 13 Jan 1943 (McEwen 2006), Davis Island on 5 Dec 1943 (RWB, ED), Coleridge Bay (Carnley

Harbour) on 3 Nov 1944 and Enderby Island in 1944 (Turbott 2002), Rose Island in January 1966 (R.H. Taylor 1971), Monumental Island on 20 Jan 1978 (RAF, RT), and Masked Island on 1 Dec 2013 (K.-J. Wilson *et al.* 2018). At Disappointment Island, Antarctic prions have been captured via spotlighting, their calls heard in acoustic recorders and their remains found in skua middens, but they have yet to be found in burrows (Walker *et al.* 2020 – Chapter 7). There are similarly no records of Antarctic prions in burrows on Ewing, Friday, Frenchs, or Dundas Islands.

An adult female Antarctic prion carrying an egg ready to lay was killed by the station cat at Ranui Cove, Auckland Island, on 23 Nov 1943 (RAF), a male was found on a fresh egg at nearby Crozier Cove the following day (RAF, ED, RWB), and a fresh egg was found on the cliff edge at Crozier Point on 20 Nov 1944 (EGT). A chick was found on Figure of Eight Island on 13 Jan 1943 (McEwen 2006), and two chicks both about 10 days old were found at Ranui Cove on 16 Jan 1943 (RAF). Six fledglings with downy heads were seen on the surface under rātā forest at Matheson Bay, Auckland Island, on 3 Mar 2019 (RLS).

Antarctic prions (Fig. 6) formerly bred in very large colonies on Auckland Island, but have been all but extirpated there by cats and pigs (Russell *et al.* 2020 – Chapter 6). P. Thomson (1986) reported more than 100 birds apparently killed by cats near Erebus Cove in Feb–Mar 1982, and there were at least 100 dead on the south side of Laurie Harbour on 2 Feb 1986 (DJC), and 88 dead between Terror Cove and Dea's Head on 9 Feb 1988 (GAT). Several cat-killed fledglings were found at Matheson Bay on 3 & 5 Mar 2019 (RLS).

Robertson & Bell (1984) suggested that there were 100,000 to a million pairs at the Auckland Islands, and Peter Harper (*in* Marchant & Higgins 1990) suggested 350,000–750,000 pairs. These estimates are likely to be at least an order of magnitude too high for the current population, but there are no recent estimates. Adams Island is apparently the species' remaining stronghold in the group (Elliott *et al.* 2020 – Chapter 3), as none of the smaller islands hold dense colonies (AT, CMM, *pers. obs.* 2018). Flocks of Antarctic prions often forage in Port Ross, and they are frequently attracted during spotlighting from islands and vessels in Port Ross, including at several sites



FIGURE 6. Antarctic prion, Adams Island, January 2013. Image: Colin O'Donnell.

where there has been no evidence of breeding to date (see above).

Large flocks of Antarctic prions are often encountered around the Auckland Islands during summer, particularly off the east coast. A few observers have attempted to estimate their numbers; estimates of >1,000 include off the eastern entrance to Port Ross on 5 Mar 1942 (1,000s; CF *in* McEwen 2006) and 15 & 26 Jan 2018 (2,000 & 5,000, respectively; CMM, AT), off the east coast of Auckland Island on 21 Jan 1945 (1,000s; HW) and 20 Jan 1978 (1,000s; RAF), Carnley Harbour on 24 Nov 2001 (3,000; ACW *in* eBird), and off Yule Island on 18 Jan 2018 (c. 3,000; AT). Elsewhere, Antarctic prions breed at numerous high-latitude islands in the South Atlantic and southern Indian Oceans, around the Antarctic coast, and at Macquarie Island (Marchant & Higgins 1990).

Lesser fulmar prion ***Pachyptila crassirostris flemingi***

65 records: Oc 16, Ro 2, En 13, Ew 7, AS 19, Mn 1, PR 1, CH 2, Ds 4. The discovery of fulmar prions breeding on Ocean and Rose Islands was one of the more significant ornithological discoveries



FIGURE 7. Lesser fulmar prion fledgling, Disappointment Island, January 2018. Image: Colin Miskelly.

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of the Cape Expedition (Miskelly & Taylor 2020 – Chapter 1). The six breeding records known from the Auckland Islands were a large chick beginning to feather on Ocean Island on 5 Jan 1943 (RAF, AP; Te Papa OR.013040), an adult on a fresh egg on Rose Island on 13 Nov 1943 (ED), an adult on an egg ready to hatch on Ocean Island on 10 Dec 1943 (RAF), a well-developed chick on Monumental Island on 20 Jan 1978 (RAF, RT), and single chicks ready to fledge in burrows on Disappointment Island on 17 Jan 2018 (CMM, KP) and on Ewing Island on 20 Jan 2018 (CMM, AT). In addition, a fledgling was caught by spotlighting on Disappointment Island on 18 Jan 2018 (CMM; Fig. 7). Egg measurements: 43.5×31 mm (Rose Island; Canterbury Museum AV23802) and 47×34 mm (Ocean Island; RAF). Fulmar prions killed by skuas have been found on Ocean, Rose, Enderby, Ewing, and Disappointment Islands, and their remains were considered numerous on Ocean, Rose, Enderby, and Ewing Islands in 1962–63 (BDB).

Six fulmar prions were caught by spotlighting on Ewing Island on 23 Feb 1973 (RR, BDB, CC, CR, SR); six were caught at night on Ocean Island on 23–24 Jun 1998, and 32 detected on Ewing Island on

24–25 June (Tennyson & Bartle 2005), with estimates of 100 pairs on Ocean Island and 100–400 pairs on Ewing Island (AT).

At-sea observations are difficult to interpret due to the similarity between lesser fulmar prions and fairy prions (*Pachyptila turtur*), which, at their closest, breed on the Snares Islands and may range to the Auckland Islands. Additionally, some at-sea records of Antarctic prions, noted above, might well refer to fulmar prions, and so we suspect that this species may be more common at sea than the records suggest. Elsewhere, lesser fulmar prions breed on Heard Island (Tennyson & Bartle 2005).

White-chinned petrel *Procellaria aequinoctialis*

300 records: AS 153, En 20, AIs 7, PR 2, Ds 28, Ad 54, Mn 10, CH 7, Ew 13, OI 1, Ro 1, Ak 4. White-chinned petrels breed in large numbers on Disappointment and Adams Islands, with small colonies on Monumental and Ewing Islands, and isolated burrows at Lindley Point on Auckland Island, and on Enderby Island. It is likely that they breed on cliff ledges inaccessible to pigs and cats on the western cliffs of Auckland Island, where lush vegetation indicates the presence of burrowing petrels (authors, *pers. obs.*). First recorded offshore in Nov–Dec 1840 (Gray 1845), and Krone (1900) reported their bones among the deposits on Enderby Island (Miskelly & Taylor 2020 – Chapter 1). Frederick Hutton noted their breeding in 1901, probably based on information from Captain Bollons, but the first confirmed breeding site was birds on eggs at Fairchild's Garden, Adams Island, on 1 Feb 1929 (ES; Canterbury Museum AV413 & 4904). They were subsequently found breeding on Monumental Island on 7 May 1943 (RAF, AP), Disappointment Island on 9 Dec 1944 (EGT), Ewing Island on 15 Jan 1963 (BDB), Lindley Point in December 2013 (three burrows; Rexer-Huber, Thompson *et al.* 2020 – Chapter 15 in this book), and Enderby Island on 26 & 27 January 2018 (two burrows; CMM, AT).

Rexer-Huber *et al.* (2017) and Rexer-Huber, Thompson *et al.* (2020 – Chapter 15) estimated 155,500 pairs on Disappointment Island, 28,300 pairs on Adams Island, 60 pairs on Monumental Island, 30 pairs on Ewing Island, and a total population for the group of 184,000 pairs. There were at least 90 burrows on Ewing Island on

29 Jan 2018, and 95 burrows on Monumental Island on 1 Feb 2018 (AT, CMM). In addition to Adams Island (1929) and Disappointment Island (1944), eggs were noted in burrows on Disappointment Island on 11 Dec 1976 (Bartle & Paulin 1986), 6 Jan 1973 (with one egg 85.6 × 51.1 mm; RR, BDB, MFS, RN), 1–11 Jan 2015 (Walker *et al.* 2020 – Chapter 5), 19 Jan 1993, and 19 Jan 2018 (AT). A chick just hatching was found on Disappointment Island on 24 Jan 1993, and a large downy chick on 26 Jan (Walker *et al.* 2020 – Chapter 5). A chick close to fledging was collected on Monumental Island on 7 May 1943 (RAF, AP; Canterbury Museum AV21940), and a mummified chick was found on Ewing Island in Jun 1998 (AT). These hatch dates are a week or so earlier than reported from Antipodes Island (Warham & Bell 1979), but there are few data from either site.

Most records of white-chinned petrels at sea near the Auckland Islands were of fewer than ten birds (or they were simply recorded as being present). Higher counts included north of Enderby Island on 11 & 19 Dec 1972 (500+; GvT, RR, BDB, MFS, RN), 8 Dec 2014 (10–100; HEx), 14 Jan 2018 (31; CMM, AT), and 6 Mar 2018 (15; HEx); around fishing boats to the north and east on 1 Mar (2000) & 2 March (750) 1981, and 8 & 13 May 1981 (140; all Robertson & Jenkins 1986), south of Adams Island on 24 Nov 2001 (40; ACW), 13 Nov 2008, 13 Feb 2009, 1 & 13 Dec 2010, 18 Nov 2013, 3 Jan 2014, and 7 Dec 2014 (all 10–100 birds), 12 Jan 2014 (50), and 13 Nov 2014 (12; all HEx), off the Auckland Islands on 7 Jan 2017 (FR in eBird), south of Disappointment Island on 19 Jan 2018 (30; CMM, AT), and east and south of Auckland Island on 11 Feb 2018 (100; HEx). Geolocator tracking showed that white-chinned petrels from Adams Island forage around the South Island and into the Tasman Sea between 30°S and 60°S during pre-laying, incubation and chick-rearing in Oct–Apr (33 breeding adults 2013–15; Rexer-Huber 2017). The birds mainly wintered off Peru, but ranged into Ecuadorean waters to the north and Chilean waters to the south.

Elsewhere in the New Zealand region, white-chinned petrels breed on Antipodes and Campbell Islands (E.A. Bell 2017).

Sooty shearwater *Ardeanna grisea*

805 records: AI 5, AS 254, PR 54, Ro 17, En 55, Ak 12, CH 210, Ds 16, Oc 35, Ad 88, Ew 31, Sh 5, F8 8, Frn

3, OI 2, Ms 4, Dn 1, Mn 2, Fri 1. The first mention of 'mutton birds' (presumed to be sooty shearwaters) at the Auckland Islands was by Abraham Bristow in Oct–Dec 1807 (Miskelly & Taylor 2020 – Chapter 1), following which the Nov–Dec 1840 *Erebus & Terror* expedition collected specimens offshore (Gray 1845). The earliest account of birds ashore was by *Invercauld* shipwreck survivor Robert Holding on Rose Island in late-1864 (Allen 1997). Hermann Krone collected specimens on Enderby Island in 1874–75, and described them nesting around Terror Cove: 'we also found on the island, always only on the coast, three species of nocturnal birds ... [including] *Puffinus* sp. the New Zealand mutton bird, grey, larger than the two previous ones [= prion and diving petrel]' (translated from German in Krone 1900; Miskelly & Taylor 2020 – Chapter 1). The first records of sooty shearwaters in burrows on other islands in the group were a well-grown chick at Fleming Bay, Adams Island, on 14 Apr 1942 (CF in McEwen 2006), and on Ewing Island on 23 Oct 1942 (LS, GP, HH in McEwen 2006), Ocean Island on 30 Oct 1942 (CF, LS in McEwen 2006), Figure of Eight Island on 18 Feb 1943 (LHP, SB, AP), Frenchs Island during 1962–63 (BDB), Disappointment Island on 15 Feb 1973 (RT), Masked Island on 1 Dec 2013 (Wilson *et al.* 2018), and Shoe Island on 25 Jan 2018 (CMM, AT). There have been only two possible records of sooty shearwaters attempting to nest on Auckland Island since 1875. One was disturbed (by a rifle shot) from a ledge in Deep Inlet on 20 Oct 1942 (CF in McEwen 2006), and a few were 'nesting at a few points on [the] mainland' in Dec 1962 (RAF).

There are few estimates of the number of breeding pairs or burrows on each island. Thousands breed on Adams Island, although most accounts of large numbers from there are of birds feeding and rafting offshore in Carnley Harbour, and of remains in skua middens (Elliott *et al.* 2020 – Chapter 3). Bartle & Paulin (1986) considered the sooty shearwater the most common breeding bird on Disappointment Island following their visit on 11 Dec 1976, and estimated c. 1,000 skua-killed corpses. Subsequent visitors considered it to be out-numbered by white-chinned petrels and white-headed petrels; KRH estimated 440,000 medium-sized burrows (Walker *et al.* 2020 – Chapter 5), and CMM estimated 20% of these to be sooty shearwaters, equating to about 88,000

burrows. GAT found burrows to be common in patches under dense scrub within 20 m of the top of sea cliffs on Enderby Island in Feb 1988, and considered there to be ‘perhaps less than 1,000 pairs’. These numbers are a fraction of the size of flocks reported feeding around the Auckland Islands (see below), but it is possible that some of the foraging birds were from breeding sites further afield (Shaffer *et al.* 2006).

The earliest record of sooty shearwaters returning from migration at the Auckland Islands was 7 Oct 1942 in Carnley Harbour, with large numbers present within 2 days (CF in McEwen 2006). K.-J. Wilson *et al.* (2018) found a bird incubating on Figure of Eight Island on 2 Dec 2013, and eggs were found on Ocean Island on 10 & 12 Dec 1943 (RAF). The earliest chick recorded was on Adams Island on 9 Feb 1991 (JCS), and the latest was on Ocean Island on 25 Apr 1943 (RWB, ED). These apparent lay and hatch dates are at least 3 weeks later than recorded on the Snares Islands (Warham *et al.* 1982), but this may be an artefact of minimal search effort rather than an actual difference in breeding chronology.

84 Large flocks of sooty shearwaters are a conspicuous feature of the seas around the Auckland Islands during Oct–May, particularly in Carnley Harbour. There were 37 flock estimates in excess of 1,000 birds between 1904 and 2014, including 26 from Carnley Harbour, five south of Adams Island and four from Port Ross, with the largest estimate being 30,000 off Enderby Island on 1 Feb 1994 (HEX). Other descriptors of the flocks included ‘myriads’ off the east coast on 8 Nov 1941 (WW), ‘hordes’ east of Deep Inlet on 10 Oct 1942 (CF in McEwen 2006), and ‘millions’ off the entrance to Carnley Harbour on 4 Feb 1943 (AP). Numerous birds were chasing small silver fish below the surface in Carnley Harbour at night on 17 Feb 2006 (GAT).

Sooty shearwaters breed at numerous sites in the New Zealand region and further afield, including on the Snares, Antipodes, and Campbell Islands (Waugh *et al.* 2013).

Subantarctic diving petrel *Pelecanoides urinatrix exsul*

425 records: Als 5, Ak 24, Sh 7, Ad 43, OI 4, PR 13, AS 161, Oc 49, CH 14, Ro 19, Ew 24, Frn 6, Fri 2, En 42, Ds 10, Mn 2. All records of common diving

petrels (*P. urinatrix*) from the Auckland Islands are presumed to be of the ‘subantarctic’ form *P. u. exsul*. The earliest record was two birds probably collected on Enderby Island in Nov–Dec 1840 (Gray 1845; Miskelly & Taylor 2020 – Chapter 1; AT, unpubl. data). Diving petrels were apparently breeding around Terror Cove in 1874–75, based on Krone’s (1875) description (in German) of “three different burrowing petrels ... that nest and brood in holes in the earth they have dug themselves near the shore, [they] are nocturnal birds [the most] common is the smallest one, shaded dark brown-grey to black, the *Puffinuria urinatrix*”, and also four specimens in the Senckenberg Natural History Collections of Dresden (Miskelly & Taylor 2020 – Chapter 1). The earliest records of birds in burrows on other islands were on Shoe Island on 10 Jan 1890 (‘little fluffy, grey, young birds’; Chapman 1891), at Fairchild’s Garden, Adams Island, on 1 Feb 1929 (ES), Davis Island in Feb 1929 (ES), Ocean Island on 8 Oct 1942 and Ewing Island on 9 Nov 1942 (CF in McEwen 2006), Rose Island on 5 Feb 1943 (fledgling; RAF, ED, WD), Frenchs Island on 25 Oct 1943 (one egg; RAF), Enderby Island on 16 Jan 1963 (chick collected; RAF), Friday Island on 29 Jan 1966 (fledgling; RT, RAF), and Monumental Island on 20 Jan 1978 (two downy chicks, RAF, RT). While birds have not been found in burrows on Disappointment Island, they were captured during spotlighting in Jan 1993, and diving petrel remains were found outside a small burrow in Jan 2015 (Walker *et al.* 2020 – Chapter 5). There were three records of birds breeding on the main island (or near to it) in 1943: an adult on an egg north of Chambres Inlet on 30 Nov 1943 (RAF; 39 × 30 mm, Te Papa OR.021685), an adult on an egg on ‘Erebus Peninsula’ (south of Erebus Cove), on 5 Dec 1943, and also on Davis Island (which is within 5 m of the main island) on the same date (RWB, ED). Diving petrels that were killed by cats were found at Tucker Point (west of Ranui Cove) on five occasions during 3 Apr–30 Sep 1943 (RWB).

The earliest date an egg was reported was 25 Oct (1943, Frenchs Island; RAF) and the latest was on 13 Dec (1943, Ocean Island; RAF). The earliest chick was on 10 Dec (1943, Ocean Island; ED) and the latest was a ‘very late’ downy chick on Ocean Island on 18 Feb (1943; RAF, ED, RWB), by which date most burrows were deserted. A few subantarctic diving petrels may be seen ashore in any month at the

Auckland Islands, and so adults must moult close to the islands, or the moult is staggered, with adults rapidly returning to their breeding sites. Two birds were ashore on Ocean Island at night on 12 Mar 1943 (RAF, ED, RWB, WD), and many diving petrels were seen during spotlighting at Maclaren Bay beach, Adams Island, 2–23 Mar 2008 (CW, PAT). Three or more were present close offshore in each of Apr 1944 (Turbott 2002) and Apr & May 1945 (HW), and birds were ashore on Ewing Island in Nov 1989 (Moore & McClelland 1990), and on Enderby, Ocean, and Ewing Islands during 22–25 Jun 1998 (AT). There are few data on the timing of breeding of *P. u. exsul* at other New Zealand breeding sites, but Imber (1983) reported an adult on a soiled egg on 21 Nov on Antipodes Island, which matches the timing on the Auckland Islands.

Subantarctic diving petrels (Fig. 8) are one of the main prey items of subantarctic skuas on the Auckland Islands, and their remains can be found wherever skuas nest or roost, including on the tops of the main island: ‘west coast tops’ on 4 & 9 Nov 1943 (RAF), and tops above McLennan Inlet at 560 m a.s.l. on 10 Feb 1973 (CC, SR). An exceptional predation record was about 50 diving petrels in the stomach of a leopard seal (*Hydrurga leptonyx*) shot at Waterfall Inlet on 19 Oct 1942 (‘three heads were all *exsul*’; CF in McEwen 2006).

Diving petrels have been recorded at sea around the Auckland Islands in all calendar months apart from July. Many records provide imprecise measures of abundance, including ‘large numbers’ east of Auckland Island on 9 & 10 Oct 1942, “half a mile of streaming *Pelecanoides*” off Dundas Island on 20 Oct 1942 (CF in McEwen 2006), ‘numerous’ birds north of Enderby Island on 9 Feb 1945 (JS) and off Keken Point on 6 Jan 1963 (BDB), and ‘large numbers’ near Dundas Island on 7 Jan 1963 (GK, BDB), and off the north coast (en route to Disappointment Island) on 15 Feb 1973 (RR, BDB, CR, RN). There were 54 in Port Ross on 5 Feb 1991 (JCS), 40 east of Auckland Island on 2 Feb 1994 (HEX), 100 north of Enderby Island on 6 Jan 2006 (CMM in eBird), and 100–1,000 east of Auckland Island on 18 Nov 2009, offshore from Enderby Island on 3 Nov 2011, and south of Adams Island on 18 Nov 2013 (HEX).

The subantarctic diving petrel also breeds on Antipodes, Campbell, and Macquarie Islands, and on several island groups in the southern



FIGURE 8. Subantarctic diving petrel, Ewing Island, January 2018. Image: Colin Miskelly.

Indian Ocean and South Atlantic (Marchant & Higgins 1990).

South Georgian diving petrel *Pelecanoides georgicus*

6 records: En 5, Dn 1. Adult and chick collected on Enderby Island Nov–Dec 1840; adult and egg collected on Dundas Island 28 Oct 1943 (see Miskelly & Taylor 2020 – Chapter 1). Four additional records of subfossil remains from Enderby Island (Tennyson 2020 – Chapter 7). Seven sightings 2011–17 (HEX) are likely to have been of subantarctic diving petrels. Several images of claimed South Georgian diving petrels that landed on the decks of tourist vessels at the Auckland Islands were of subantarctic diving petrels (CMM, *unpubl. data*). The species was presumed extinct on the Auckland Islands since soon after 1943 (Fischer *et al.* 2017). Within New Zealand, South Georgian diving petrels formerly bred on Stewart and Chatham Islands, but are now confined to Whenua Hou/Codfish Island (Worthy 1998). Fischer *et al.* (2018) proposed the name *P. whenuahouensis* for ‘South Georgian diving petrels’ from the New Zealand region, including the Auckland Islands.

Grey-backed storm petrel *Garrodia nereis*

222 records: Ad 42, Ds 9, AIs 1, PR 5, CH 12, Ak 10, AS 107, Ro 2, Dn 1, En 22, Frn 1, Oc 2, Ew 7, Sh 1.

Grey-backed storm petrel nests are well concealed as the birds typically nest among dense vegetation rather than in an actual burrow. They are likely to breed on most islands in the group, but we are aware of only eight breeding records from three islands. An apparently hatched egg shell was found on a ledge near Tagua Bay, Auckland Island, on 13 Jan 1943 (LS in McEwen 2006), and an adult was flushed from a nest in heavy tussock at South West Cape in 1972–73 (B.D. Bell 1975). Five nests or eggs have been found on Adams Island: an egg in tussock west of Grafton Point on 17 Nov 1944 (EGT, GE), a bird on an egg (31.6 × 24.1 mm) in a tussock tunnel on the ridge above Gilroy Head on 1 Feb 1973 (RT, BDB, RR), an adult on an egg in a 75 mm long tunnel in *Asplenium* fern bases west of Maclaren Bay on 13 Dec 1995 (JJ, NJ, MA, PG), a small downy chick in a nest among *Dracophyllum* leaves in the Amherst Basin albatross study area on 14 Jan 2001 (SH, AJW), and a crushed egg (near hatching) that was found in the same area on 31 Dec 2001 (KW, GPE). A bird on an egg (32.0 × 23.6 mm) was found in a hollow under *Carex* on Ewing Island on 8 Dec 1991 (MJW, JJA, DB).

86 Birds disturbed from tussock during the day are likely to have been either adults on nests, or departing fledglings, including on Disappointment Island on 28 Nov 1907 (Waite 1909), Rose Island on 17 Oct 1943 (LHP, RAF, ED), and Dundas Island on 28 Oct 1943 (RAF, ED). On Enderby Island, birds were recorded at the east end of Sandy Bay on 13 Feb 1988 (GAT), in rātā forest west of the hut on 17 Dec 2017 (RF), and in open woody scrub near the south-west coast on 25 Nov 2018 (GCP). Adams Island records are from Grafton Point on 22 Nov 1989 (RB, GPE, KH), the albatross study area on 1 Jan 2002 (KW, GPE) and 27 Dec 2013 (KRH, GCP), Rhys's Ridge on 31 Jan 2006 (KW, GPE), and ledges south-west of Astrolabe basin on 23 Dec 2015 (KRH, GCP).

Many birds have been observed or caught in spotlights, but it is unclear if these records represent nearby breeding or birds attracted from the sea. Records include at Deep Inlet on 9 Oct 1942 (4; CF), Waterfall Inlet on 19 Oct 1942 (CF), Enderby Island 1963–2018 (BDB, GAT, AT, JHF, CMM, with a high count of 6 on 26 Jan 2018), Frenchs Island on 6 Dec 1972 (RR, MFS, BDB), Erebus Cove on 9 Feb 1973 (3 collected; BDB), Ewing Island on 7–8 Feb 1988 (GAT), Nov 1989 (Moore & McClelland 1990),

and 21 (8 birds) & 28 (3 birds) Jan 2018 (AT, CMM), Ocean Island on 14–15 Feb 1988 (2; GAT) and 24 Jan 2018 (2; AT, CMM), Adams Island (numerous sites from sea level to 670 m a.s.l., 1972–2013; many observers; Fig. 9), Laurie Harbour on 14 Jan 2018 (3; AT, CMM), Disappointment Island in Jan 1993 (4 birds plus one in a skua midden; Walker *et al.* 2020 – Chapter 5) and on 16 Jan (40 birds) & 18 Jan 2018 (6 birds; CMM), off Terror Cove on 16 Jan 2018 (2; AT), and on Shoe Island on 29 Jan 2018 (3; AT, CMM). Many landed on the deck of the *Acheron* in Laurie Harbour during a misty night on 16 Dec 1973 (14 collected; FK).

Grey-backed storm petrels are regularly seen in low numbers at sea around the Auckland Islands. High counts in Carnley Harbour include a 'huge number' on 1 Feb 1994 (PD, PP, AC, RdH), 50 on 24 Nov 2001 (ACW), 40 on 25 Nov 2001 (NMC), 'large numbers' on 3 Mar 2010 (HEX), and 60 on 20 Jan 2018 (CMM, AT); also 22 were recorded south of Adams Island on 6 Dec 1994, and 200 on 13 Nov 2014 (HEX).

Elsewhere in the New Zealand region, grey-backed storm petrels breed on the Antipodes Islands, Chatham Islands, and Campbell Island, and probably in Fiordland (G.A. Taylor 2000; Miskelly, Stahl *et al.* 2017).

White-faced storm petrel *Pelagodroma marina*

31 records: AS 2, En 2, Ak 21, Ew 4, Frn 1, Oc 1. First reported as collected offshore by the 1840 *Erebus & Terror* expedition (Gray 1845). Salvin (1896) subsequently listed an adult collected from Enderby Island during the same expedition. A breeding colony between Ranui Cove and Crozier Point on Auckland Island was discovered by CF in Nov 1942, and was the source of 19 records (9 breeding) through to Feb 1945. Fresh eggs were reported on 3 Dec 1942 (LS) and 25 Nov 1943 (RWB, RAF), a c. 10-day-old chick on 14 Jan 1943 (RAF), and a chick on 9 Feb 1945 (HW). These dates fall within the range of hatch dates reported by Richdale (1943) for Whero Island, off Stewart Island, but data are few. There were at least four reports of cat predation at the Crozier Point colony during 1942–44 (Russell *et al.* 2020 – Chapter 6), and white-faced storm petrels have not been reported there since 1945. The last report of them being seen offshore at the Auckland Islands was of them being 'plentiful'

off the entrance to Carnley Harbour on 30 May 1947 (JS).

Several white-faced storm petrels were reported on Ewing Island on 16 Nov 1943 (RAF), and they were subsequently reported there in 1962–63 (BDB) and Nov 1989 (Moore & McClelland 1990). Four were collected on Ocean Island on 2 Jan 1963 (RAF, BDB), and one was found dead there on 8 Dec 1972 (RR, MFS, BDB). The latter observers also caught one during spotlighting on Frenchs Island on 6 Dec 1972. All these sites are close to the former breeding colony near Crozier Point, and it is possible that the birds did not breed on these islands but were attracted by spotlights.

Remains of 'white-faced storm petrels' reported from falcon prey remains collected on Adams Island 1991–97 (Hyde & Worthy 2010) were re-examined by AJDT in 2019 and were considered to be indistinguishable from black-bellied storm petrel reference specimens, with several specimens definitely being black-bellied storm petrels. Black-bellied storm petrels are abundant on Adams Island, and there are no other records of white-faced storm petrels on land south of Port Ross. The complete absence of reports of white-faced storm petrels from 140 Heritage Expedition visits to the Auckland Islands since 1993, and the absence of land-based records since 1989, suggests that this population has been extirpated.

The New Zealand subspecies of white-faced storm petrel remains abundant elsewhere, breeding on several islands from Northland and the Chatham Islands and south to muttonbird islands south-west of Stewart Island (G.A. Taylor 2000).

Black-bellied storm petrel *Fregetta tropica*

278 records: Ad 55, AS 145, Ak 5, AIs 3, F8 2, Ro 8, Ew 13, En 17, PR 5, Frn 2, Oc 1, Ds 9, CH 10, Sh 1, Mn 1, OI 1. Although the black-bellied storm petrel is a common breeding species on the Auckland Islands, only seven eggs have been found there, and no chicks have been reported. Black-bellied storm petrels at the Auckland Islands apparently lay in late-Jan or Feb, and so their eggs are likely to hatch in Mar or Apr and the chicks to fledge in May or June. Apart from during the Second World War, few observers have been present on the Auckland Islands during Mar–May (Miskelly & Taylor 2020 – Chapter 1). Two eggs were collected



FIGURE 9. Grey-backed storm petrel, Adams Island, January 2013. Image: Colin O'Donnell.



FIGURE 10. Black-bellied storm petrel, Ewing Island, January 2018. Image: Colin Miskelly.

at Fairchild's Garden, Adams Island, on 1 Feb 1926 (ES; 37 × 27 mm & 38.5 × 27 mm), an adult on an egg was found on Rose Island on 18 Feb 1973 (RT), and a damaged egg was found there on 23 Jan 2018 (AT; Te Papa OR.030242, 35.5 × 26.5 mm). A damaged egg (35.5 × 26.5 mm) was found at the top of Rhys's Ridge, Adams Island, on 29 Jan 2001 (SH, AJW), an abandoned egg (36.4 × 27.6 mm) in *Dracophyllum-rātā* forest behind Maclaren Bay, Adams Island, on 29 Jan 2003 (KW, GPE, COD, JAS) and again in Jan 2019 (GCP, KRH), and an adult on an egg (36.9 × 27.7 mm) in a short burrow among *Bulbinella* on Enderby Island on 27 Jan 2018 (AT, CMM). A storm petrel egg containing a well-developed chick found by BT under the boat in the boatshed on Adams Island on 18 Feb 1973 may have been a late or abandoned grey-backed storm petrel egg or an early black-bellied storm petrel. Remains of depredated fledglings were found at Tagua Bay on 28 Apr & 10 May 1942, and on Figure of Eight Island on 11 May 1942 (CF). The three remaining records from the main island were birds killed by cats at Tucker Point (west of Ranui Cove) on 4 Apr 1943 (RWB), at Ranui Cove on 7 May 1943 (RAF), and at North Harbour on 6 Dec 1943 (RAF).

Black-bellied storm petrels (Fig. 10) are regularly seen and heard at night on Ewing, Rose, Adams, and Disappointment Islands, and less often on Ocean, Enderby, and Shoe Islands. High counts include six on Rose Island on 13 Jan 1963 (BDB), 'many' in the basin above Fly Harbour, Adams Island, on 24 & 29 Nov 1989 (KW, GPE, RB), counts of 9–12 or 'common' at Magnetic Bay, Adams Island, on 8 & 13 Feb 1991 (JCS), 24 Feb 2003 (COD, JAS), 15 Jan 2013 (COD, DG) and in late-Jan 2016 (KRH, GCP), 20 on Disappointment Island on 16 Jan 2018 (CMM), 23 on Ewing Island on 21 Jan 2018 (AT, CMM), and three at the western end of Sandy Bay, Enderby Island, on 26 Jan 2018 (AT, CMM). A bird with an extensive white throat patch and mostly white belly was photographed on Ewing Island at night on 21 Jan 2018 (AT, CMM), and a melanistic bird with small white flank patches was seen over Shoe Island at night on 29 Jan 2018 (CMM). Black-bellied storm petrels are also regularly seen at sea around the Auckland Islands, with high counts of 50 in Carnley Harbour on 24 Nov 2001 (ACW) and 30 the following day (NMC). The highest counts further offshore were around fishing boats to

the north and east in Mar & May 1981: 200 on 1 Mar and 100 on 8 & 13 May (Robertson & Jenkins 1986). South of Adams Island there were 30 on 6 Dec 1994, 50 on 24 Nov 2003, and 'large numbers' there on 12 Jan 2010 (HEX). There were 'lots' north of Enderby Island on 25 Jan 2006 (GAT), 'large numbers' there on 5 Mar 2010 (HEX), and 70 south of Disappointment Island on 19 Jan 2018 (AT, CMM).

Elsewhere in the New Zealand region, black-bellied storm petrels probably have a large breeding population on Antipodes Island, although no active nests have been found (G.A. Taylor 2000).

Auckland Island shag *Leucocarbo colensoi*

1,107 records: AIs 15, Ak 224, PR 79, OI 11, Ew 31, En 294, CH 192, F8 12, Ro 30, Sh 6, Fri 2, Ad 61, AS 84, Oc 36, Frn 4, Dn 3, Ds 13, Mn 7, Ms 3. Shags were reported from the Auckland Islands from 1807, and were shot and eaten by most explorers and shipwreck survivors; however, specimens were not retained until 1880 (Hector 1881; Buller 1888; Miskelly & Taylor 2020 – Chapter 1). Locations where Auckland Island shags were seen in Nov 1840 included Dea's Head and Tucker Point on Auckland Island, and Davis, Ewing, and Enderby Islands (McCormick 1884; RM). The survivors of the *Grafton* shipwreck hunted shags on Musgrave Peninsula (Carnley Harbour) and Figure of Eight Island in 1864–65 (Musgrave 1865; Raynal 1874), and around the same time survivors of the *Invercauld* wreck snared shags from ledges on the outer coast of Rose Island (RH in Allen 1997). Krone (1900) recorded shags on Shoe and Friday Islands in 1874–75, and shags were shot from cliffs above Fairchild's Garden, Adams Island, on 26 Oct 1890 (ER in Cass 2014). Auckland Island shags were first reported from Ocean Island on 7 Mar 1942, and Shag Rock (off Falla Peninsula) on 24 Sep 1942 (CF in McEwen 2006). They were subsequently recorded from French's Island on 28 May 1943 (RAF, RWB), an islet south of Kekenno Point on 23 Sep 1943 (RAF), Dundas Island on 28 Oct 1943 (RAF, ED), Disappointment Island on 9 Dec 1944 (EGT), Beacon Rock on 27 Dec 1972 (BDB, MFS), Monumental Island on 3 Jan 1973 (RR, MR, DJC, KJW), Archer Rock (off Cape Bennett) on 17 Jan 1973 (RR, BDB, RN, MFS), Masked Island on 15 Feb

1985 (RT), and Green Island on 20 Feb 1985 (RT).

Auckland Island shags were reported during 22% of recent visits to Auckland Island, and 46–98% of visits to the remaining larger islands (Fig. 11). The highest recorded counts on each island were 1889 nests on Enderby Island on 12 Jan 2012 (BB in Chilvers *et al.* 2015), c. 1,000 nests on the headland south of Webling Bay, Auckland Island, on 6 Nov 1942 (CF in McEwen 2006), c. 1,000 nests on Ewing Island (south-east point) on 5 Jan 1963 (RAF), 700–800 birds on an islet south of Kekenno Point on 23 Sep 1943 (RAF), c. 540 at three sites (combined) on Adams Island on 1 Mar 2003 (COD, JAS), 300–400 on Green Island on 20 Feb 1985 (RT), c. 300 on Rose Island on 15 Jan 2018 (CMM, AT), c. 250 on Dundas Island on 24 Jun 1998 (AT), 150 on Figure of Eight Island on

18 Feb 1943 (LHP, SB, AP), c. 90 on Ocean Island on 23 Jun 1998 (AT), c. 50 on Monumental Island on 1 Mar 2003 (COD, JAS), dozens on Frenchs Island on 28 May 1943 (RAF, RWB), many on Friday Island on 3 Mar 1875 (Krone 1900), 20 on Disappointment Island on 18 & 19 Jan 2018 (CMM), 14 on Shoe Island on 7 May 1945 (HW), three nests on Archer Rock on 17 Jan 1973 (RR, BDB, RN, MS), five birds on Masked Island on 20 Jan 2018, and two on Davis Island on 25 Jan 2018 (CMM, AT).

Dumont d'Urville (1846) reported that shags 'meet by thousands on the steepest rocks' in Port Ross following his visit in Mar 1840, and that they built their nests in the rocks and crevices of the shoreline. Musgrave (1865) writing on 1 Jan 1865 reported that the shags deserted Carnley Harbour in summer: 'very likely they have gone elsewhere to

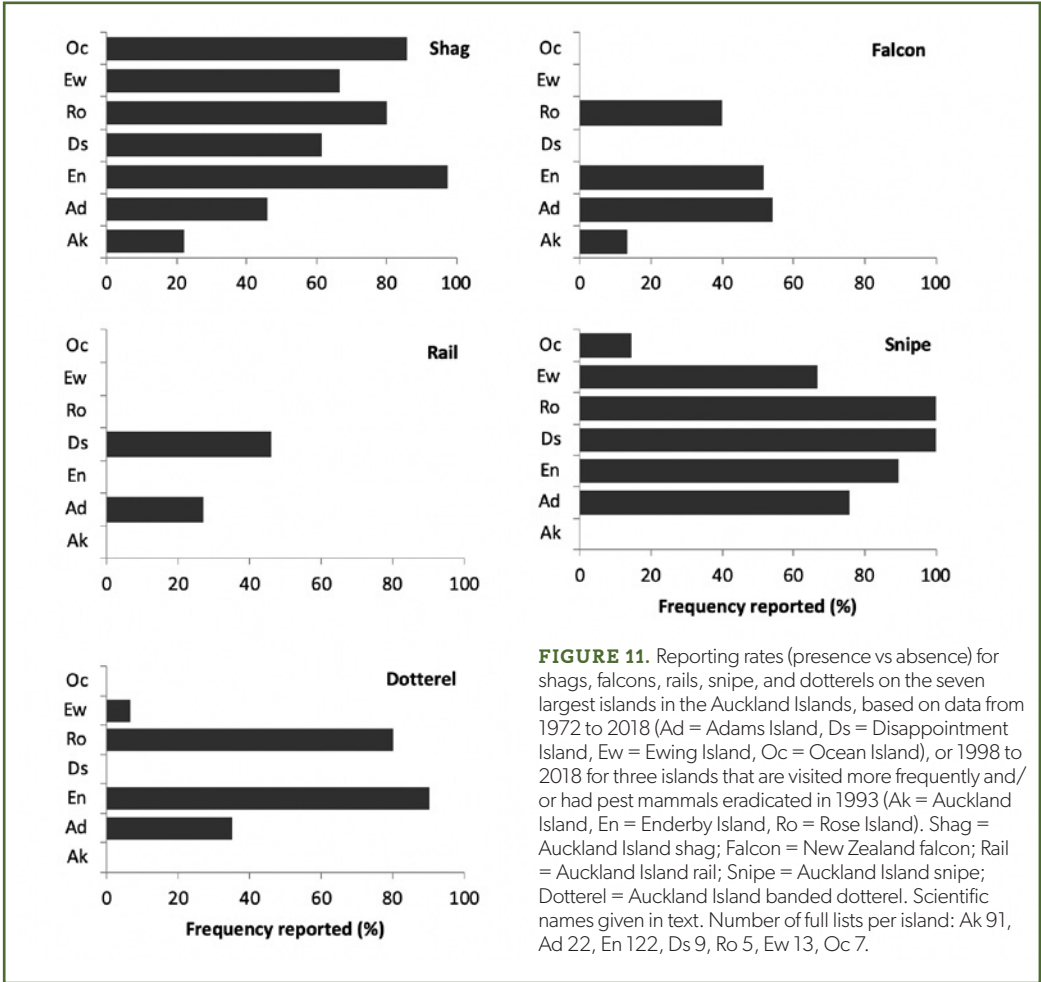


FIGURE 11. Reporting rates (presence vs absence) for shags, falcons, rails, snipe, and dotterels on the seven largest islands in the Auckland Islands, based on data from 1972 to 2018 (Ad = Adams Island, Ds = Disappointment Island, Ew = Ewing Island, Oc = Ocean Island), or 1998 to 2018 for three islands that are visited more frequently and/or had pest mammals eradicated in 1993 (Ak = Auckland Island, En = Enderby Island, Ro = Rose Island). Shag = Auckland Island shag; Falcon = New Zealand falcon; Rail = Auckland Island rail; Snipe = Auckland Island snipe; Dotterel = Auckland Island banded dotterel. Scientific names given in text. Number of full lists per island: Ak 91, Ad 22, En 122, Ds 9, Ro 5, Ew 13, Oc 7.

breed'; whereas RH in 1864–65 found all stages of breeding on ledges on Rose Island (Allen 1997). The first breeding records at other sites were Enderby Island on 27 Jan 1875 (Krone 1900), Ocean Island on 1 Oct 1942 (McEwen 2006), Crozier Point, Auckland Island, on 1 Nov 1942 (CF), Adams Rocks (west of Adams Island) on 22 Jan 1943 (CF in McEwen 2006), Ewing Island on 28 Feb 1943 (RAF), Adams Island (just south of Gilroy Head) on 29 Dec 1972 (RR, PC, RN, GRW, MWW), Archer Rock on 17 Jan 1973 (RR, BDB, RN, MS), Disappointment Island on 19 Jan 1993 (Walker *et al.* 2020 – Chapter 5), Musgrave Inlet, Auckland Island, on 31 Dec 1996 (HEX), and Monumental Island on 1 Mar 2003 (COD, JAS). Large colonies often persist for many years before sudden abandonment (e.g. west of Sandy Bay on Enderby Island, abandoned in 2018–19; HMCF).

Auckland Island shags have a prolonged nesting season. Some pairs were nest-building while others had chicks during 25 Dec 1962 to 15 Jan 1963 (BDB). Nest-building was recorded from 14 Aug (2010, Enderby Island; Lalas & McConnell 2012) and mating from 26 Sep (1942, Enderby Island; CF in McEwen 2006). Eggs were recorded between 4 Nov (1942, Crozier Point; GP, HH) and 28 Feb (1943, Ewing Island; RAF), with chicks in nests reported between 4 Dec (1994, large chicks on Enderby Island; HEX) and 21 Mar (1944, last study chick taken by skua at Crozier Point; EGT). The usual clutch was three eggs, incubation took about 28 days, and the chicks fledged when about 10 weeks old (Turbott 2002).

Auckland Island shags often forage in dense rafts of up to 100 birds, diving in synchrony with the flock re-forming on the surface after each dive. They often feed in association with other species, e.g. a mixed feeding flock of red-billed gulls, white-fronted terns, Auckland Island shags, and Buller's mollymawks associated with c. 60 feeding sea lions in North Arm, Carnley Harbour, 8–9 May 1981 (Robertson & Jenkins 1986). Waite (1909, 1916) reported that shags in Carnley Harbour had been feeding on *Munida gregaria* (gregarious squat lobster) in Nov 1907 and sardines (*Sardinops sagax*) in Jun 1912, and CF reported that a female had been feeding on pilchards in Carnley Harbour on 26 Apr 2006 (McEwen 2006; this may also refer to *S. sagax*). An adult female collected at Crozier Point on 12 Jun 1943 had eaten shrimps and fish

(RAF). Lalas & McConnell (2012) analysed regurgitated pellets collected on Enderby Island in Aug 2010. When converted to estimated mass, the prey items taken were octopus (*Octopus* sp., 68%), red cod (*Pseudophycis bachus*, 19%), triplefin (*Forsterygion* sp., 9%), and nototheniid cod (*Paranotothenia microlepidota*, 3%). The predominance of octopus in the diet was considered unprecedented among shags for which diet composition was known (Lalas & McConnell 2012).

Auckland Island shags are frequently eaten by subantarctic skuas (see below). A subadult male New Zealand sea lion vomited remains of shags at Ranui Cove on 15 Dec 1943 (RWB), and shag remains were found in two sea lion scats in Port Ross in January 2011 (CL, CS).

New Zealand falcon *Falco novaeseelandiae*

571 records: Ak 88, Als 6, PR 5, En 129, Ro 7, Ad 325, CH 6, F8 4, Oc 1. Falcons were first reported in Carnley Harbour in Jan 1830, and were 'numerous' on the main island around Port Ross in 1840 and during the 1849–52 Hardwicke settlement (B. Morrell 1832; Hombron & Jacquinet 1841; Wilkes 1845; Martin [1852]; RM), and at Epigwaitt (Carnley Harbour) in Jan–Feb 1864 (Raynal 1874). They were first reported from Enderby Island in 1866–67 (Eunson 1974), Rose Island in 1874–75 (Krone 1875), and Adams Island on 7 Jan 1901 (Ogilvie-Grant 1905). There were four records from Figure of Eight Island between 11 May 1942 and 20 May 1945, including a nest with three eggs on 25 Nov 1944 (Turbott 2002; McEwen 2006; HW). The only record from Ocean Island was a subadult male collected on 18 Jun 1943 (RWB, JFJ).

The few counts of four or more falcons at any one time were mainly adults with 2–3 fledged young. Most of these high counts have been from the Carnley Harbour shore of Adams Island between 1991 and 2017, plus four were seen at Sandy Bay, Enderby Island, in Jan 2018 (RF, CGM). Falcons were reported on 40–54% of recent visits to Adams, Enderby, and Rose Islands (Figs 11 & 12); there are no records from Ewing or Disappointment Islands.

At least 33 falcon nests were found on Adams (25), Enderby (5), Figure of Eight (1), Auckland (1), and Rose (1) Islands between 1944 and 2019. The only nest reported on Auckland Island was found

at Western Harbour on 30 Dec 1972 (SaB). Clutch sizes for 12 nests with eggs were 2×2 eggs and 10×3 eggs. All the following breeding details are from Adams Island. Eggs were reported between 4 Nov (1993, clutch incomplete; NHH) and 10 Dec (2018, 3 eggs; KRH, GCP), with three complete clutches recorded on 5 Nov 1989 (two) & 5 Nov 1993 (Buckingham *et al.* 1991; NHH). Nestlings were reported between 27 Nov (2018, two small downy chicks; KRH, GCP) and 2 Feb (2018, single large female chick fledged around this date; KRH, GCP). Fledglings were reported from 8 Jan (2013; COD, DG) through Jan and Feb.

EW observed a falcon hunting rabbits on Enderby Island on 19 Mar 1904 (Wilson 1966), and RT saw a young rabbit being taken there on 18 Feb 1985. A female collected on Figure of Eight Island on 11 May 1942 had the remains of a white-headed petrel in its stomach (CF in McEwen 2006). The subadult male collected on Ocean Island on 18 Jun 1943 had eaten a silvereye (RWB, JFJ). One that perched on ship's rigging in Erebus Cove, Port Ross, on 11 Feb 1945 cast up the leg of a blackbird (JS), another swooped at a swimming diving petrel in Carnley Harbour (North Arm) on 21 Feb 1945, and one was feeding on a sooty shearwater (probably a fledgling) on Figure of Eight Island on 20 May 1945 (HW). A female was observed hunting mice in a rubbish pit at Camp Cove on 22 Feb 1973 (RR, CR, CC, RN). A falcon at Crab Bay (Musgrave Peninsula) on 19 Feb 1992 had been feeding mainly on Antarctic prions (Chance 1992), and one was seen feeding on a bellbird on Enderby Island in early-Nov 1993 (NHH). There have also been several records of falcons chasing parakeets on Enderby Island (e.g. 14 Feb 2003 & 26 Dec 2016; sea lion team & HEx) and Adams Island (17 Feb 1991; KH, GPE, PJD, JCS). Prey remains near a nest on Enderby in Feb 2019 included parakeet, tomtit, pipit, snipe, and bellbird (KRH, GCP).

Most details of the falcon diet on the Auckland Islands come from Adams Island. A pair with a $\frac{1}{2}$ -grown chick on the north coast on 27 Dec 1972 was feeding mainly on Antarctic prions (GRW, MWW), as was a pair at Castle Point on the south-east coast in Jan 1973, and one caught a pipit on the main ridge (B.D. Bell 1975). A falcon was observed catching a snipe in flight, and other birds stooped unsuccessfully on snipe (3), dotterels, and a rail (Buckingham *et al.* 1991). A snipe skull was found



FIGURE 12. Adult New Zealand falcon, Enderby Island, January 2016. Image: Tony Whitehead, New Zealand Birds Online.

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at a falcon nest west of South Cape on 17 Feb 1991, and another nest above Fly Harbour on 19 Feb 1991 was lined with many black-bellied storm petrel remains and snipe skulls (KW, GPE, PJD, JCS). Many snipe bones (particularly skulls) were found in an old falcon nest site at Fleming Bay on 10 Feb 1993 (GPE, KW, AD, PM). A nesting pair at Maclaren Bay on 13 Jan 1996 was feeding mainly on small petrels (JJ, JM, NJ), and a pair with two chicks at Survey Bay on 28 Jan 1997 had taken a juvenile Auckland Island rail (HMcF). A male captured a grey-backed storm petrel at Fleming Bay on 6 Dec 1999, and the head of a young Auckland Island teal duckling was found at a falcon nest site east of Magnetic Bay on 2 Feb 2002 (KH, GPE). A falcon was seen clutching a bellbird along the shoreline on 16 Dec 2005 (HEx). Two juveniles were watched walking and searching for bellbird nests among rātā tree roots at Maclaren Bay on 9 Feb 2010 (KW, GPE), and an

adult at the same site used this technique to catch two bellbird chicks as they fled on 6 Feb 2014 (KRH, GCP). A black-bellied storm petrel freshly eaten by a falcon was seen at Maclaren Bay on 3 Feb 2013 (COD, DG). A female falcon was seen to take two tomtit nestlings to feed herself and her chick on a ledge south of Amherst Stream (south coast) on 20 Dec 2015. Three depredated snipe (including two fresh juveniles) were found above Fly Harbour on 29 Jan 2016, and a falcon was seen to catch a bellbird at Maclaren Bay on 22 Dec 2016. An old nest site on a ledge south of Astrolabe Stream on 13 Jan 2017 contained storm petrel legs and snipe bits. Three fledglings at Maclaren Bay on 20 Jan 2017 were feeding on pieces of snipe. The adults at Maclaren Bay during 2016–17 twice caught prions (probably Antarctic prions) during the day, and the male flew in from the tops carrying a snipe chick on 28 Dec 2017 (all records after 2014 by KRH & GCP).

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Hyde & Worthy (2010) reported on 215 prey items of 16 species identified from falcon prey remains and regurgitated pellets collected on Adams Island during 1991–97. In decreasing order of the minimum number of individuals, the prey species recorded were: bellbird 47, Auckland Island snipe 33, Auckland Island rail 28, Antarctic prion or prion sp. 21, subantarctic diving petrel 19, black-bellied storm petrel 17, parakeet sp. 11, unidentified passerine 7, unidentified storm petrel 9, Auckland Island teal 6, pipit 5, white-headed petrel 3, ?sooty shearwater 2, ?blackbird 2, ?white-chinned petrel 1, grey-backed storm petrel 1, ?banded dotterel 1, and tomtit 1. This list differs slightly from that in the original study (Hyde & Worthy 2010) as a few remains were re-identified in 2019 at Te Papa by AT: 16 '*Pelagodroma*' remains are considered to be black-bellied storm petrels, 2 '*cf Turdus philomelos*' are considered to be ?black-birds, and '*cf Passer*' is considered to be a pipit.

No other New Zealand subantarctic island has a resident falcon population; however, there have been two records from Campbell Island (1946 & 1952; Bailey & Sorensen 1962).

Auckland Island rail *Lewinia muelleri*

206 records: Ro 1?, AIs 1, Ad 164, Ak 1, Ew 2, En 7, Ds 30. The only confirmed modern records of Auckland Island rail have been on Adams and Disappointment Islands. Shipwreck survivors

made three possible sightings during 1864–65: Fairchild's Garden, Adams Island, on 11 Jun 1864 (Raynal 1874), below Wilkes Peak, Auckland Island, on 19 Jun 1864 (Musgrave 1865), and on Rose Island (RH in Allen 1997 – this last record is discussed further under weka in 'Failed introductions'). No details are known about where and when the type specimen was collected, sometime before 1893 (discussed by Falla 1967; Elliott *et al.* 1991; Miskelly & Taylor 2020 – Chapter 1). There was a possible sighting on Adams Island on 14 Jun 1942 (CF in McEwen 2006), and a series of possible records from Ewing Island between 1942 and 1963 (Falla 1967).

The first definite modern record was a bird seen at a campsite at Magnetic Bay, Adams Island, on 24 Jan 1966, and trapped there 5 days later (JLK, BDB). Auckland Island rails were confirmed to be common in suitable habitat on Adams Island in Nov–Dec 1989 (Elliott *et al.* 1991), and were discovered to have a population on Disappointment Island on 16 Jan 1993 (Walker *et al.* 2020 – Chapter 5). Bones of Auckland Island rails were first found on Enderby Island in 1964 (EWD); evidence of their former presence on the island is summarised by Tennyson (2020 – Chapter 7). The only possible recent record from Enderby was rail-like calls heard by an experienced birder in the early evening on 25 Nov 2001 (reported to RR). Elliott *et al.* (1991) estimated there to be '*hundreds of birds*' on Adams Island, and it is thought that there were well over 500 birds on Disappointment Island in 1993 (Walker *et al.* 2020 – Chapter 5). Rails were reported in about 46% of full bird lists from Disappointment Island, and 27% from Adams Island (Fig. 11).

The only active nest found (in a wetland at Maclaren Bay, Adams Island) contained two eggs on 16 Nov 1989 (Elliott *et al.* 1991). A pair was observed copulating at Magnetic Bay, Adams Island, on 14 Feb 1991 (KW, GPE, PJD, JCS). Rail chicks have been seen or heard on at least 12 occasions (10 on Adams Island, two on Disappointment Island), with the earliest and latest records of downy chicks being 24 Nov (1989, basin above Fly Harbour, Adams Island; Elliott *et al.* 1991) and 16 Feb (1991, Adams Island; KW, GPE, PJD, JCS). Juveniles were caught on Adams Island on 28 Jan & 9 Feb 2011 (KW, GPE) and 13 Feb 2013 (COD, DG).

Auckland Island rails persist only on Adams

and Disappointment Islands, which remained completely free of introduced mammals. On both islands they are most often heard and seen in areas dominated by the megaherbs *Anisotome latifolia*, *A. antipoda*, *Pleurophyllum criniferum*, *P. speciosum*, and *Stilbocarpa polaris* (Elliott *et al.* 2020 – Chapter 3; Walker *et al.* 2020 – Chapter 5). These plants are highly susceptible to browsing and uprooting by ungulates, rabbits, and pigs (R.H. Taylor 1971). The loss of these plants from islands in Port Ross may have contributed to the local extinction of rails, and the slow recovery of these megaherb species long after the removal of browsing mammals may limit the short-term potential for rail restoration or recolonisation on Enderby, Rose, Ewing, and Ocean Islands. The combination of damage to the vegetation by pigs and predation by cats probably precludes their recolonisation of the main Auckland Island.

Auckland Island snipe *Coenocorypha aucklandica aucklandica*

735 records: AIs 8, Ak 2, PR 3, En 233, Ro 21, Ew 50, Ad 382, CH 1, Ds 26, F8 1, Dn 2, Oc 5, Fri 1. Snipe was one of the birds that Abraham Bristow listed following his exploratory visit to the Auckland Islands in late 1807, and was also reported in Jan 1830 (B. Morrell 1832; Miskelly & Taylor 2020 – Chapter 1). The first specimen was collected by Silas Holmes in Port Ross in Mar 1840 (Wilkes 1845; Peale 1848). However, delayed publication of the find (and the intended name *Scolopax holmesii*) meant that the honour of naming the first snipe species found in New Zealand befell Gray (1845), based on specimens collected by RM on Enderby Island during 30 Nov–3 Dec 1840 (McCormick 1884). Snipe were subsequently found by Hermann Krone on Rose Island on 21 Jan 1875 and Ewing Island on 12 Feb 1875, during the German Transit of Venus Expedition. Krone (1900) referred to the birds as '*Rallus Dieffenbachii*'; however, his description of them being small, long-billed snipe-like birds reveals that he had observed snipe rather than Auckland Island rails. Reischek (1889a) reported snipe on Adams Island following a landing on 26 Jan 1888, after which this was the main site where snipe were encountered during the government steamship era through to 1929 (e.g. Chapman 1891; Lukins 1896; Ogilvie-Grant 1905; Waite 1907; ER in Cass 2014). Exceptions were sightings on Rose

Island on 10 Jan 1890 (Chapman 1891) and Enderby Island on 25 Oct 1890 & 28 Oct 1891 (ER in Cass 2014; RW). The only possible record of a snipe on the main island was one shot by Leonard Kristensen on 23 Jul 1894 when the *Antarctic* was anchored at the head of North Arm, Carnley Harbour (Bugayer accepted ms). Unfortunately Kristensen did not state where the snipe was found, and it is possible that he used a ship's boat to visit Adams Island, c. 13 km away.

Throughout the Second World War, coastwatchers based at Port Ross and Carnley Harbour found snipe at two locations only – Ewing Island (where they were rediscovered on 23 Oct 1942) and Adams Island (LS in McEwen 2006). Despite numerous landings on Enderby and Rose Islands, snipe were not sighted again here until 13 Dec 1972 on Enderby Island (BDB) and 19–20 Feb 1985 on Rose Island (RT). Snipe have become abundant on both Enderby and Rose Islands since browsing mammals were eradicated in 1993 (Miskelly, Walker *et al.* 2006; Russell *et al.* 2020 – Chapter 6; French *et al.* 2020 – Chapter 4). Snipe were discovered on rarely visited Disappointment Island on 6 Jan 1973, when a nest with one egg was found (RN in Miskelly, Walker *et al.* 2006), and the first report on 12 ha Ocean Island was on 14–15 Feb 1988 (GAT). In recent years, snipe have been reported during 67–100% of visits to Disappointment, Rose, Enderby, Adams, and Ewing Islands (Fig. 11). Snipe, or evidence of their presence, have occasionally been noted on three small islands that are unlikely to hold resident populations. Probe holes were plentiful, and footprints noted, in mud pans on Figure of Eight Island on 16 Feb 1985 and on Dundas Island on 20 Feb 1985 (RT), and possible probe holes were noted on Friday Island during 9–10 Dec 1989 (AC). A single snipe was seen on Dundas Island, 5 km south-southeast of Ewing Island, on 3 Feb 1999 (GM).

Snipe are territorial, and typically occur as breeding pairs or parent–chick pairs rather than flocks (Miskelly 1999; Miskelly, Walker *et al.* 2006). As a result, it is unusual for ten or more birds to be reported in a day, and observers frequently resort to using qualitative measures of abundance. Snipe reported as '*many*', '*plentiful*', '*abundant*', or ten or more birds have been recorded on at least 52 occasions on the Auckland Islands: 36 times on Adams Island, 9 times on Enderby Island, 3 times on Rose

Island, twice on Disappointment Island, and twice on Ewing Island (the latter on 21 & 26 Dec 1943; RAF).

Miskelly, Walker *et al.* (2006) reported on the first 25 snipe nests found on the Auckland Islands, between 1966 and 2006, including descriptions of nest locations and construction, and egg colour, markings, and dimensions. A further 13 nests were found between 2007 and 2018: nine on Adams Island, three on Disappointment Island, and one on Enderby Island. When all nests are combined, their contents were 3×1 egg and 35×2 eggs. None of the single-egg nests was revisited to determine if they were incomplete clutches. Eggs were found between 8 Nov (1997, Adams Island; GM, JM) and 12 Feb (2006, Enderby Island; MB). Both parents incubated at nests found on Ewing Island on 18 Jan 1966 (RO, RAF) and on Disappointment Island on 18 Jan 2018 (KRH, CMM). Chicks were reported between 15 Aug (2010, chick c. 5–7 days old, Enderby Island; HM, CL) and 15 Feb (2017, Enderby Island; CGM). From these egg and chick records, laying dates were estimated to occur between mid-July and the end of Jan, peaking in late-Nov (modified from Miskelly, Walker *et al.* 2006). However, there have been few observers present on ‘snipe’ islands in the Auckland Islands after mid-Feb (and note that Snares Island snipe *Coenocorypha huegeli* and Chatham Island snipe *C. pusilla* have been reported to lay as late as 13 Apr and early-Apr, respectively; Miskelly 2005, 2017).

Auckland Island snipe apparently breed at different times on different islands in the group within the same season. Snipe were surveyed on Disappointment, Rose, Enderby, and Ewing Islands during 15–31 Jan 2018 (CMM, AT, KP, NKA). A nest with eggs was found but no chicks or juveniles seen on Disappointment Island during 16–19 Jan, while six fully feathered juveniles (but no nests or downy chicks) were found on Rose Island (two birds on 22 & 23 Jan) and Enderby Island (four birds on 26 Jan). Three young chicks, a juvenile moulting into adult plumage and a female carrying a fully formed egg were found on Ewing Island during 20–21 and 28–31 Jan, but no chicks in the 12–80-day range were seen.

Nocturnal aerial displaying by Auckland Island snipe (*‘hakawai’* displays – a mix of vocalisations and sounds made by tail-feather vibrations; Miskelly 1987) were first heard on Enderby Island

in Jun 1998 and on Adams Island in Jun & Dec 2001, and subsequently on Adams Island during the 2002–03, 2004–05 and 2005–06 summers (Tennyson 1999; Miskelly, Bell *et al.* 2006). Hakawai displays have since been heard at night on Adams Island on 28 Jan 2007, 15 & 16 Jan 2009, 31 Jan 2010, 16 Jan 2011, 12 Jan 2013, 7 Feb 2014, 2 Jan 2016 & 27 Dec 2017 (KW, GPE, COD, DG, KRH, GCP). There was no relationship between moon phase and the dates that hakawai displays were reported. Damaged tail feathers characteristic of the wear caused by hakawai aerial displaying (Miskelly 1987) were noted on 13 of 27 adult snipe handled in late-Jan 2018: 3 of 6 on Disappointment Island, 6 of 8 on Rose Island, 2 of 6 on Enderby Island, and 2 of 7 on Ewing Island (CMM).

Before 2018, it was assumed that three refugial snipe populations (on Adams, Ewing, and Disappointment Islands) had persisted in the Auckland Islands following introductions of predatory and browsing mammals, and that snipe reported on other islands in Port Ross had dispersed or recolonised from nearby Ewing Island (Baker *et al.* 2010). Genetic comparisons between snipe populations on Adams, Disappointment, Ewing, Enderby, and Rose Islands in 2018 revealed an additional refugial population, with snipe on Rose plus Enderby Islands (0.5 km apart) comprising a genetically distinct population that had persisted undetected between 1891 and 1972 (Shepherd *et al.* 2020 – Chapter 16 in this book). There was little evidence for gene flow in either direction between the snipe population on Ewing Island and that on Enderby Island only 2 km away. The snipe populations on Adams and Disappointment Islands were confirmed to be distinct from each other and from the two Port Ross populations (Shepherd *et al.* 2020 – Chapter 16). In addition to the genetic differences identified between snipe populations on Adams Island and those on islands in Port Ross, the birds on Adams Island were significantly smaller (Miskelly & Baker 2010).

Auckland Island banded dotterel *Charadrius bicinctus exilis*

434 records: Ak 11, Fri 1, Ad 185, Als 2, En 210, Ro 14, Ew 6, Dn 2, Oc 2, CH 1. B. Morrell (1832) reported the presence of plovers following his visit to Carnley Harbour in 1830, and RM saw a ‘ringed plover’ on Friday Island on 29 Nov 1840. Reischek (1889a)

was the first to report 'banded dotterels' at the Auckland Islands, on Adams Island on 26 Jan 1888, and they were subsequently listed as present by Lukins (1896). The next reports were single birds seen on the tablelands south of Port Ross in 1941 and on 12 Sep 1943 (CY, LHP in Falla 1978). A pair was then found on the high tops between the head of Chambres Inlet and the west coast of Auckland Island on 30 Sep 1943, and a nest with three eggs was found there on 4 Oct 1943 (LHP, ED, RWB in Falla 1978). This remains the only nest ever found on Auckland Island, and no chicks have been reported there. There were subsequent reports of dotterels on the tops east of Carnley Harbour in 1943, on 29 Oct 1944 (a pair in territorial display), and on 27 Mar 1945 (five birds; RAF, EGT, GE in Turbott 2002, and HW in Falla 1978). The only reports of banded dotterels on Auckland Island since the coastwatching era were at Erebus Cove on 15 Dec 1981 (BA), and one on the Hooker Hills in November 1989 (KT in Walker *et al.* 1991).

Two banded dotterels were collected on the tops of Adams Island opposite Camp Cove on 11 Oct 1943 (WD, AP in Falla 1978), and several birds observed (and two males collected) east of Mt Dick, Adams Island, on 26 & 28 Aug 1944 (EGT, AE, GE, LC in Falla 1978; Turbott 2002). Adams Island was subsequently recognised as the main breeding site for banded dotterels in the Auckland Islands, although the first nest was not found there until 5 Nov 1989 (KW, GPE, RB, LVS, AA).

Banded dotterels were first encountered on Enderby Island on 6 Feb 1944 (RAF, GP, JS, WI), and for many years it was considered to be solely a post-breeding flocking site (Falla 1978). The first (eight) nests were found on Enderby Island in Nov 1989 (Walker *et al.* 1991). A single dotterel was present on Rose Island during 16–19 Feb 1973, with two there on 24 Feb 1973 (RT). The first sighting on Ewing Island was on 23 Feb 1973 (RR, BDB, CC, CR, SR), followed by Dundas Island (two birds on 20 Feb 1985; RT), and Ocean Island (eight birds roosting at night on 14–15 Feb 1988; GAT). Breeding was confirmed on Rose Island on 23 Jan 2018 (a pair with two small chicks; CMM, AT, NKA).

Although the large, long-legged and dull-plumaged dotterels from the Auckland Islands were recognised as being distinct from the time the first specimens were collected in 1943–44 (Oliver 1955; Fig. 13), they were not named as a

endemic subspecies until 1978 (Falla 1978). They are encountered most frequently on Enderby and Rose Islands (on 80–90% of visits) and on the tops of Adams Island (Fig. 11). There have been no records from Disappointment Island. With the exceptions of a count of 273 birds on Adams Island in Nov 1989 and c. 155 on Dundas Island on 24 Jun 1998 (Walker *et al.* 1991; AT), all remaining high counts have been from Enderby Island. The highest count was a full Enderby Island census of 440 birds in Nov 1989 (Walker *et al.* 1991), and there were 14 further counts or estimates of 100–250 birds at Derry Castle Reef or on the northern *Oreobolus* and *Bulbinella* moors on Enderby Island between 1980 and 2018.

Distraction displays by adults (indicating the presence of eggs or young) were noted between 30 Sep (1943, Auckland Island; Falla 1978) and 27 Jan (2018, Enderby Island; CMM, AT). At least 26 nests have been found on Auckland (1), Adams (14) and Enderby (11) Islands, between 4 Oct (1943; Falla 1978) and 27 Jan (2018; CMM, AT). Recorded nest contents were 2 × 1 egg, 11 × 2 eggs, 8 × 3 eggs, and 3 × 4 eggs. A single egg found on Adams



FIGURE 13. Auckland Island banded dotterel, Enderby Island, December 2013. Image: John Fennell.

Island on 12 Jan 2010 had hatched by the following day (KW, GPE), showing that this was not an incomplete clutch in the process of being laid (although eggs may have been lost during incubation). Downy chicks have been recorded between 11 Dec (2016, Enderby Island; CGM) and 12 Feb (1991, Adams Island; KW, GPE, PJD, JCS), with all broods comprising one or two chicks only. Juveniles or fledglings were noted between 27 Jan (2018, Enderby Island; CMM, AT) and 12 Feb (1991, Adams Island; KW, GPE, PJD, JCS).

Pierce (1980) studied foraging behaviour of post-breeding birds at Derry Castle Reef, Enderby Island, in Apr 1980. Amphipods up to 2 cm long were the predominant prey, which also included polychaetes, oligochaetes, isopods, crabs, insects, and spiders.

Banded dotterels on the Auckland Islands visit some sites only at night, probably to reduce the risk of falcon predation. During daylight in summer, dotterels are found on the open tops of Adams Island and in open areas on the outer coasts of Enderby and Rose Islands. At night they have been observed on the shorelines of other islands in Port Ross, e.g. one to nine on Ewing Island on 23 Feb 1973, 2–9 Nov 1989, 24–25 Jun 1998, and 28 Jan 2018 (Walker *et al.* 1991; RR, BB, CC, CR, SR, AT, CMM), eight on Ocean Island on 14–15 Feb 1988 (GAT), and two there on 23–24 Jun 1998 (AT). Dotterels frequently forage at night on the shoreline at Magnetic and Maclaren Bays on Adams Island, with one to four birds reported on 18 occasions between 1989 and 2015, with records in all months that observers have been present (Nov–Feb, and also on 28 Jun 2001; most records KW & GPE or in logbooks held by them, also Buckingham *et al.* 1991).

There is one accepted record of (two) Auckland Island banded dotterels on Campbell Island (16 Jan 2006; Scofield 2008). A record of two birds there on 1 Mar 1944 was also likely to have been this taxon (LHP in Bailey & Sorensen 1962).

Shore plover *Thinornis novaeseelandiae*

1 record: AIs 1. The unique specimen of '*Thinornis rossii*' (currently considered to be an immature shore plover) was reported by Gray (1845) to have been collected at the Auckland Islands in Nov–Dec 1840, although it was not mentioned in

Robert McCormick's diary (ATL microfilm Micro-MS-Coll-20-2665, pp. 675–709). The specimen (which was illustrated in Gray 1845) is much darker than typical *T. novaeseelandiae* and may represent an endemic (extinct) taxon (Miskelly & Taylor 2020 – Chapter 1). Shore plover formerly occurred throughout mainland New Zealand and the Chatham Islands; the sole remaining natural population is on Rangatira (South East Island) in the Chatham Islands. While no shore plover bones were identified among more than 3,500 bones collected on Enderby Island, we note that a single bone only of the larger Auckland Island banded dotterel (which is abundant on Enderby Island) was found (Tennyson 2020 – Chapter 7), indicating the low likelihood of plover bones being found in the sand dune deposits.

Subantarctic skua *Catharacta antarctica lonnbergi*

1,073 records: PR 46, En 315, Ro 34, AIs 8, Ad 175, Ak 193, Sh 8, Ds 39, OI 8, CH 120, AS 31, Oc 31, Frn 10, Ew 32, Dn 9, F8 8, Mn 4, Ms 2. McCormick (1884) shot '*the brown gull*' in Port Ross and on Enderby Island in Nov–Dec 1840; however, apparently no specimen was retained. Survivors of the *Invercauld* wreck ate young skuas on Rose Island in 1864–65, but found the adults tough (RH in Allen 1997). Reischek (1889a) was troubled by subantarctic skuas taking eggs of Gibson's wandering albatrosses that he disturbed from their nests on Adams Island on 26 Jan 1888. The first records from Auckland Island were at North Harbour on 27 Oct 1891 (RW) and at the head of North Arm, Carnley Harbour, 23 Jul 1894 (LK), and there was one on Shoe Island on 23 Mar 1904 (Wilson 1966). Survivors of the *Dundonald* wreck reported '*skewer gulls*' on Disappointment Island in 1907 (CE in Escott-Inman 1911), and this was confirmed by members of the Philosophical Institute of Canterbury on 28 Nov 1907 (Waite 1909). ES reported a chick on Davis Island in February 1929, and CF (in McEwen 2006) recorded skuas on Ocean Island on 5 Mar 1942, on Shag Rock (off Falla Peninsula) on 24 Sep 1942, and a nest on Frenchs Island on 1 Nov 1942. Three pairs with flying young were on Ewing Island on 20 Jan 1943 and a single bird on Dundas Island on 28 Oct 1943 (RAF, ED), and EGT collected two clutches of eggs on Figure of Eight Island on 29 Nov 1944. Two

skuas were on Yule Island on 6 Dec 1972 (RR, MFS, BDB), an adult with a chick on Sugar-Loaf Rocks (east of Disappointment Island) on 6 Jan 1973 (RR, RN, GvT), and four birds were on Monumental Island on 18 Jan 1973 (RR, BDB, RN, MFS). Gamble *et al.* 1986 reported a 'colony of young skuas' on the north-west side of Masked Island in Feb–Mar 1982. The most recent record of breeding on Auckland Island was a pair with a chick above Cape Lovitt (north of South West Cape) on 21 Feb 1973 (RR, CC).

Subantarctic skuas (Fig. 14) were recorded on 60–97% of recent visits to most islands in the Auckland Islands, but on only 15% of visits to Auckland Island itself (Fig. 15). The highest numbers were consistently reported from Enderby Island, including estimates of 100 or more on 12 Feb 2009 and 11 Feb 2018 (HEX). Counts in excess of 40 birds have been reported on 20 occasions: 17 times on Enderby Island (1945–2018), twice on Dundas Island (1978 & 1980), and once on Adams Island (c. 50 at Lake Turbott outlet on 2 Feb 2010; KW, GPE). Almost all skuas depart the Auckland Islands from mid-May to mid-Aug (RAF); the only records in June and July were single dark (immature) birds in Carnley Harbour on 23 Jul 1894 (LK) and on Dundas Island on 22 Jun 1998 (AT).

Coastwatchers monitored 17 skua nests in the Port Ross region during 1943–44 (Enderby Island, 4; Ewing Island, 4; Rose Island, 3; Ocean Island, 2; Tucker Point, 2; Frenchs Island, 1; meadow above Ranui Cove, 1; RAF). Birds returned to territories from 11 Aug, laying was recorded 17 Oct–10 Dec (15 × 2 eggs, 2 × 1 egg) and hatching from 11 Nov after 27+ days of incubation. In the first week of Jan 1963, the most advanced young were just flying, and the youngest chicks were a few days old and still being brooded (BDB). Adult skuas had departed by May 1943, and the few remaining immatures had all departed by 15 May (RAF). Mating was observed on 9 Oct 1942 (Webbing Bay, Auckland Island; CF in McEwen 2006), with the earliest eggs being a clutch of two on Rose Island on 17 Oct 1943 (LHP, RAF, ED) and the latest a bird on a single egg on Disappointment Island on 7 Jan 2015 (KRH). The earliest chicks were estimated to be a week old on 18 Nov 1943 (Ewing Island; RAF), and the latest was a pair with a fledgling on Adams Island on 14 Apr 1942 (CF in McEwen 2006). This breeding chronology is about a week later than on the Snares Islands (Miskelly *et al.* 2001).

Most skuas on the Auckland Islands breed as pairs; however, a trio was noted on the south coast of Adams Island on 15 Feb 1991 (JCS). In contrast, we note that up to a third of subantarctic skua breeding territories were occupied by trios on the Snares Islands, Chatham Islands, and islands around Stewart Island (Guthrie-Smith 1925; Stead 1932; Hemmings 1994; Miskelly *et al.* 2001). Non-breeding clubs of up to 20–50 skuas were most often noted among the sea lion colony at Sandy Bay, Enderby Island, and at the outlet to Lake Turbott, Adams Island. Observers noted skuas bathing in fresh water at Lake Turbott on 20 Sep 1944, 8 Feb 2006, and 12 Feb 2016 (EGT, GE, KW, GPE, KRH, GCP). Subantarctic skuas banded at Sandy Bay, Enderby Island, in Jan 1973 were seen on Dundas Island and at Ranui Cove, Webbing Bay, and North Harbour over the following 3 weeks (RR, BDB, RN, TA, GvT).

During the breeding season, subantarctic skuas on the Auckland Islands feed predominantly on other seabirds, plus they congregate to feed on dead marine mammals (particularly at the New Zealand sea lion colonies on Enderby and Dundas Islands). Observers recorded prey items on more than 230 occasions, with identified prey including sooty shearwater (37), white-headed petrel (37), white-capped mollymawk eggs and small

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FIGURE 14. Subantarctic skua and chicks, Fairchild's Garden, Adams Island, December 2015. Image: Kalinka Rexer-Huber.

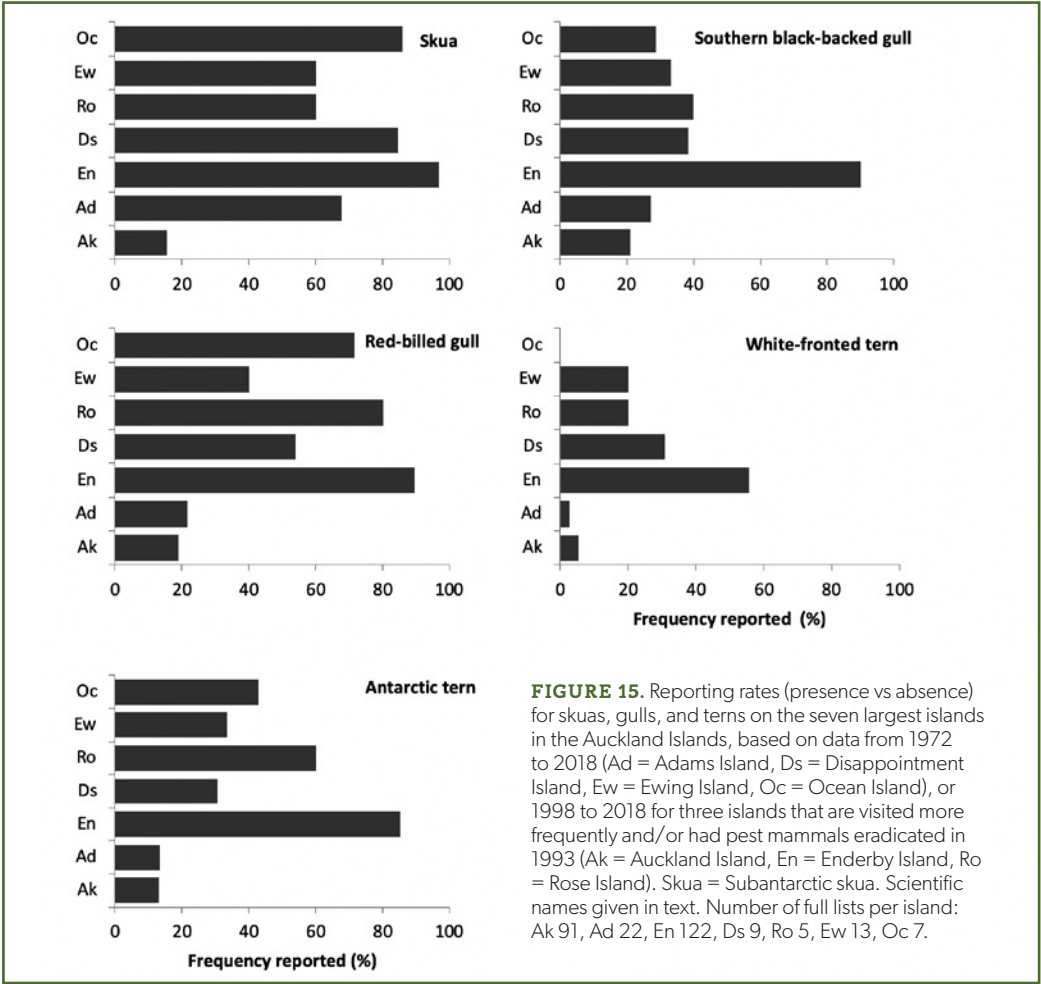


FIGURE 15. Reporting rates (presence vs absence) for skuas, gulls, and terns on the seven largest islands in the Auckland Islands, based on data from 1972 to 2018 (Ad = Adams Island, Ds = Disappointment Island, Ew = Ewing Island, Oc = Ocean Island), or 1998 to 2018 for three islands that are visited more frequently and/or had pest mammals eradicated in 1993 (Ak = Auckland Island, En = Enderby Island, Ro = Rose Island). Skua = Subantarctic skua. Scientific names given in text. Number of full lists per island: Ak 91, Ad 22, En 122, Ds 9, Ro 5, Ew 13, Oc 7.

chicks (10+), rabbit (14), necropsied sea lion pups (14), prion sp. (13), diving petrel (12), black-bellied storm petrel (11), Antarctic prion (10), Auckland Island shag (10), Auckland Island teal (9), Gibson's wandering albatross (9), white-chinned petrel (6), fulmar prion (5), subantarctic skua (4), New Zealand sea lion carcass (4), penguin sp. (3), Gibson's wandering albatross egg (3), Auckland Island snipe (3), and one example each of mallard, northern giant petrel, northern giant petrel egg, subantarctic little shearwater, grey-backed storm petrel, storm petrel sp., small petrel sp., Auckland Island shag egg, southern black-backed gull, red-billed gull, Antarctic tern, parakeet sp., a pipit that had been shot, goat carcass, pig trotter, fish, washed-up krill, and RR's steak dinner. In addition to these records, at least 26 bird species identified

TABLE 1 (OPPOSITE). A total of 1,219 skua midden remains were identified from systematic observations and collections made on nine islands in the Auckland Islands during 16 Jan–1 Feb 2018. Note that smaller prey items will be under-represented as they are harder to find. Some prey remains may have been obtained through being prey remains of other species, e.g. squid and fish being regurgitated by sea lions. A few of the oldest skua midden remains must date back at least 25 years because bones of rabbits (which were eradicated from the Auckland Islands in 1993) were present in two samples. However, most remains appeared to be fairly fresh. Islands are presented north to south. Dismt = Disappointment Island; Fig. 8 = Figure of Eight Island; Montl = Monumental Island. Figures presented are the minimum numbers of individuals found on each island, and MNI is the total minimum numbers of individuals found across all islands. Biomass % is based on mean adult body weight of adult birds (eggs and non-avian food items excluded from total and percentage biomass).

Island	Enderby	Rose	Ewing	Ocean	Shoe	Davis	Dismt	Fig. 8	Montl	MNI	%	Biomass %
Auckland Island teal	12	5	7							24	2.0	2.1
Mallard	1									1	0.1	0.2
Rockhopper penguin	2									2	0.2	1.1
Yellow-eyed penguin	4	2	3		1					10	0.8	8.9
Penguin spp.	20		4	1					1	26	2.1	18.4
Light-mantled sooty albatross (chick)									1	1	0.1	0.5
Albatross <i>Diomedea</i> sp.	1			1						1	0.1	1.4
Mollymawk <i>Thalassarche</i> sp.	4	1								1	0.1	0.7
Cape petrel	76	6	74				12	4	11	183	15.0	0.4
White-headed petrel	6									6	0.5	19.5
Blue petrel	2	1								3	0.2	0.2
Broad-billed prion	7		5		3	2		4	6	27	2.2	0.1
Antarctic prion*	5		2				1			8	0.7	0.7
Fulmar prion*	84	10	35		23	47	1	25	10	235	19.3	0.2
Antarctic or fulmar prion	2						1		1	4	0.3	6.0
White-chinned petrel	13	1	33			1	6	1	1	56	4.6	0.9
Sooty shearwater	5								1	6	0.5	7.9
Subantarctic little shearwater	170	36	76	23	17	50	11		2	385	31.6	0.3
Subantarctic diving petrel**	8		1							9	0.7	8.9
Grey-backed storm petrel	52	26	19	1		2	1	5	1	107	8.8	0.1
Black-bellied storm petrel	29	18	5			1		2	1	56	4.6	1.0
Auckland Island shag	2									2	0.2	19.8
Auckland Island shag egg	1	1								2	0.2	0.2
New Zealand falcon	7									7	0.6	0.1
Auckland Island snipe	1									1	0.1	0.0
Auckland Island banded dotterel	1									1	0.1	0.2
Southern black-backed gull	4									4	0.3	0.2
Red-billed gull	1	2	1							4	0.3	0.1
Starling	7									7	0.6	
Egg	3									3	0.2	
Lepas sp. (goose barnacles)	5									5	0.4	
Squid	7	3		1					1	12	1.0	
Fish	12	1								13	1.1	
Seal	1									2	0.2	
Rabbit	1	1								2	0.2	
TOTAL	555	114	265	27	44	103	33	41	37	1219		564.4 kg

* Identified using beak remains.

** Assumed to be subantarctic diving petrels, although most remains were not identifiable beyond genus level.

in skua middens on nine islands in the Auckland Islands in Jan–Feb 2018 are listed in Table 1. The middens were dominated by common diving petrel (31.6%) and prion spp. (22.4%) remains. Other prey that account for more than 1% of prey items (in decreasing order of abundance) were: white-headed petrel (15.0%), black-bellied storm petrel (8.8%), sooty shearwater (4.6%), Auckland Island shag (4.6%), penguin spp. (3.1%), Auckland Island teal (2.0%) and sea lion/fur seal (1.1%). When converted to biomass of birds consumed, the most important prey species were Auckland Island shag (19.8%), white-headed petrel (19.5%) and penguin spp. (18.4%). Other species providing more than 5% of bird biomass were yellow-eyed penguin and common diving petrel (both 8.9%), sooty shearwater (7.9%), and prion sp. (6.0%). Note that large prey items are unlikely to be consumed whole, and so may be over-represented in % biomass.

Subantarctic skuas are opportunistic predators and scavengers, and so a wide variety of prey is to be expected. Subantarctic skuas were observed hunting rabbits on Enderby Island (Moore & McClelland 1990), and pursuing or capturing Antarctic prions, diving petrels, and storm petrels close offshore on several occasions. The presence of a species in a midden does not necessarily indicate that the prey species has a breeding population on that island. Some taxa without known breeding populations at the Auckland Islands were almost certainly caught at sea before being regurgitated on land, e.g. blue petrel, broad-billed prion, and subantarctic little shearwater. Such finds help to document some of the rarer taxa at sea around the islands.

Failed predation attempts were observed on a white-faced heron (Enderby Island, 18 Dec 1989; MC) and four white-chinned petrels on Disappointment Island in Jan 1993 (GPE, KW, CR, PM). Although white-chinned petrels comprise a significant part of skua diet at Fairchild's Garden, Adams Island, capture attempts frequently fail there too (Dec 2013; KRH). Some larger taxa were probably scavenged: penguin species, albatross species, and seals. For prey species at relatively low densities, even small numbers of prey remains indicate that skuas are significant predators of the following taxa: Auckland Island teal (24 remains) and Auckland Island snipe (7

remains; Table 1). The ratio of prion taxa (based only on beak remains) may bear a relationship to the relative population sizes of the species, e.g. 8 fulmar prions to 27 Antarctic prions. Similarly, storm petrel remains were 9 grey-backed storm petrels and 107 black-bellied storm petrels (with no white-faced storm petrels identified), indicating that black-bellied storm petrels may have a population size an order of magnitude larger than grey-backed storm petrels at the Auckland Islands. The only passerines recovered were four starlings.

Subantarctic skuas were often chased or mobbed by other species, including New Zealand falcon (five occasions on Adams Island, twice on Enderby Island), a flock of seven banded dotterels (Adams Island albatross study area, 8 Dec 1995; JJ, NJ, MA, PG), a red-billed gull (west of Magnetic Bay, Adams Island, 9 Dec 1995; JJ, NJ, MA, PG), and a flock of 30 Antarctic terns (Rose Island, 23 Jan 2018; CMM, AT, NKA). However, skuas were also observed chasing falcons on five occasions (Adams Island, 3 times; Enderby Island, 2 times), and we note the remains of falcons in skua middens on Enderby and Rose Islands in 2018 (Table 1).

Elsewhere in the New Zealand subantarctic, subantarctic skuas are a common breeding species on the Snares, Antipodes, and Campbell Islands, and are a frequent non-breeding visitor to the Bounty Islands (Robertson & van Tets 1982).

Southern black-backed gull *Larus dominicanus*

645 records: PR 47, Ak 109, AIs 5, En 188, Ad 61, Ms 5, Ew 19, Ds 7, CH 111, Oc 12, Ro 26, Dn 9, F8 7, AS 19, Frn 5, OI 3, Mn 9, Fri 3. César Desgraz described two kinds of gull feeding on a dead whale in Port Ross in Mar 1840 (Dumont d'Urville 1846). The first definite records of southern black-backed gulls at the Auckland Islands came 8 months later, when RM shot specimens at Laurie Harbour and Dea's Head, Auckland Island, and Ross (1847) described them as being abundant. The earliest records on other islands were on Enderby Island on 19 Mar 1904 (Wilson 1966); Adams Island on 19 Nov 1907 (BCA in Godley 1979), Masked, Ewing, and Disappointment Islands during Nov 1907 (Waite 1909); Ocean Island on 5 Mar 1942; Rose Island on 3 Oct 1942, Dundas Island on 20 Oct 1942, and Figure of Eight Island on 13 Jan 1943 (CF in

McEwen 2006); Frenchs Island on 28 May 1943 (RWB, RAF); Yule Island on 6 Dec 1972 (RR, MFS, BDB); Monumental Island on 18 Dec 1972 (KJW); Friday Island on 7 Feb 1973 (RT, BDB, RN); Green Island on 4 Dec 2015 (GCP); and Davis Island on 25 Jan 2018 (CMM, AT).

Southern black-backed gulls were reported on 90% of recent visits to Enderby Island, but on only 21–38% of visits to other islands larger than 10 ha (Fig. 15). By far the largest gathering reported at the Auckland Islands was c. 1,000 (including 40–50% immature) in Ranui Cove and offshore from Frenchs Islands on 2 & 4 June 1942 (RAF, RWB). The birds were foraging on a vast aggregation of *Phronima* (hyperiid amphipods) and their eggs and young, and large flocks of gulls were present until at least 21 June 1942 ('scores'; RWB, RAF, JFJ). Falla estimated 200 southern black-backed gulls to be on Rose Island on 17 Sep 1943, there were 100 on Monumental Island on 18 Jan 1973 (RR, BDB, RN, MFS), and more than 100 were estimated to be present on Enderby Island on 30 Nov 2008 & 18 Nov 2009 (HEX). Other high counts included c. 120 at Keken Bay, Auckland Island 23–24 Sep 1943 (RAF), c. 50 on Dundas Island on 21 Jan 1978 (Falla *et al.* 1979), 54 on Friday Island on 25 Jan 2018 (CMM, AT), 50 in Carnley Harbour on 6 Mar 2018 (HEX), and 20 nests along the northern Adams Island coast plus another 20–30 non-breeding and juvenile gulls in Fleming Bay in Dec 2018–Jan 2019 (Rexer-Huber & Parker 2019).

Southern black-backed gulls have been reported breeding on 11 islands in the Auckland Islands. Nests with eggs were found at Laurie Harbour on 23 Nov 1840 (RM), and breeding on the main island was subsequently reported in 1941–45, 1972–73, 1983, 2000, & 2014. Waite (1909) published a photograph of a nest with three eggs on Masked Island in Nov 1907 (the only breeding record at this site). There was a large colony on the north coast of Rose Island on 3 Oct 1942 (CF in McEwen 2006), with breeding subsequently reported there in 10 years through to 2019. Chicks were observed on Ocean Island on 5 Jan 1943 (RAF), with single nests found there on 10 Dec 1943 & 9 Nov 1954 (RAF). An egg was collected on Figure of Eight Island on 13 Jan 1943 (McEwen 2006), followed by breeding records there in Dec 1943 and 1944–45 (Turbott 2002). Chicks were seen on Ewing Island on 20 Jan & 28 Feb 1943 (RAF), with breeding also

reported there the following season (RAF), in Jan 1963 (BDB), and in late-Jan 2018 (AT). Breeding was first reported on Enderby Island on 28 Nov 1943 (5 nests with eggs; RAF), followed by 1963, 1976, 1980, 1988, 2002, 2004, 2010, 2011, 2018, & 2019. Three nests with eggs were found at Fleming Bay, Adams Island, on 16 Nov 1944 (EGT), with breeding on Adams Island also reported in 1945, 1972, 1989, 1991, 1993, 1995, 1998, 1999, 2001, 2004, 2010, & 2012–19. A nest with two fresh eggs on Frenchs Island, 8 Nov 1954 (RAF) remains the only breeding record from the site. More than 30 nests were found on Monumental Island on 18 Jan 1973 (RR, BDB, RN, MFS), with breeding also reported there in 1978, 1980, & 2018. At least six large downy chicks were on Friday Island, 25 Jan 2018 (CMM, AT).

Eggs have been recorded from 8 Nov (1954, 2 fresh eggs on Frenchs Island; RAF) to 8 Feb (2014, 2 eggs near Boatshed Bay, Adams Island; KRH, GCP). Chicks were noted from 21 Nov (2011, small downy chicks on Enderby Island; HEX) to 20 Feb (1945, $\frac{3}{4}$ -grown chick at Magnetic Bay, Adams Island; HW). Nest contents included 4 × 1 egg, 19 × 2 eggs, 10 × 3 eggs, 2 × 1 chick and 3 × 2 chicks. EGT measured two clutches of two eggs and a single egg on Adams Island on 16 Nov 1944: 70.8 × 48 mm & 71.5 × 49.5 mm; 70.0 × 49.0 mm & 69.5 × 50 mm; and 67.8 × 47.5 mm. RR, MFS, & BDB measured one clutch of two eggs at Webbing Bay, Auckland Island, on 7 Dec 1972: 67.6 × 50.3 mm & 69.3 × 49.2 mm. Six fledglings were noted at Derry Castle Reef, Enderby Island, on 28 Jan 2018 (CMM, AT). Breeding commences about a month later than on mainland New Zealand (Higgins & Davies 1996).

Few observers have reported food items taken by southern black-backed gulls at the Auckland Islands. Waite (1909) reported a gull dropping a mussel (*Mytilus* sp.) onto rocks at North Arm, Carnley Harbour in Nov 1907, then descending to feed upon it. There are numerous reports of southern black-backed gulls scavenging on sea lion carcasses and also on birds that had been skinned by coastwatchers. Large flocks were feeding on stranded hyperiid amphipods in Port Ross in Jun 1943 (see above). Nine adults and four juveniles were feeding on a dead sooty shearwater in Tagua Bay, 7 Apr 1945 (HW). A colony at the western end of Enderby Island on 18 Jan 1963 had been feeding almost exclusively on black-bellied storm petrels (BDB). About ten southern

black-backed gulls were pecking at krill-like organisms on the southern shore on Ewing Island on 22 Dec 1991, and unaccompanied Auckland Island teal ducklings were taken there on 2 & 5 Jan 1992 (MJW). A first-year bird was feeding on paua (*Haliotis* sp.) at low tide at Maclaren Bay, Adams Island, on 4 Jan 2001 (SH, AJW). About six adults had been eating small paua, mussels, and marine snails, in that order, along the Maclaren Bay to Magnetic Bay coast on 24 Dec 2001 (KW, GPE).

Elsewhere in the New Zealand subantarctic, southern black-backed gulls breed in low numbers on the Snares, Bounty, Antipodes, and Campbell Islands (Bailey & Sorensen 1962; Robertson & van Tets 1982; Miskelly *et al.* 2001; Tennyson *et al.* 2002).

Red-billed gull *Chroicocephalus novaehollandiae scopulinus*

622 records: AIs 7, PR 42, Ak 106, En 206, CH 107, Ds 10, Oc 27, Ad 31, F8 5, AS 17, Ro 23, Ew 20, Frn 2, Dn 5, Mn 6, OI 3, Ms 4, Fri 1. Abraham Bristow reported 'such plenty' of small gulls along the shore following his exploratory visit to the Auckland Islands in Oct–Dec 1807 (Miskelly & Taylor 2020 – Chapter 1). They were subsequently reported feeding around a dead whale in Port Ross in Mar 1840 (CD), and RM killed two small 'ash backed gulls' with one shot at Erebus Cove, Auckland Island, on 20 Nov 1840 (McCormick 1884). Red-billed gulls are ubiquitous around the Auckland Islands. The first reported sightings from other islands in the group were on Enderby Island on 3 Dec 1840 (McCormick 1884), Disappointment Island on 28 Nov 1907 (BCA in Godley 1979), Ocean Island on 5 Mar 1942, Adams Island on 14 Apr 1942, Figure of Eight Island on 11 May 1942 and Rose Island on 3 Oct 1942 (all CF in McEwen 2006), Ewing Island on 28 Feb 1943 (RAF), Frenchs Island on 28 May 1943 (RWB, RAF), Dundas Island on 28 Oct 1943 (RAF, ED), Monumental Island on 18 Dec 1972 (KJW), Sugar-Loaf Rocks (east of Disappointment Island) on 6 Jan 1973 (RR, BDB, MFS, RN, GvT), Masked Island on 2 Feb 1973 (RT), and Friday and Davis Islands on 25 Jan 2018 (AT, CMM).

Red-billed gulls were reported on 71–89% of recent visits to Enderby, Rose, and Ocean Islands, but on only 19–22% of visits to Auckland and Adams Islands (Fig. 15). They are present year-round at the Auckland Islands. Records of

red-billed gulls being abundant, occurring in large numbers, or counts exceeding 80 birds, included from Port Ross in Mar 1840 and 1874–75 (Dumont d'Urville 1846; Krone 1875); Enderby Island in 1874–75 (Krone 1875), on 26 Sep 1942 (CF in McEwen 2006), in Feb–Mar 1982 (P. Thomson 1986), on 12 Feb 2009 (HEX), and on 12 Nov 2014 (SE in eBird); south-east of Adams Island on 13 Jun 1942 (CF in McEwen 2006); in Carnley Harbour on 13 Jun 1942 and 8–9 May 1981 (CF in McEwen 2006; Robertson & Jenkins 1986); in Ranui Cove on 17 & 21 Jun 1943 (feeding on abundant *Phronima* hyperiid amphipod adults, eggs, and young in washed-up seaweed; RAF, RWB, JFJ); 80 at the head of Musgrave Harbour on 20 Feb 1973 (RR, CC); c. 185 on Dundas Island on 24 Jun 1998 (AT); and c. 130 on Adams Island on 1 Mar 2003 (COD, JAS).

Breeding by red-billed gulls has been reported on seven islands in the Auckland Islands. Two eggs were found on Ocean Island on 5 Dec 1942 (LS), and red-billed gulls were subsequently reported breeding there in 1943, 1954, 1962–63, 1972–73, and 1989 (Moore & McClelland 1990), with a maximum of nine nests on 1 Dec 1943 (RAF, ED, JFJ). A 'half-fledged' chick and other juveniles were noted on Ewing Island, 28 Feb 1943 (RAF), with breeding subsequently reported there in Dec 1943, 1963, 1972, 1978, 1989, and 1991, with two colonies reported on 14 Dec 1991 (MJW, JJA, DB). Nesting had recently commenced on Rose Island, 29 Nov 1943 (fresh eggs collected; RAF), and breeding was subsequently recorded there in 1963 (BDB, PMJ), and 1972–73 (RR, DV, MFS, BDB, KJW, RT). At least two nests with eggs were found at Derry Castle Reef, Enderby Island in 1962–63 (BDB), with breeding subsequently reported on Enderby Island in 1972–73, 1978, 1980, 2010, 2018, & 2019. Red-billed gull colonies have been reported at four sites on Auckland Island since 28 & 30 Dec 1962, when a colony was found in a cave south of Crozier Point (most chicks about half-fledged, with 23 banded; BDB, LG). Colonies were subsequently recorded at Webling Bay, Matheson Bay, and on the west coast during the 1972–73 expedition (RR, MFS, BDB, RN, KJW); there are no subsequent breeding records from Auckland Island. A nest with two eggs was found on Monumental Island on 18 Jan 1973 (RR, BDB, RN, MFS), and red-billed gulls were nesting there on 30 Dec 1980 (MC). Colonies were reported at inaccessible sites on Adams Island in 1989 &

2003; the only confirmed breeding on the island was a nest with two eggs west of Magnetic Bay, 9 Dec 1995 (JJ, NJ, MA, PG).

Red-billed gulls were mating noisily at Ranui Cove and on Ocean Island on 28 & 29 Oct 1943, and a gull was carrying nesting material at Crozier Point, 1 Nov 1943 (RAF). Eggs were reported between 9 Nov (1954, two eggs collected on Ocean Island; RAF) and 18 Jan (1973, Monumental Island; RR, BDB, RN, MFS). Clutch sizes of 31 nests were 5×1 egg, 25×2 eggs, and 1×3 eggs (the only 3-egg nest was on Enderby Island, 29 Dec 1972; BDB); 22 eggs measured in the field averaged $54.0 \pm 1.8 \times 38.7 \pm 1.5$ mm (mean \pm s.d.). Chicks were reported between 7 Dec (1972, two new dry chicks at Webling Bay, Auckland Island; RR, MFS, BDB) and 28 Feb (1943, one half-fledged chick on Ewing Island; RAF). The earliest fledglings reported were on 5 Jan 1943 on Ocean Island (RAF). This breeding chronology is 2–3 weeks later than on the Snares Islands (Miskelly *et al.* 2001).

Elsewhere in the New Zealand subantarctic, red-billed gulls breed on the Snares and Campbell Islands (Bailey & Sorensen 1962; Miskelly *et al.* 2001); however, they have never been reported from the Bounty or Antipodes Islands.

White-fronted tern *Sterna striata*

334 records: PR 43, CH 88, Ak 43, AIs 2, En 107, Ew 7, Oc 3, Ro 7, AS 15, OI 1, Ad 7, Ds 7, Mn 1, Dn 1, Ms 1, Fri 1. Saunders (1896) listed a specimen (as *Sterna frontalis*) from the Auckland Islands, ex the Gould Collection (bequeathed in 1881). The specimen lacks collection data (Jo Cooper, *pers. comm.* to CMM, Apr 2019), but it is likely to have been collected during the 1840 *Erebus & Terror* expedition (Miskelly 2000). Four specimens of white-fronted tern were collected at Port Ross, Laurie Harbour, and Erebus Cove by the German Transit of Venus Expedition in 1874–75 (Krone 1875, 1877; Miskelly & Taylor 2020 – Chapter 1). The species was next encountered in Carnley Harbour on 7 Jan 1901 (FH) and in Port Ross in Mar 1904 (Wilson 1966). The Cape Expeditioners found white-fronted terns to be common on Enderby Island from 1941 (egg in Canterbury Museum collected by DK & LHP). Most of the records were of roosting and foraging birds. The earliest records at other known or likely breeding sites were on Rose Island, 12 Nov 1942 (LS, GP, HH, NH in McEwen 2006); on an islet off

Kekenno Point, 30 Nov 1943 (RAF); Adams Island (Grafton Point to above 300 m), 2 Feb 1944 (RAF, JS, DK); Ewing Island, 1 Jan 1963 (BDB); Monumental Island, 20 Jan 1978 (RAF, RT); and Dundas Island, 20 Feb 1985 (RT). White-fronted terns also roost and forage off Disappointment Island (first recorded 11 Dec 1976; Bartle & Paulin 1986).

White-fronted terns are reported most frequently on Enderby Island (56% of visits; Fig. 15). High counts include 100+ in Tagua Bay, Carnley Harbour, on 8 Jun 1942 (CF in McEwen 2006), c. 40 at Derry Castle Reef, Enderby Island, on 17 Mar 1954 (PB, RT, DD), c. 60 pairs on Monumental Island on 20 Jan 1978 (RAF, RT), 200 on Enderby Island on 31 Jan 1999 (Esler 1999), 35 (including 4 juveniles) just west of Breaksea Point, Carnley Harbour, on 3 Feb 2006 (GAT), 32 on the south-east coast of Disappointment Island on 19 Jan 2018 (CMM, AT), and 31 roosting on Friday Island on 25 Jan 2018, in addition to a large mixed flock (100+) of white-fronted and Antarctic terns feeding in the middle of Port Ross (CMM, AT).

Eggs have been recorded between 28 Nov (1943, 5 pairs each on a single fresh egg, Enderby Island; RAF) and 14 Jan (1973: 2×2 eggs, 7×1 egg, Enderby Island; BDB), and chicks between 4 Jan (1963, seven chicks, including one nearly fledged and two c. 3 days old, small bay south of Webling Bay; BDB) and 23 Feb (1943, 7–8 pairs, young not yet fully fledged, Enderby Island; RAF, ED). Additional breeding records included a nest with two eggs plus two half-grown chicks nearby at Kekenno Point, 6 Jan 1943 (RAF), a nest with one egg on the south-west point of Ewing Island, 1 Jan 1963 (BDB), and several small colonies (in association with Antarctic terns) on headlands between Webling Bay and Tandy Inlet on 5 Jan 1963 (BDB). Several of the breeding records were of mixed colonies with Antarctic terns and/or red-billed gulls. Breeding commences about a month later than on mainland New Zealand (Higgins & Davies 1996).

White-fronted terns do not breed at other subantarctic islands, but have been recorded as vagrants at the Snares Islands and Campbell Islands (Bailey & Sorensen 1962; Miskelly *et al.* 2001).

Antarctic tern *Sterna vittata*

445 records: Ro 22, CH 57, PR 52, Ak 43, Oc 16, Ew 14, AS 17, En 202, Frn 7, OI 2, Ad 5, AIs 1, Dn 2,

Ds 4, Fri 1. Antarctic terns were first reported at Port Ross in 1874–75, including a specimen collected on Rose Island (Krone 1875; Miskelly & Taylor 2020 – Chapter 1). They were seen frequently in Carnley Harbour in Nov 1907 (Waite 1909), and a nest was found inland from Ranui Cove, Auckland Island, 30 Nov 1941 (reported to CF; egg in Canterbury Museum). The first reports of birds roosting or nesting on other islands were on Ocean Island, 3 Nov 1942 (CF, GP, LS in McEwen 2006); Enderby Island, 6 Jan 1943 (RAF); Frenchs Island, 7 Mar 1943 (RAF, ED); Ewing Island, 18 Nov 1943 (RAF); the islet off Kekenō Point, 30 Nov 1943 (RAF); Adams Island, 18 Dec 1972 (RR, BDB, MFS, RN, KJW); Dundas Island, 24 Jun 1998 (AT); Disappointment Island, 5 Jan 2015 (PS in eBird); and Friday Island, 25 Jan 2018 (CMM, AT).

In contrast to Turbott (2002), we note records of Antarctic terns at the Auckland Islands in all months, with several reports of flocks (20–70 birds) during May–Oct. The largest recorded aggregation of Antarctic terns at the Auckland Islands was c. 100 at Derry Castle Reef, Enderby Island, on 17 Mar 1954 (PB, RT, DD), and there were c. 40 there on 4 Dec 1994 (HEX) and c. 80 adults (c. 20 nests) on 29 Nov 2013 (BZB). There were c. 20 pairs on Rose Island on 12 Nov 1942 (LS, GP, HH, NH), and c. 70 on Dundas Island on 24 Jun 1998 (AT). Antarctic terns were recorded on 60–85% of

recent visits to Rose and Enderby Islands, and on 43% of visits to Ocean Island (Fig. 15).

The earliest confirmed breeding on each island was 30 Nov 1941 on Auckland Island (nest with 2 eggs inland from Ranui Cove; reported to CF, 1 egg in Canterbury Museum), 23 Jan 1943 on Enderby Island (three nests: 1 × 2 eggs & 2 × 1 egg; Canterbury Museum), 28 Dec 1962 on Ocean Island (eight nests: 6 × 2 eggs & 2 × 1 egg; BDB), 11 Jan 1963 on Rose Island (nests with 1–2 eggs and a newly hatched chick; BDB, PMJ), and 20 Jan 2018 on Ewing Island (nest with 2 eggs; CMM, AT, NKA). In addition to the 1941 record, Antarctic terns were recorded breeding on Auckland Island on 4 & 5 Jan 1963 (south of Webling Bay, and north-east coast; BDB), and three nests with eggs and chicks were found inland of Dea's Head on 17 Jan 2018 (AT).

Eggs were recorded between 23 Nov (1978, Enderby Island; RAF) and 23 Feb (1943, Enderby Island; RAF, ED). Combined clutch sizes were 39 × 1 egg and 28 × 2 eggs; 20 eggs measured in the field averaged $44.1 \pm 1.4 \times 32.8 \pm 1.2$ mm (mean ± s.d.). Downy chicks were noted between 21 Dec (1972, Rose Island; RR, BDB) and 26 Feb (1944, Enderby Island; EGT, GE). There were two cycles of breeding in the Port Ross area in 1962–63, with flying young present, and a second cycle of eggs hatching after the first week of January (BDB). Nests were mainly on headlands or in salt marshes or moorlands, sometimes among dead rātā (Enderby and Rose Islands), and sometimes associated with white-fronted terns. In contrast, Antarctic terns on the Snares Islands have a much more protracted breeding season that starts 2 months earlier, with eggs reported mid-Sep–Mar (Miskelly *et al.* 2001).

Antarctic terns (Fig. 16) often foraged singly, in pairs, or in small flocks over *Macrocystis* kelp beds. The few prey items noted were small fish, including anchovies (near Shoe Island, 8 Nov 1943; RAF, ED, JFJ).

Antarctic terns breed at all the New Zealand subantarctic islands, and also on some of the muttonbird islands south-west of Stewart Island (Sagar 2013).

Red-crowned parakeet *Cyanoramphus novaezelandiae novaezelandiae*

351 records: En 193, PR 1, Ak 29, Ad 90, AIs 2, Ro 18, Ew 13, CH 3, AS 1, Mn 1. At least two red-crowned parakeets were collected and three others seen

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FIGURE 16. Antarctic tern, Ewing Island, January 2018. Image: Alan Tennyson.

on Enderby Island during 30 Nov–1 Dec 1840 (Gray 1845; McCormick 1884). The first record on Auckland Island was at Epigwaitt, Carnley Harbour, in Jan 1864 (Raynal 1874), followed by Adams Island on 26 Jan 1888 (Reischek 1889a). A parakeet was heard on Rose Island in early-Jun 1942 (GA in McEwen 2006), otherwise there were no parakeet records on either Rose or Ewing Islands during the coastwatcher era (1941–45). The first definite record of red-crowned parakeets on Rose Island was in Nov 1954, when they were common (KAW, RT), and the first record on Ewing Island was on 1 Jan 1963 ('a few'; BDB). One parakeet was seen on Monumental Island, 1 Feb 2018 (CMM, AT). There are no records of parakeets from Disappointment, Ocean, Friday, Frenchs, Dundas, Figure of Eight, or Masked Islands.

Red-crowned parakeet encounter rates are now highest on Enderby and Rose Islands (80–93%; Fig. 17). When combined with yellow-crowned parakeets, hybrid parakeets, and unidentified parakeets, the encounter rates for parakeets is 68–100% on Rose, Enderby, Ewing, and Adams Islands (Fig. 17). Red-crowned parakeets were described as plentiful on Adams Island, 2 Feb 1944 (JS, RAF), and numerous on Rose Island, 11 Jan 1963 (BDB). In contrast to Rose Island during 1941–45, such descriptors (along with 'abundant' and 'very common') were routinely applied to the red-crowned parakeet population on Enderby Island 1962–82, when cattle and rabbits were present. Numbers were estimated as 30 or more birds on eight occasions on Enderby Island between 1976 and 2018, with the highest estimates on 1 Dec 1998

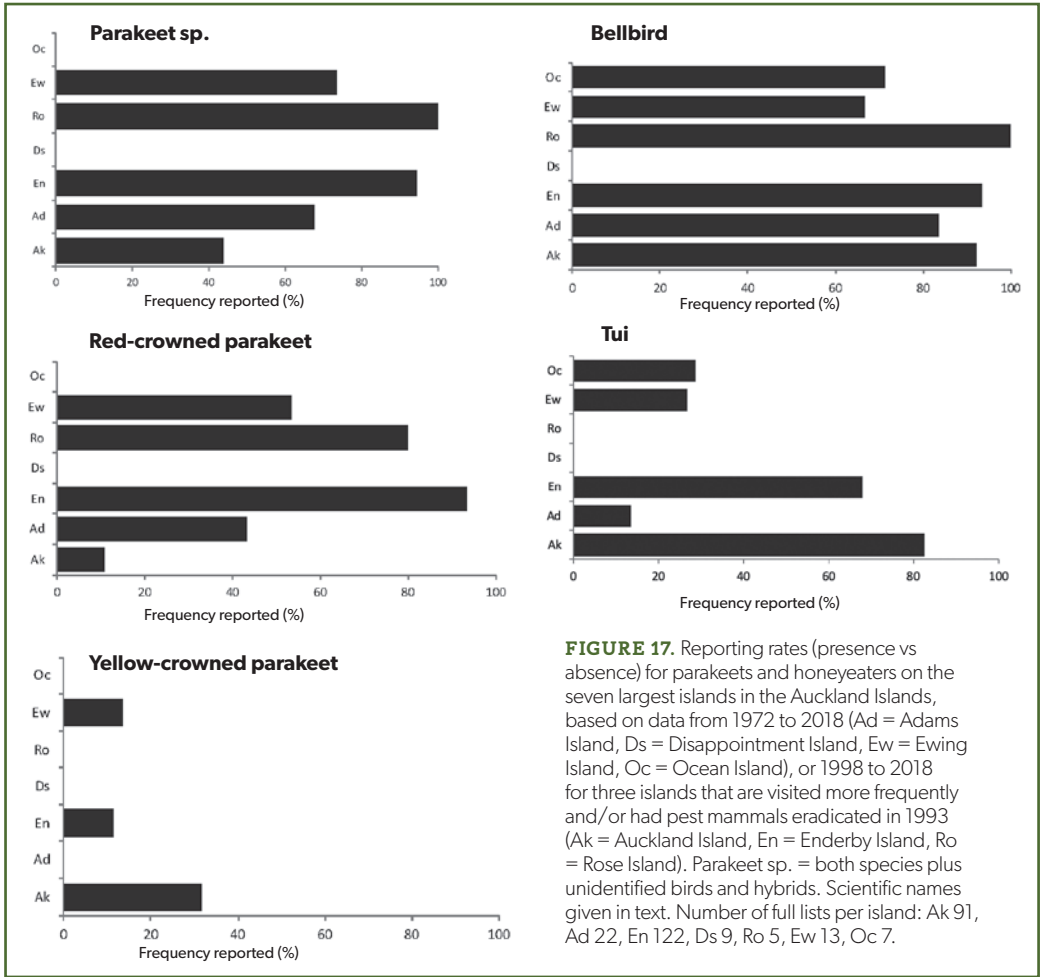


FIGURE 17. Reporting rates (presence vs absence) for parakeets and honeyeaters on the seven largest islands in the Auckland Islands, based on data from 1972 to 2018 (Ad = Adams Island, Ds = Disappointment Island, Ew = Ewing Island, Oc = Ocean Island), or 1998 to 2018 for three islands that are visited more frequently and/or had pest mammals eradicated in 1993 (Ak = Auckland Island, En = Enderby Island, Ro = Rose Island). Parakeet sp. = both species plus unidentified birds and hybrids. Scientific names given in text. Number of full lists per island: Ak 91, Ad 22, En 122, Ds 9, Ro 5, Ew 13, Oc 7.

(100; JA in eBird), and 23 Nov 2003 (200; HEx).

Few nests have been reported. A red-crowned parakeet and a hybrid were apparently feeding chicks in the nest in a hollow rātā (entrance 2 m off ground) on Rose Island 11 Jan 1963 (BDB). A nest with young was found at Magnetic Bay, Adams Island, on 25 Jan 1966 (JLK), and at least one nest was still being incubated on Enderby Island on 20 Feb 1973 (MFS). Three nests at Fairchild's Garden, Adams Island, 30 Dec 2016 were all in similar sites: a cavity in an *Asplenium* peat mound 1 m above the rocky beach; one with a female on at least five eggs (KRH, GCP).

Food items on islands in Port Ross included *Rumex* seed on Enderby Island, 17 Jan 1963 (BDB); *Carex appressa* seed, *Rumex* leaves and seed heads, and *Stellaria* on the ground on Rose Island, 16–19 Feb 1973 (RT); *Colobanthus* flower-heads on Enderby Island, Feb–Mar 1982 (Penniket 1986); *Epilobium* leaves on Enderby Island, 6–16 Feb 1988 (GAT); and *Rumex* leaves on Enderby Island, 28 Jan 2018 (CMM, AT). Food items on Adams Island included *Ozothamnus vauvilliersii* on 31 Jan 1994 (PJD, PP, AC, RdH); *Coprosma* berries well above the bushline on 17 Jan 1998 (JAm, GM); honeydew scale insects from *Dracophyllum* trunks on 6 Dec 1999 & 26 Jun 2001 (KW, GPE) and 4 Feb 2003 (KW, GPE, COD, JAS); *Astelia linearis* fruit on 19 Jun 2001 (KW, GPE) and 10 & 15 Jan 2013 (COD, DG); rātā flowers on 3 & 5 Feb 2003 (KW, GPE, COD, JAS) and 25, 26, & 31 Jan 2004 (JK, Jar); honeydew on *Dracophyllum* on 3 Feb 2003 (KW, GPE, COD, JAS); green fruit of *Coprosma foetidissima* on 4, 5, & 16 Feb 2003 (KW, GPE, COD, JAS); *Uncinia* seeds on 9 Feb 2003 (COD, JAS); insects under loose bark of dead rātā branches on 16 Feb 2003 (COD, JAS); and *Gentianella* flowers on 8 Feb 2014 (KRH, GCP).

Yellow-crowned parakeet *Cyanoramphus auriceps*

113 records: AIs 1, Ak 82, En 20, Ad 4, Ew 5, Ro 1. One specimen collected during Nov–Dec 1840 (Miskelly & Taylor 2020 – Chapter 1), then not reported again till 26 Mar 1904 (Wilson 1966), with both records apparently from Port Ross. Cape Expedition members found the yellow-crowned parakeet to be the predominant parakeet species on Auckland Island in the vicinity of both the Ranui Cove and Tagua Bay stations (Turbott 2002; McEwen 2006). This remains the case, although

there have been many more reports from Carnley Harbour landing sites than Port Ross mainland landing sites since 1989 (27 vs 6; records from Moore & McClelland 1990, HEx, and eBird). The two other recent records from Auckland Island were from the track to Lake Hinemoa (Musgrave Inlet) on 31 Dec 1996 & 31 Dec 2008 (HEx), with an overall reporting rate of 32% for Auckland Island since 1998 (Fig. 17). The largest flocks were 4–6 birds, with the only recent sightings of flocks of this size being four at Tagua Bay on 1 Nov 2009, five at Epigwaitt on 18 Nov 2013, and six at Western Harbour on 12 Jan 2014 (all HEx).

Yellow-crowned parakeets were first reported from Enderby Island on 6 Feb 1944 (RAF, GP, JS, WI), Adams Island in Sep 1944 (Turbott 2002), and Ewing Island on 4 Jan 1963 (RAF). They continue to be reported on about 11–13% of visits to Ewing and Enderby Islands (Fig. 17), with recent sightings on Enderby Island on 18 Dec 2016 (HEx) and one bird on Ewing Island on 31 Jan 2018 (CMM, AT; Fig. 18). Red-crowned parakeets are the predominant species on Enderby, Ewing, Rose, and Adams Islands, and all records of yellow-crowned parakeets on these islands where numbers have been given have been 1–2 birds only, often associating with red-crowned parakeets.

The four reported nests were all inside hollow southern rātā trees on Auckland Island. A nest found close to the ground at Crab Bay on 29 Mar 1942 contained three chicks close to fledging on 1 Apr, and was later found to contain an additional dead chick (CF in McEwen 2006). A pair at Ranui Cove on 25 Oct 1942 had a low nest entrance too small for inspection, but the two young close to fledging on 19 Nov were 'one pure *auriceps* and other a hybrid "with ear marks and orange crown"' (CF in McEwen 2006). A nest close to the ground found at Tagua Bay on 28 Feb 1945 contained at least four chicks, but both adults were apparently killed by cats at the nest entrance by 18 Mar 1945 (HW). A nest at Ranui Cove lookout on 25 Jan 1966 was in a hole 3 m from ground level, and possibly contained eggs or very small young (RT). An adult was seen feeding a fledgling at Musgrave Peninsula lookout on 7 Apr 1942 (ADC in McEwen 2006), and a pair with four young was seen at Ranui Cove on 7 Nov 1954 (EG).

An adult female collected at Tagua Bay on 26 May 1942 had been feeding on the ground

on *Chionochloa* seeds ('*Danthonia*', CF in McEwen 2006). Single birds on Adams Island on 26 Jan 2004 and 7 Feb 2013 were feeding on rātā flowers (JK, JAr; COD, DG), and one on Ewing Island on 31 Jan 2018 was feeding on *Carex trifida* seed (CMM, AT).

Hybrid parakeets *Cyanoramphus novaezelandiae* × *C. auriceps*

49 records: Ad 24, Ak 4, PR 1, Ro 4, Ew 6, En 10. Many of the parakeets on the Auckland Islands show evidence of hybridisation in their head markings, with variable amounts of yellow on the forehead ('crown') of birds that otherwise appear red-crowned, and birds with extensive yellow crowns often having some red on the ear coverts (a red-crowned feature). R.H. Taylor (1975b) commented on the spatial occurrence of hybridisation in parakeets on the Auckland Islands, and Moore & McClelland (1990) reported that more than 50% of the parakeets seen on Ewing and Rose Islands in Nov 1989 were hybrids. Several observers have reported mixed pairs of parakeets, or hybrids crossing back to one of the parent species. Two chicks taken from a nest at Ranui Cove on 19 Nov 1942 were described as one pure *auriceps* and other a hybrid 'with ear marks and orange crown' (CF in McEwen 2006). A red-crowned and a hybrid were apparently feeding chicks in a nest on Rose Island on 11 Jan 1963 (BDB). One of a nesting pair by the hut on Enderby Island on 30 Dec 1984 had 'red over yellow crown' (MC).

Rawlence *et al.* (2015) reported that four parakeet specimens in Te Papa that were collected on the Auckland Islands had orange-fronted parakeet mitochondrial DNA. This may have been due to interspecific hybridism before the ancestors of these birds dispersed to the Auckland Islands.

Bellbird *Anthornis melanura melanura*

923 records: AIs 11, Ak 364, En 208, Ro 29, Ew 25, Ad 220, PR 11, Oc 34, F8 11, CH 6, Ms 2, AS 1, Sh 1. Bellbirds are extremely abundant on most of the larger Auckland Islands; early visitors commented on their presence without knowing their identity. Abraham Bristow mentioned '*singing birds with sweet melodious notes*' following his visit in 1807 (Miskelly & Taylor 2020 – Chapter 1), and Abby and Benjamin Morrell described green birds that were '*delightful singers*' and '*whose melody is so*



FIGURE 18. Yellow-crowned parakeet feeding on *Carex trifida* seeds, Ewing Island, January 2018. Image: Colin Miskelly.

fine' following their visit to Carnley Harbour in 1829–30 (B. Morrell 1832, A.J. Morrell 1833). The first specimens were collected by McCormick (1884), who recorded '*green birds*' with a '*pleasant whistling note*' on Enderby Island and on Auckland Island (at Erebus Cove and several other sites in Port Ross) in Nov 1840. Bellbirds were numerous on Rose Island in 1864–65 (RH in Allen 1997); however, Krone (1900) remarked on their scarcity on Ewing Island on 12 Feb 1875. Reischek (1889a) was the first to record bellbirds from Adams Island, on 26 Jan 1888, and CF found them common on Ocean Island on 5 Mar 1942 and Figure of Eight Island on 11 May 1942 (McEwen 2006). Bellbirds were observed on Masked Island on 2 Feb 1973 (RT), and there was one on Shoe Island on 25 Jan 2018 (CMM, AT). There are no records from Disappointment Island.

Bellbirds remain very abundant in rātā forest on Adams, Rose, Ocean, and Figure of Eight Islands, and are present but at lower densities, or more patchily in time or space, on Auckland, Enderby, and Ewing Islands. However, they are sufficiently abundant on all islands (other than Disappointment Island) to be recorded on

67–100% of visits (Fig. 17). Qualitative assessments of high abundance were recorded on 89 occasions on seven different islands: 26 times on Auckland Island (1941–2003), 22 times on Adams Island (1942–2018), 15 times on Enderby Island (1962–2018), 13 times on Rose Island (1864–2018), five times on both Ocean Island (1943–2018) and Figure of Eight Island (1944–2018), and three times on Ewing Island (1943–1982). RT estimated up to 375 bellbirds per hectare in the coastal fringe of forest on Figure of Eight Island on 16 Feb 1985 (there were fewer birds in the taller central forest), with at least 1,000 birds estimated on the 5 ha island. COD & JAS completed 33 × 5-minute bird counts in rātā forest on Adams Island Feb–Mar 2003, recording a mean of 8.9 bellbirds per 5 minutes (range 2–17). At least 18 bellbirds were visible simultaneously within 5 m of CMM in rātā forest on Rose Island on 23 Jan 2018. The extremely high densities of bellbirds on Adams, Rose, Ocean, and Figure of Eight Islands apparently suppress or exclude several other passerine species (see accounts for tui, tomtit, silvereye, and dunnock below).

108 Female bellbirds begin nest-building in September on the Auckland Islands (CF in McEwen 2006). The earliest eggs were three in a nest on Ocean Island, 24 Oct (1942; CF in McEwen 2006), and single eggs were found in two nests on Ocean Island on 24 Oct (1943; RAF). However, CF also recorded chicks flying from a nest on the same date, presumably from eggs laid about 20 Sep. The latest eggs were two in a nest at Boatshed Bay, Adams Island, on 18 Feb (1973; BT). Contents of seven nests were 4 × 2 eggs, 2 × 3 eggs, and 1 × 4 eggs (Ocean Island × 3, 1942–43; Adams Island × 4, 1973–97). The earliest nestlings fledged on 24 Oct 1942 (see above), and the latest chicks in a nest were two large chicks on Adams Island, 7 Feb 2009 (KW, GPE). The latest fledglings recorded were two on Enderby Island, 25 Feb 1973 (BDB, RR, CC).

Food items or other foraging information were recorded for bellbirds on the Auckland Islands on 26 occasions (20 of which were on Adams Island). There were ten observations of invertebrates being taken, including blowflies (*Calliphora* sp.) and sandflies (*Austrosimulium* sp.) at windows, kelp flies (Coelopidae) among tidewrack, and one record of hawking on swarms of flying insects at dusk (Fairchild's Garden, Adams Island, 30 Dec 2016; KRH, GCP). Feeding on rātā nectar was

recorded on nine occasions (including on Figure of Eight Island, 16 Feb 1985, RT; and on Ewing Island, 22 Dec 1991, MJW), and on honeydew from scale insects on *Dracophyllum* on seven occasions (six at Maclaren Bay, Adams Island, plus Figure of Eight Island, 16 Feb 1985, RT). There are two records of bellbirds taking *Coprosma foetidissima* berries (Tagua Bay, Auckland Island, 17 Jun 1942, CF in McEwen 2006; and Figure of Eight Island, 16 Feb 1985, RT), and one record of a bird feeding on *Dracophyllum* sap, at Fairchild's Garden, 3 Jan 1973 (RR, MR, DJC, KJW).

Bellbirds are an important prey item for New Zealand falcons on the Auckland Islands. Hyde & Worthy (2010) reported at least 47 bellbirds from falcon prey remains collected on Adams Island (22% of total prey items, but only 74% by weight).

A bellbird flew from Ewing Island to Auckland Island (1.2 km away) on 8 Oct 1942 (CF in McEwen 2006). At least one bellbird was on Campbell Island during 2003–04 (Scofield 2005, 2006) and is likely to have arrived from the Auckland Islands (270 km away). Apart from two possible records from the Snares Islands (Miskelly *et al.* 2001), bellbirds are otherwise absent from other subantarctic islands.

Tui *Prosthemadera novaeseelandiae novaeseelandiae*

435 records: PR 11, Ak 239, En 122, Ew 11, AIs 7, Oc 6, Ad 15, Ro 10, F8 4, AS 2, Ms 3, CH 4, Frn 1. Tui were first reported at the Auckland Islands by the *Astrolabe* & *Zélée* expedition in Mar 1840 (Dumont d'Urville 1846). The first record explicitly from the main island was at Laurie Harbour, 23 Nov 1840 (McCormick 1884), and they were subsequently reported from Enderby Island, 26 Jan 1875 and Ewing Island, 12 Feb 1875 (Krone 1900), followed much later by Ocean Island, 24 Oct 1942 (CF in McEwen 2006); Adams Island, 2 Feb 1944 (JS, RF, DK); Rose Island in Nov 1954 (KAW, RT); Figure of Eight Island, 2 Jan 1973 (RR, MR, DJC, KJW); Masked Island, 15 Feb 1985 (RT); and French's Island, 21 Jan 2018 (CMM, AT). The largest number of tui recorded at the Auckland Islands was 302 shot by officers of HMS *Fantome* at Port Ross, May–Aug 1852 (Malone 1854). Few other observers provided specific numbers when tui were abundant. Qualitative descriptions of high abundance were used for tui at Tagua Bay on 19 Oct 1941 (LHP)

and 10 Mar 1977 (MC), Ranui Cove on 5 Mar 1942, 5 Dec 1943, 26 May 1947, 26 Dec 1962, 4 Jan 1963, and 27 Jan 2008 (CF in McEwen 2006, RAF, JS, BDB, HEx), Ocean Island on 9 Jan 1963 (BDB), Camp Cove on 16 Dec 1972 (KJW), Enderby Island in Jan 1976 (Gardiner 1986), and Erebus Cove on 4 May 1978 (JCG). Ten tui were reported at Crozier Point on 30 Sep 1943 (RAF), ten at Sandy Bay, Enderby Island on 24 Nov 2001 (ACW), 12 on Enderby Island on 12 Nov 2014 (HEx), and 14 flying in from Port Ross to the western end on Enderby Island on 27 Jan 2018 (DAG).

Tui were reported most frequently from Auckland and Enderby Islands (68–82% of visits, Figs 17 & 19). They are rarely seen or heard on Adams Island, and have never been reported from Disappointment Island. The most recent record from Rose Island was a single bird in Nov 1996 (MJW). It is likely that tui are excluded from Adams and Rose Islands by the extremely dense bellbird populations.

There are no reports of tui eggs from the Auckland Islands. Musgrave (1865) reported that they laid in November; a nest with fledged young was found at Waterfall Inlet on 18 Jan 1943 (CF in McEwen 2006), a dead nestling was found on the ground on Masked Island on 15 Feb 1985 (RT), and a nest was found near the huts on Enderby Island on 8 Jan 2004 (WH, BLC, AM, HB). Fledglings or flying young were reported between 30 Dec (1962, Crozier Point; BDB) and 11 Mar (1943, Ranui Cove; RAF).

Waite (1909) reported tui feeding like flycatchers in Nov 1907, CF (in McEwen 2006) reported several hawking sandflies at Keken Point on 8 Oct 1942, RAF reported them '*hawking conspicuously again*' at Ranui Cove on 11 Dec 1943, and HW reported five in the air at once catching insects at Ranui Cove on 19 Jan 1945. Up to five tui feeding in the rubbish dump at Tagua Bay on 15 Mar 1945 (HW) were probably catching blowflies. At least two were catching kelp flies on the shore of Rose Island on 17 & 19 Feb 1973, including over the water (RT). Tui were noted as feeding on insects on Enderby Island on 13 & 20 Dec 2000 (SC, NG, WH), and four were hawking insects at the east end of Enderby Island on 26 Jan 2018 (CMM, AT). Dozens of tui were feeding on rātā nectar at Ranui Cove on 13 Feb 1944 (AE), two were feeding on rātā nectar at Tandy Inlet on 28 Jan 1945 (HW),



FIGURE 19. Tui, Smiths Harbour, Auckland Island, March 2019. Image: James Russell.

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they were common and feeding on rātā in flower on Figure of Eight Island on 2 Jan 1973 (RR, MR, DJC, KJW), and were seen on several occasions on profusely flowering rātā in the Sandy Bay area, Enderby Island, in Jan 1980 (Mitchell & Ensor 1986). Three or four were observed eating *Myrsine* berries at Sandy Bay on 6 Jun 1986 (MC), and one was feeding on honeydew at Matheson Bay in Nov–Dec 1989 (Moore & McClelland 1990).

Auckland Island tomtit *Petroica macrocephala marrineri*

769 records: PR 7, Ew 26, En 212, Ak 311, Ro 23, AIs 3, Ad 177, CH 7, F8 1, AS 1, Ms 1. Two early visitors to the Auckland Islands (1807 and 1830) commented on the variety of song birds present without attempting to describe the component species (AB in Miskelly & Taylor 2020 – Chapter 1; B. Morrell 1832). The first description likely to have been of a

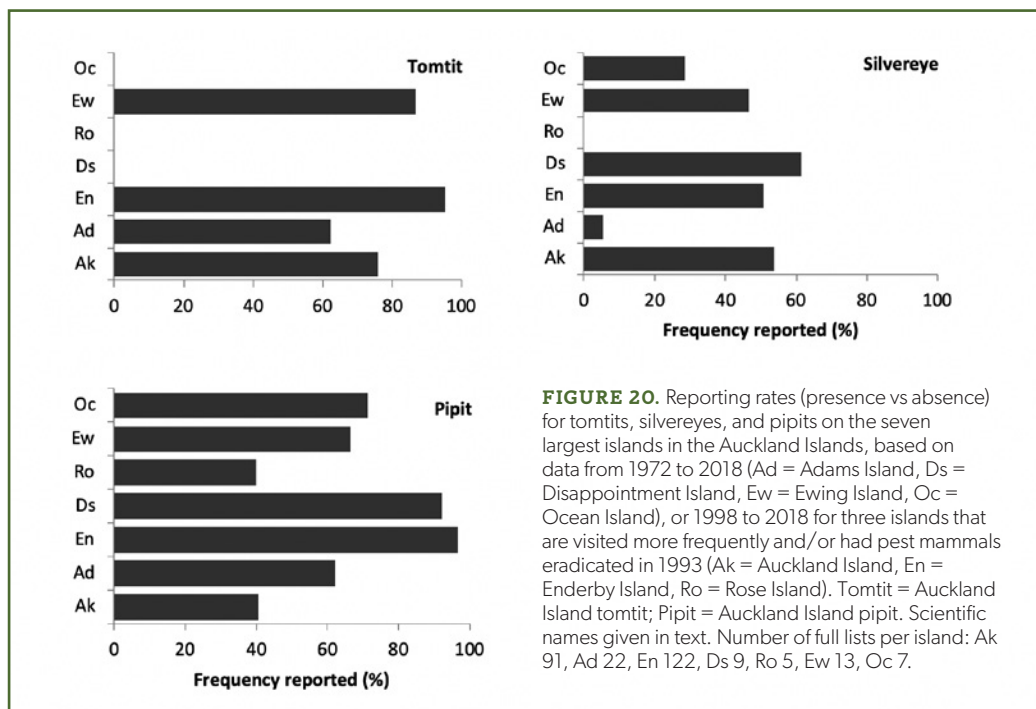


FIGURE 20. Reporting rates (presence vs absence) for tomtits, silvereeyes, and pipits on the seven largest islands in the Auckland Islands, based on data from 1972 to 2018 (Ad = Adams Island, Ds = Disappointment Island, Ew = Ewing Island, Oc = Ocean Island), or 1998 to 2018 for three islands that are visited more frequently and/or had pest mammals eradicated in 1993 (Ak = Auckland Island, En = Enderby Island, Ro = Rose Island). Tomtit = Auckland Island tomtit; Pipit = Auckland Island pipit. Scientific names given in text. Number of full lists per island: Ak 91, Ad 22, En 122, Ds 9, Ro 5, Ew 13, Oc 7.

110 tomtit was at Port Ross in Mar 1840 (SH in Wilkes 1845), 'a still smaller species, of a black colour spotted with yellow, was numerous and sang very sweetly', and RM collected specimens on Ewing Island on 30 Nov 1840 and on Enderby Island 2 days later. Musgrave (1865) and Raynal (1874) described tomtits at Epigwaitt (on the eastern shore of North Arm, Carnley Harbour) in Jan & Nov 1864 following the wreck of the *Grafton* at the start of the year, and RH reported the 'Australian robin' to be present on Rose Island in 1864–65 following the wreck of the *Invercauld* (Allen 1997). Reischek (1889a) listed tomtit as present on Adams Island on 26 Jan 1888. There have been no records of tomtits on Disappointment or Ocean Islands; however, single birds were reported on Figure of Eight Island on 3 Feb 1973 (RT) and Masked Island on 20 Jan 2018 (CMM, AT). Tomtits were reported during 62–95% of recent landings on Enderby, Ewing, Auckland, and Adams Islands (Figs 20 & 21). After more than 20 reports of tomtits on Rose Island during 1942–91 (and being considered common, numerous or very plentiful on six occasions during 1954–85), tomtits were last reported there in Nov 1996 (MJW), and apparently died out on Rose Island between 1996 and 2013 (a

full bird list made by COD on 18 Feb 2013 did not include tomtit). Tomtits were explicitly noted as being absent on Rose Island in Dec 2015 and Jan 2018 (KRH, GCP, CMM, AT, NKA). Silvereeyes were similarly last reported on Rose Island in 1989 (see below). Bellbirds are very numerous in the small patch of rātā forest on Rose Island. We speculate that bellbirds have increased since rabbits were eradicated, and have driven out or out-competed tomtits and silvereeyes.

Auckland Island tomtits are sexually monomorphic, a distinction from mainland populations that was first recognised by CF at Tagua Bay in Mar 1942 (Fleming 1950; McEwen 2006). The Second World War coastwatchers commented on the birds on the main island being much more brightly coloured than those on Enderby Island, with descriptions including males with a rich salmon breast at Ranui Cove lookout, 13 Jun 1943, and at Webling Bay, 2 Jul 1943 (RAF, RWB), and one with rich orange breast almost the colour of orange peel at Terror Cove, 12 May 1945 (HW). Musgrave (1865) and Raynal (1874) described possibly the same bird at Epigwaitt, Carnley Harbour, in Jan 1864 as 'robin-redbreast' and having the breast 'marked in the centre with a red spot'. In contrast, the ongoing

'absence of yellow' on tomtits on Enderby Island was first noted on 23 Feb 1943 (RAF, ED).

Tomtits occur from sea level to 500 m a.s.l. (on the southern cliffs of Adams Island). They do not occur as flocks, and are typically encountered as single birds, pairs, or family groups. Most observers on the Auckland Islands have used qualitative measures of abundance for tomtits. They have been recorded as 'many', 'abundant', 'numerous' or 'plentiful', or in counts of 20 or more birds on 33 occasions on islands other than Rose Island: 13 times on Enderby Island (1943–2014), ten times on Adams Island (2003–17; KW, GPE, KRH, GCP), three times on Auckland Island (Ranui Cove on 5 Mar 1942 & 9 Dec 1983, Erebus Cove on 18 Jan 2017; McEwen 2006, Mayhill & Goulstone 1986, KRH & GCP), and twice on Ewing Island (29 Dec 1972 and 3 Dec 2015; Atkinson 2001, KRH & GCP). Tomtits are conspicuously absent from coastal rātā forest on Adams Island during early summer (Buckingham *et al.* 1991), during which time they breed in megaherb fields on the southern cliffs and at Fairchild's Garden. They return to forest at Maclaren Bay from mid- to late-Jan, perhaps because bellbirds are no longer aggressively defending breeding territories (KW, GPE, KRH, GCP).

Eleven tomtit nests have been reported from the Auckland Islands: three at Musgrave Peninsula, Auckland Island, in 1942 (CF in McEwen 2006), two on Rose Island in 1942 & 1943 (CF in McEwen 2006; LHP, RAF, ED), four on Adams Island in 2002 & 2015 (KW, GPE, KRH, GCP), one on Enderby Island in 2017 (RF, CGM), and one at Dea's Head, Auckland Island, 1 Dec 2018 (KRH). Nesting was reported from July (Tagua Bay; CF in McEwen 2006 [precise date not given]) until 16 Feb (2006, adults feeding flying young at Western Harbour; GAT).

Three nests at Musgrave Peninsula were all less than 3 m above the ground, with two in split rātā at 2.5–3.0 m, and one in a cave 1.5 m above the floor. All were in deep shade and were constructed of fern roots and lined with feathers (CF in Falla MS-Papers-2366-252, ATL). Two clutches of 3 and 5 eggs were described as very pale grey blue with smallish grey-brown specks concentrated at the larger end (CF *ibid.*). Eggs were noted from 20 Sep (1942, with 1 egg laid per day until the clutch of 4 eggs was complete on 23 Sep; CF) to 17 Nov

(2017, clutch of 3 eggs discovered on 8 Nov that hatched 9 days later; RF, CGM). These four nests are the only clutch sizes recorded. Nestlings were reported from 8–9 Oct (1942, eggs hatched after 15–16 days of incubation; CF *ibid.*) to 24 Dec (2015, adult feeding chicks in nest in *Asplenium* patch growing on rock face on south coast of Adams Island; KRH, GCP). Incubation was by the female only (fed by the male), and the female brooded the chicks for 5 days while the male fed them every 5–10 min (CF *ibid.*). Both sexes fed the chicks from day 6, with food being delivered every 2 minutes. Food items were collected within a radius of 50–60 m and included caterpillars, beetles, beetle larvae, small earthworms, spiders, crane flies, and moths (CF *ibid.*). Adults carried faecal sacs a short distance away before dropping them. The nestling period was 19 days ($n = 2$; French *et al.* 2020 – Chapter 4; CF). No brood sizes of nestlings have been reported; however, broods of three fledglings were recorded on five occasions, along with several reports of two fledglings being fed.

There are few records of food items taken by tomtits beyond CF's detailed observations of food provided to chicks at one nest (see above). There are several reports of birds taking kelp flies (Coelopidae) from washed-up seaweed, perching on bull kelp (*Durvillea* sp.), and hawking insects over water up to 10 m from shore (e.g. Fleming Bay, Adams Island, 14 Apr 1942, CF in McEwen 2006; Rose Island on 19 Feb 1973, 19 Jan 1978, & 12 Dec 1991, RT & DB; and Ewing Island, 10 Dec

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FIGURE 21. Auckland Island tomtit, Smiths Harbour, Auckland Island, March 2019. Image: James Russell.

1991, MJW, JJA, DB). Tomtits were also reported catching blowflies (*Calliphora* sp.) at hut windows and porches at Tagua Bay on 15 Mar 1945 (HW) and on Adams Island, 2015–19 (KRH, GCP).

A tomtit at Maclaren Bay, Adams Island, was confused by the tomtit song on Radio New Zealand National (*Morning Report* programme) on 18 Feb 2016 (KRH, GCP).

Silvereye *Zosterops lateralis*

346 records: Ak 196, Ad 11, En 86, AIs 5, PR 3, CH 3, Ew 11, Oc 6, Ro 4, Frn 3, Sh 1, Ms 3, Ds 12, Dn 2. Silvereyes colonised New Zealand from Australia in the 1850s (Oliver 1955). They were first recorded at the Auckland Islands (at Erebus Cove) during the 1874–75 German Transit of Venus Expedition (Miskelly & Taylor 2020 – Chapter 1), and subsequently on Adams Island on 26 Jan 1888 (Reischek 1889a), Enderby Island on 3 Jan 1901 (Ogilvie-Grant 1905), Ewing Island on 28 Feb 1943 (RAF), Ocean Island on 15 Sep 1943 (RAF, LHP), Rose Island in Nov 1954 (KAW, RT), Frenchs Island on 29 Dec 1962 (BDB, RAF), Shoe Island on 10 Dec 1972 (RR, DJC, MR), Disappointment Island on 6 Jan 1973 (RR), Masked Island on 2 Feb 1973 (RT), and Dundas Island on 24 Jun 1998 (AT).

Silvereyes were encountered on 47–62% of recent visits to Disappointment, Auckland, Enderby, and Ewing Islands (Fig. 20). Their low encounter rate on Adams Island is probably due to competitive exclusion by the dense bellbird population there (Elliott *et al.* 2020 – Chapter 3). Silvereyes have apparently disappeared from Rose Island since rabbits were eradicated in 1993 (see discussion under tomtit above). While the apparent absence of records from Rose Island may be an artefact of the small number of full bird lists available (five only since 1998), we note that the small area of rātā forest on Rose Island holds a very dense bellbird population.

There are many accounts of silvereyes occurring in flocks, or being plentiful, very common, very numerous or abundant, mainly from Auckland Island between Mar 1942 (CF in McEwen 2006) and Feb 1973 (RR, CR), and also Enderby Island on 19 Mar 1904 (Wilson 1966) and 31 Dec 1962 (BDB). The few high counts recorded were c. 20 at Hanfield Inlet on 11 Mar 1977 (MC), 20+ at Musgrave Peninsula and/or Camp Cove on 1 Apr 1980 (Pierce 1986), and 20–30 on Enderby Island in

Feb–Mar 1982 (P. Thomson 1986).

At least eight silvereye nests have been found, all on Auckland Island, since the first in 1874–75 (Miskelly & Taylor 2020 – Chapter 1), although few breeding dates or clutch sizes are known. A nest found in *Dracophyllum* in the ‘eastern sounds’ on 5 Jan 1901 contained three bad eggs (FH). A nest with eggs and another with chicks were found at Waterfall Inlet in Mar 1943 (RAF). Two chicks were found dead in a nest at Ranui Cove following bad weather on 17 Dec 1943, and ‘more nests with young’ were found near the station on 20 Dec (RAF). A nest was collected at Tagua Bay, 18 Aug 1944 (Canterbury Museum AV4053), with no comment on nest contents or whether it was recently constructed. Adult silvereyes were seen carrying nest material at Ranui Cove lookout on 29 Oct 1942 and 5 Feb 1943 (CF in McEwen 2006; RAF), and at Ranui Cove, 8 Nov 1943 (RAF). Fledglings were observed being fed at the lookout on 5 Feb 1943 and at Ranui Cove on 16 Nov, 11 Dec (3 chicks), and 12 Dec 1943 (3–4 broods in recent days; RAF, RWB). An adult fed caterpillars from *Veronica* to a fledgling among *Veronica elliptica* in Castaways Bay, Disappointment Island, 21 Jan 1993 (Walker *et al.* 2020 – Chapter 5).

Silvereyes are common on the Snares and Campbell Islands, and there have been more than a dozen records from Antipodes Island (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002).

Eurasian blackbird *Turdus merula*

479 records: Ak 184, AIs 2, En 125, Ew 21, Ro 21, Oc 14, Frn 4, Dn 8, Ad 69, F8 5, Ds 12, PR 2, Sh 1, Mn 2, Ms 4, CH 3, AS 1, OI 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. First recorded at Terror Cove, Auckland Island, on 27 Oct 1891 (RW) and subsequently on Enderby Island on 3 Jan 1901 (FH), Ewing Island on 28 Feb 1943, Rose Island on 25 Jul 1943, Ocean Island on 23 Oct 1943, Frenchs Island on 25 Oct 1943, Dundas Island on 28 Oct 1943, and Adams Island on 2 Feb 1944 (all records RAF), Figure of Eight Island on 25 Nov 1944 and Disappointment Island on 9 Dec 1944 (EGT; Turbott 2002), Shoe Island on 10 Dec 1972 (RR, DJC, MR), Monumental Island on 18 Jan 1973 (RR, BDB, RN, MFS), Masked Island on 2 Feb 1973 (RT), and Davis Island on 25 Jan 2018 (CMM, AT).

The blackbird was the most frequently reported

introduced bird species on the Auckland Islands, and was recorded on 38–73% of recent visits to all seven of the largest islands (Fig. 22). Most sightings were in forest and shrubland. Notable exceptions included birds in tussock (at 335 m a.s.l., Stony Peak, Auckland Island, 15 Apr 1945, Mt Easton to Mt Granger, 23 Apr 1945, and Mt Eden, 2 May 1945, all records HW; and Bleak Hill to Giants Archway, 12 Feb 1973, RT & BT), in every habitat from sea level to summit on Disappointment Island (including tussock and megaherbs) 16–26 Jan 1993 (Walker *et al.* 2020 – Chapter 5), and in megaherbs on the sea cliffs below Mt Dick, Adams Island on 8 Dec 1995 (JJ, NJ, MA, PG) and 15 Jan 2003 & 5 Feb

2007 (KW, GPE). The highest reported counts of blackbirds were eight from Chambres Inlet to Mt Easton on 23 Apr 1945 (HW), 16 on Ewing Island on 8 Nov 1989 (Moore & McClelland 1990), and 11 there on 24 Jun 1998 (AT). Qualitative records of abundant blackbirds included on Enderby Island on 19 Mar 1904, 31 Dec 1962, 7–9 Dec 1976 & 2 Jan 2014 (Wilson 1966, BDB, Bartle & Paulin 1986, HEx), Tagua Bay during Mar–Sep 1942 (CF), Ranui Cove on 28 Dec 1962 (RAF), Ocean Island on 28 Dec 1962 & 2 Jan 1963 (BDB), Ewing Island on 1 Jan 1963 (BDB), Auckland Island shores of Carnley Harbour on 3 Jan 2014 (HEx), and Fairchilds Garden, Adams Island on 29 Dec 1916 (KRH, GCP).

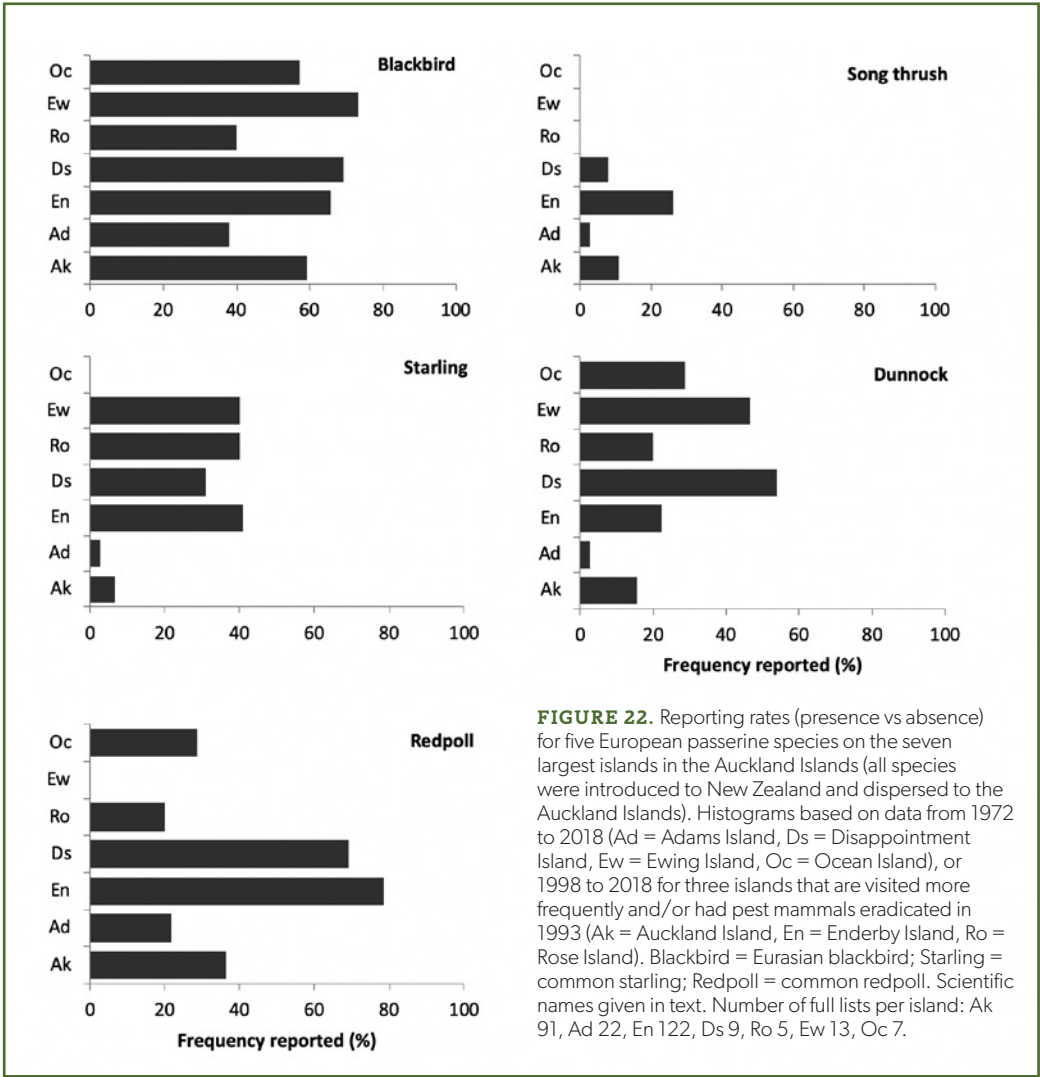


FIGURE 22. Reporting rates (presence vs absence) for five European passerine species on the seven largest islands in the Auckland Islands (all species were introduced to New Zealand and dispersed to the Auckland Islands). Histograms based on data from 1972 to 2018 (Ad = Adams Island, Ds = Disappointment Island, Ew = Ewing Island, Oc = Ocean Island), or 1998 to 2018 for three islands that are visited more frequently and/or had pest mammals eradicated in 1993 (Ak = Auckland Island, En = Enderby Island, Ro = Rose Island). Blackbird = Eurasian blackbird; Starling = common starling; Redpoll = common redpoll. Scientific names given in text. Number of full lists per island: Ak 91, Ad 22, En 122, Ds 9, Ro 5, Ew 13, Oc 7.

The blackbird was the first introduced bird species recorded breeding on the Auckland Islands, when a nest with eggs was found at Terror Cove during 27–29 Nov 1907 (Waite 1909). At least 25 nests have been found, on Auckland Island (11), Enderby Island (4), Ewing Island (3), Rose Island (2), Ocean Island (2), Adams Island (2), and Disappointment Island (1). Nest sites included in a tree fork surrounded with fern, 1 m above the ground (Ocean Island, 9 Jan 1963; BDB), in *Veronica* scrub (Disappointment Island, 31 Dec 1980; MCW), in a fern mound raised 1 m above the ground (Ewing Island, 22 Dec 1991; MJW), and in rātā forest (Enderby Island, 27 Nov 2015 & Dec 2016; CGM). Active nests with eggs were found between 6 Oct (1943, 3 eggs at Ranui Cove; RAF) and 9 Jan (1963, 3 eggs on Ocean Island; BDB). Clutch sizes were 1 × 2 eggs, 13 × 3 eggs, and 2 × 4 eggs. Nestlings were reported between 7 Oct (1943, hatched on this date, Ranui Cove; RAF) and 14 Jan (1944, Crozier Point; EGT). Fledglings were reported between 22 Oct (1943, Ranui Cove; RAF) and January (1980, Mitchell & Ensor 1986).

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Blackbird song was recorded between 23 Jun (1943, Ranui Cove; RAF) and 14 Feb (2017, Disappointment Island; KRH, GCP). The only records of foraging were several birds digging in kelp at the top of the bay and in leaf mulch under *Olearia* trees on Ewing Island on 10 & 12 Dec 1991 (MJW, JJA, DB), and one regularly seen foraging at the top of the beach at Maclaren Bay in Jan 1999 (KW, GPE). Ten were recovered dead (apparently poisoned) during the 1993 rabbit eradication programme on Enderby and Rose Islands (Torr 2002). Blackbirds were recorded as prey items for cats on Masked Island (11 Feb 1993; GPE & PM) and at Port Ross in Jun–Jul 2007 (Harper 2010), and for falcons on Adams Island (4–6 Nov 1993; NHH, Hyde & Worthy 2010) and Enderby Island (Feb 2019; KRH, GCP).

Elsewhere in the New Zealand subantarctic, blackbirds are well established on the Snares and Campbell Islands, and there have been at least eight records from Antipodes Island (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002; CMM unpubl. data).

Song thrush *Turdus philomelos*

127 records: Ak 48, Ew 4, Ro 9, En 55, Mn 1, Ad 7, Oc 1, Dn 1, Ds 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. First recorded

at Musgrave Peninsula, Carnley Harbour, 12 Apr 1942 (GA in McEwen 2006), and one was in full song at Ranui Cove lookout (Port Ross) on 22 Oct 1942 (CF in McEwen 2006). The first records on other islands were: Ewing Island on 28 Feb 1943, Rose Island on 25 Jul 1943, and Enderby Island on 19 Aug 1943 (all RAF). Monumental Island on 18 Jan 1973 (RR, BDB, RN, MS), Adams Island on 15 Feb 1985 (RT), Ocean Island on 30 Nov 1989 (Moore & McClelland 1990), Dundas Island on 24 Jun 1998 (AT), and Disappointment Island on 17 Jan 2018 (CMM).

Song thrush had the lowest reporting rate among the five resident adventive passerine species (Fig. 22); however, the total number of records was skewed by the high observer presence on Enderby Island. Three nests have been found: a clutch of four fresh eggs on Enderby Island on 13 Oct 1943 (LHP), young just leaving the nest at Ranui Cove on 17 Dec 1943 (RAF), and a nest with four eggs in *Myrsine divaricata* 1 m from the ground on Rose Island on 11 Jan 1963 (BDB). An egg was found freshly laid on the track at Tagua Bay on 29 Nov 1944 (EGT), and an adult was gathering nest material on Rose Island during 7–10 Nov 1954 (KW, RT). Song thrush fledglings were reported on Rose Island on 11 & 12 Jan 1963 (BDB) and 16 Feb 1973 (RT), and on Enderby Island on 27 Jan 2017 (RF).

A small song thrush population established on the Snares Islands, and there are many records from Campbell Island and at least four from Antipodes Island (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002; CMM unpubl. data).

Common starling *Sturnus vulgaris*

160 records: Ew 13, Ak 16, Frn 5, En 84, Oc 10, PR 1, Ro 18, Mn 2, Ds 7, Ad 2, Dn 1, CH 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. First recorded on Auckland Island (Ranui Cove) from Mar 1942 (CF), and subsequently from Ewing Island in Jul 1942 (CF in McEwen 2006), Frenchs Island on 5 Mar 1943, Enderby Island on 19 Aug 1943, Ocean Island on 11 Oct 1943, and Rose Island on 23 Oct 1943 (all records RAF), Disappointment Island on 18 Jan 1993 (Walker *et al.* 2020 – Chapter 5), and Dundas Island on 24 Jun 1998 (AT). The first record from the south of the group was from Monumental Island in Nov–Dec

1989 (Buckingham *et al.* 1991), followed by Adams Island in Dec 1996 (MJW), and South West Cape on 16 Dec 2005 (HEX). There have been no records from Tagua Bay or Musgrave Peninsula.

Records of flocks of 50 or more were all from Port Ross islands: Enderby Island during 16–19 Mar 1954 (c. 100 & c. 200; PB, RT, DD) and on 28 Dec 1972 (50–60; KJW, BDB, MFS), 7 Jan 1973 (50+; KJW), and 22 Feb 1973 (c. 350; RT); Rose Island on 12 Jan 1963 (c. 200; BDB) and 16 Feb 1973 (50+; RT); and Dundas Island on 24 Jun 1998 (c. 50; AT). Starlings are recorded on about 40% of visits to Enderby, Rose, and Ewing Islands (Fig. 22).

No nest contents have been described, but eggs were found on the ground on Ocean Island on 14 Nov 1943 and Enderby Island on 28 Nov 1943 (RAF). Starlings were reported nesting in cliff faces at Crozier Point, Auckland Island, on 23 Oct 1942 (CF, GL *in* McEwen 2006), on Ocean Island on 2 Jan 1963, and on Ewing Island Dec 1962–Jan 1963 (BDB). Juveniles were noted in flocks on Enderby Island on 6 Feb 1944 (JS, RAF, WI, GP).

Starlings are established on the Snares, Antipodes, and Campbell Islands, and single birds have reached the Bounty Islands on at least five occasions (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002; CMM *unpubl. data*).

Auckland Island pipit *Anthus novaeseelandiae aucklandicus*

633 records: AIs 5, Ak 157, Fri 3, Ew 31, En 225, PR 6, Ro 25, Ad 89, Sh 1, Ds 19, Oc 43, F8 6, CH 5, Frn 12, OI 1, Dn 2, Mn 2, AS 1. Pipits are common and widespread throughout the Auckland Islands, and were reported during 40–97% of recent landings on the seven largest islands (Figs 20 & 23). Abraham Bristow was probably referring to pipits when he listed 'lark' among the birds encountered at the Auckland Islands in 1807 (Miskelly & Taylor 2020 – Chapter 1). They were recorded on Friday, Ewing, and Enderby Islands on 29–30 Nov 1840 (RM), and Rose Island on 21 Jan 1875 (Krone 1900). Reischek (1889a) recorded pipits on Adams Island on 26 Jan 1888, but the first unambiguous report from the main island was not until 18 Mar 1904 (on Mt Eden; Wilson 1966). Pipits were first reported on Shoe Island on 23 Mar 1904 (Wilson 1966), Disappointment Island on 28 Nov 1907 (Waite 1909), Ocean Island on 5 Mar 1942, Figure of Eight Island on 11 May 1942, and Frenchs Island on 1 Nov 1942 (all CF *in* McEwen 2006). Two pipits were seen on the Sugar-Loaf Rocks (east of Disappointment Island) on 6 Jan 1973 (RR, RN, GvT), there was one on Dundas Island on 21 Jan

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FIGURE 23. Auckland Island pipit, Enderby Island, January 2016. Image: Tony Whitehead.

1978 (Falla *et al.* 1979), and pipits were present on Monumental Island on 17 Jan 2015 (PS in eBird).

Pipits are dispersed as territorial pairs and family groups over summer, but may form winter flocks, e.g. up to 20 on the coast of North Arm, Carnley Harbour, 27 Aug 1942 (CF, GA in McEwen 2006). This may also explain Musgrave's (1865: 71) description of '*a small bird which appears to be an annual visitor ... here about same time both last year and the present one. They come in immense flocks, fly rather high, and in waves. They are evidently a seed bird of the sparrow species, and very much resemble a wild canary, both in color and size. They only remained here a few days* [c. 3 Apr 1865]'. This was long before any introduced finch species could have reached the Auckland Islands (G.M. Thomson 1922). There are few other reports of flocks of pipits; however, several observers have counted or estimated more than 100 birds seen in a day on Enderby Island, including c. 200 at Derry Castle Reef on 11 Mar 1982 (P. Thomson 1986), c. 150 in Feb 1988 (GAT), 100 on 1 Feb 1994, and 300 on 23 Nov 2003 (HEX). Other sites where pipits have been described as abundant or plentiful include Ranui Cove on 5 Mar 1942 (CF), the spur north of Tagua Bay (towards Wilkes Peak, Auckland Island) on 5 Dec 1942 (CF in McEwen 2006), Ocean Island on 9 Nov 1954 and 28 Dec 1962 (RAF, BDB), Bollons Bay, Adams Island, on 19 Jan 1973 (Atkinson 2001), between Lake Turbott and Fly Harbour, Adams Island, on 11 Feb 1973 (RR, CR), Rose Island, on 16 Feb 1973, 19 Jan 1978, and in Nov 1996 (RT, MJW), Camp Cove to Fleming Plateau, Auckland Island, on 20 Feb 1973 (RR, CC), Disappointment Island on 11 Dec 1976 (Bartle & Paulin 1986), and Lake Turbott ridge, Adams Island on 9 Feb 1994 (PJD, PP, AC, RdH).

At least 69 pipit nests have been found on the Auckland Islands since 1891: 22 on Ocean Island, 14 on Rose Island, 10 on Adams Island, 8 on Enderby Island, 5 on Ewing Island, 4 on Auckland Island, 4 on Frenchs Island, and 2 on Disappointment Island. Nest sites were mainly in or under tussock, often in rock crevices sheltered by tussock blades. Other sites included in *Carex*, behind *Asplenium* fern under tussock, between fern and a low bank, under rock, in holes in the base of tussocks, under a 20 cm high mat of *Myrsine divaricata*, and among tussock and *Coprosma*. Nests were deep cups lined

with fine tussock blades. Eggs were recorded between 15 Sep (1943, Ocean Island; RAF, LHP) and 24 Jan (2018, Ocean Island; CMM), and nestlings between 11 Oct (1942, newly hatched, Ocean Island; McEwen 2006) and 3 Mar (2004, two half-downy chicks, Adams Island, albatross study area; JK, JAr). Nest contents included: 6 × 1 egg, 23 × 2 eggs, 3 × 3 eggs, 3 × 1 egg + 1 chick, 1 × 1 chick, 17 × 2 chicks, and 5 × 3 chicks. Five eggs measured in the field were 23.8 × 17.4 mm & 23.6 × 17.5 mm (Enderby Island, 1 Jan 1973; BDB), 25.3 × 17.2 mm (Derry Castle Reef, Enderby Island, 14 Jan 1973; BDB), and 25.1 × 17.6 mm & 24.6 × 17.8 mm (Rose Island, 22–28 Nov 1996; MJW). The earliest fledglings noted out of the nest were on Ewing Island, 8 Nov 1989 (Moore & McClelland 1990), and the latest date that adults were reported feeding a dependent fledgling was on Rose Island, 14 Feb 1988 (GAT). However, chick care must continue throughout March at least based on the dates that chicks were observed in nests.

Pipits are primarily insectivorous, but one was photographed carrying a large intertidal amphipod on the shore line of Ewing Island on 20 Jan 2018 (AT).

The Auckland Island subspecies of pipit also occurs on islands in the Campbell Island group. It was confined to offshore stacks before Norway rats (*Rattus norvegicus*) were eradicated from Campbell Island in 2001, but rapidly recolonised the main island soon after the eradication (Thompson *et al.* 2005). A separate subspecies of pipit is endemic to the Antipodes Islands (Warham & Bell 1979). There have been no reports of pipits on the Snares Islands since 1907 (Miskelly *et al.* 2001).

Dunnock *Prunella modularis*

118 records: Ak 25, En 40, Ew 11, Ad 12, Ro 8, Frn 2, Oc 4, Ds 9, Dn 4, Fri 2, Mn 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. First record at Ranui Cove on 24 May 1947 (JS). The first records on other islands were: Enderby Island on 31 Dec 1962 and Ewing Island on 1 Jan 1963 (BDB), Adams Island on 22 Jan 1966 (JLK), Rose Island on 27 Jan 1966 (RT), Frenchs Island on 5 Dec 1972 (RR), Ocean Island on 8 Dec 1972 (RR, MFS, BDB), Disappointment Island on 6 Jan 1973 (RR, MFS, BDB, RN), Dundas Island on

25 Jan 1973 (Falla *et al.* 1979), Friday Island on 7 Feb 1973 (RT, BDB, RN), and Monumental Island during Nov–Dec 1989 (Buckingham *et al.* 1991).

Dunnocks are a scarce component of bird communities on the Auckland Islands. The highest reporting rate is from Disappointment Island (54%; Fig. 22) in the absence of bellbirds and tomtits. They are apparently affected by competition or aggression by bellbirds, as the reporting rate from Adams Island (in the presence of a very dense bellbird population in *rātā* forest) is 3% only. No nests have been found, but fledglings or juveniles were noted on Friday Island on 7 Feb 1973 (RT, BDB, RN), Rose Island on 16 & 17 Feb 1973 (RT), and Adams Island (in herb-fields) on 15, 20, & 29 Dec 2015 (KRH, GCP).

Dunnocks are rare vagrants to the Snares Islands, but have established populations on Antipodes Island and Campbell Island (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002).

Common redpoll *Carduelis flammea*

325 records: Ak 113, Ad 21, En 145, Ro 11, PR 4, Oc 5, Ds 17, F8 1, Ew 1, AIs 2, CH 4, AS 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. First reported at Musgrave Peninsula, Carnley Harbour, on 23 Mar 1942 (minimum three birds; CF in McEwen 2006), and subsequently at Fairchild's Garden, Adams Island, on 15 Sep 1942, Enderby Island on 26 Sep 1942, Lindley Point (Port Ross) on 28 Sep 1942, and Rose Island on 3 Oct 1942 (all records CF in McEwen 2006), Ocean Island on 30 May 1943 (RAF), Disappointment Island on 9 Dec 1944 (Turbott 2002), Figure of Eight Island on 19 Feb 1945 (HW), and Ewing Island during Nov 1989 (Moore & McClelland 1990).

Charles Fleming was a member of the second year of Cape Expedition coastwatchers, and recorded redpolls within 18 days of arrival at the Auckland Islands in Mar 1942 (McEwen 2006). There were no ornithologists among the first (1941) contingent of coastwatchers. The widespread reports of redpolls throughout 1942 indicate that either redpolls had colonised the Auckland Islands before the 1940s or that there was a major influx that year. Hugh Wenham recorded large flocks in 1945, including 50–70 feeding in tussock on Mt Granger (a 570 m peak north-east of Mt Easton) on 20 Apr, and flocks of c. 70 between Mt Easton and

Mt Granger on 23 Apr. These remain the largest recorded flocks; however, many observers have used imprecise terms such as 'numerous' or 'very numerous' or have scored redpoll abundance as 10+ or 10–100 birds.

Redpolls occur throughout the group, and are reported most frequently on Enderby Island (79% of full bird lists) and Disappointment Island (69%; Fig. 22). The single report from Ewing Island was not part of a full bird list, and so could not be included in Fig. 22.

Five redpoll nests have been reported from the Auckland Islands. A nest with five recently hatched young was found near the Ranui Cove lookout on 16 Jan 1943, and the young fledged on 27 Jan (RAF). Three nests found in Castaways Bay, Disappointment Island, on 17 & 20 Jan 1993 were in twigs and foliage at the top of *Veronica elliptica* shrubs 1.0–1.5 m off the ground, and contained three recently hatched chicks, three chicks $\frac{3}{4}$ grown, and four chicks close to fledging. The largest four chicks fledged on 24 Jan, revealing an unhatched egg (GPE, KW). A nest containing five eggs was found in a *rātā* at Ranui Cove on 19 Jan 1994 (HEX).

Redpolls are also well established on the Snares, Antipodes, and Campbell Islands (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002).

Population estimates

We recognise 41 bird species as currently having breeding populations on the Auckland Islands. Of these, 11 species only have had their population sizes estimated using repeatable survey methodologies (Table 2). Note that for four species, the estimates excluded one or more known breeding sites within the archipelago, and so should be considered incomplete (Table 2). Further to these species, Bell (1975) estimated c. 5,000 pairs of light-mantled sooty albatrosses for the group, and Robertson & Bell (1984) provided 'order of magnitude' estimates for Antarctic prion (100,000 to 1 million pairs), and lesser fulmar prion (1,000 to 5,000 pairs). However, Tennyson & Bartle (2005) suggested that there were probably fewer than 1,000 pairs of fulmar prions present. The few species with repeatable population estimates are predominantly large surface-nesting seabirds (Table 2).

TABLE 2. Population estimates for eleven Auckland Islands bird taxa.

Taxon	Estimate	Year(s)	Comment	References
Auckland Island teal	>1,000 birds	1991–92		Williams 2013
Yellow-eyed penguin	512 pairs	2012–17	Excludes sites that birds access from the west coast	Muller <i>et al.</i> 2020 – Chapter 9
Gibson’s wandering albatross	4,829 pairs	2018	Adams I. only; c. 5% of the population breeds on other islands	Elliott <i>et al.</i> 2018
Southern royal albatross	84 pairs	1989 & 2013	54 pairs Enderby I. 2013	Buckingham <i>et al.</i> 1991; G.B. Baker & Jensz 2013
White-capped mollymawk	91,117 pairs	2016–17		G.B. Baker <i>et al.</i> 2018
Northern giant petrel	340 pairs	2015–16		Parker <i>et al.</i> 2020 – Chapter 13
Cape petrel	200 pairs	1972–73		Bell 1975
White-headed petrel	>300,000 pairs	2018		Miskelly, Gilad <i>et al.</i> 2019
White-chinned petrel	184,000 pairs	2015		Rexer-Huber, Thompson <i>et al.</i> 2020 – Chapter 15
Auckland Island shag	1,889 pairs	2011–12	Enderby I. only	Chilvers <i>et al.</i> 2015
Auckland Island banded dotterel	730 birds	1989		Walker <i>et al.</i> 1991

Migrant and vagrant species, and failed colonists

Summary statistics for each locality are based on the presumed number of arrival events at that site, rather than the total number of records (where multiple records over a short time period may refer to the same individual or flock).

Black swan *Cygnus atratus*

PR 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. One in Port Ross, 4 Jan 1901 (JB, FH). The only record from the New Zealand subantarctic islands.

Canada goose *Branta canadensis*

En 1, CH 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. One on Enderby Island 14 Nov 1989 to 12 Jan 1990 (McClelland & Moore 1991; MC), and 12 in Carnley Harbour on 22 Nov 2014 (SK). There is one record of a single bird from the Snares Islands, and one from Campbell Island in 2011 (Miskelly *et al.* 2001; Kyle Morrison, *pers. comm.* to CMM).

Chestnut-breasted shelduck *Tadorna tadornoides*

En 9. All records from Enderby Island. One on 3 Apr 1983, with two the following day (Cawthorn 1986a). Two at Derry Castle Reef on 18 Dec 1984, and one on Teal Lake 2 days later (MC). Three at Derry Castle Reef in Dec 1985 (MC in Heather 1987). Eight on 15 Dec 1990 (DL in eBird) and one at Derry Castle Reef on 15 Jan 1991 (MC). One on 4 Dec 1994, 9 & 14 Jan 2007, and 24 Dec 2012 (HEX), with one at Derry Castle Reef on 25 Jan 2013 (sea lion team). Thirteen photographed on 12 Nov 2014 (JH in eBird; NKH), with two in late-Nov (LT, KS), and at least one on 14 Dec 2014 (HEX). A female photographed on Skua Lake 30 Nov 2015 was still present on 10 Dec 2015 (CGM, BM). See also paradise shelduck (*T. variegata*) under unverified records.

Chestnut-breasted shelducks have also reached the Snares and Campbell Islands on one occasion each, with up to 22 birds on Campbell Island in 1984–85 (Heather 1987; Miskelly *et al.* 2001).

Blue duck***Hymenolaimus malacorhynchos***

In 1. A flock of five in Hanfield Inlet, Auckland Island, in Feb 1883 was reported by Captain John Bollons ('a keen and careful observer'; Waite 1909). The only record from the New Zealand subantarctic islands of this New Zealand endemic species.

Grey teal *Anas gracilis*

EN 1. Sixteen birds on Enderby Island on 3 Nov 2011 (SG), still present on 21 Nov (HEX), and seven still present on 26 Jan 2012 (JSM). One record (two birds each) from each of Snares Islands (Miskelly *et al.* 2001) and Campbell Island (Tucker Cove, Oct 2012; Kyle Morrison *pers. comm.* to CMM).

Australasian shoveler***Anas rhynchos***

Ak 1, En 2. A drake at Ranui Cove, Auckland Island, on 10–11 Oct 1943 (RAF), one on Skua Lake, Enderby Island, on 7–8 Mar 2003 (NG, NM), five on Enderby Island on 5 Dec 2015 (HEX), and one there on 17 Dec 2015 (BM). Falla (1965) and Turbott (2002) reported shoveler as breeding on the Auckland Islands; however, we found no supporting records of this. There is one record from the Snares Islands (Miskelly *et al.* 2001).

King penguin***Aptenodytes patagonicus***

9 records: En 5, Ad 3, PR 1. One at Sandy Bay, Enderby Island, on 25 & 26 Dec 1972, and 14 Jan 1973 (KJW, BDB; Soper 1976; Atkinson 2001). Subsequent Enderby Island records in Jan & Feb 1984 (Cawthorn 1986b), 18 Feb 2001 (sea lion team), and 5, 8, & 11 Jan, and 10 Feb 2006 (HEX; AM, KG, MS). One at Fairchild's Garden, Adams Island, on 2 & 10 Feb 1973 (RR, CR), with one at Maclaren Bay, Adams Island, on 25–26 Jun 2001 and 9 Jan 2006 (found dead on 11 Jan 2006; both records KW & GPE). One in Port Ross on 21 Jan 2010 (JW in Miskelly *et al.* 2013). One mandible found in dunes at Sandy Bay (Tennyson 2020 – Chapter 7).

King penguins commonly reach Campbell Island, with two records from the Snares Islands and five records from Antipodes Island (Bailey & Sorensen 1962; Warham & Bell 1979; Miskelly *et al.* 2001, 2013).

Chinstrap penguin***Pygoscelis antarctica***

En 1. One ashore at Sandy Bay, Enderby Island on 7 Jan 1985 (MC). One record from each of Campbell and Antipodes Islands (Fennell 1986; Tennyson *et al.* 2002).

Fiordland crested penguin***Eudyptes pachyrhynchus***

3 records: Ro 1, CH 1, En 1. One collected on Rose Island 1874–75 (Senckenburg Museum C_5740; Miskelly & Taylor 2020 – Chapter 1). One at western entrance to Carnley Harbour on 7 May 1943 (RAF, AP), and one on Enderby Island on 31 Jan 1999 (HEX). One reported on Enderby Island on 6 Feb 1944 (Bailey & Sorensen 1962) was identified at the time as an erect-crested penguin (RAF). Fiordland crested penguins regularly moult at the Snares Islands, and there are three records from Campbell Island (Bailey & Sorensen 1962; Kinsky 1969; Marchant & Higgins 1990; Miskelly *et al.* 2001).

Snares crested penguin***Eudyptes robustus***

9 records: En 5, CH 2, Ad 1, In 1. Recorded from Enderby Island on 24 Feb 2000, 30 Jan & 24 Feb 2002, 9 Feb 2013, and 22 Feb 2017 (HEX; Blundell 2017). One at Western Arm, Carnley Harbour, 1 & 11 Dec 2008 (PS in eBird; Miskelly *et al.* 2013); one at Maclaren Bay, Adams Island, 18 & 19 Feb 2010 (KW, GPE); one among eastern rockhopper penguins at Musgrave Inlet, 24 Dec 2011 (HEX); one at Western Harbour (Carnley Harbour) near Breaksea Point, 4 Feb 2013 (DH). Snares crested penguins breed only on the Snares Islands, 270 km north of the Auckland Islands. They have been recorded at least seven times at Antipodes Island, and twice at Campbell Island (Warham & Bell 1979; Marchant & Higgins 1990; Miskelly *et al.* 2013).

Erect-crested penguin***Eudyptes sclateri***

39 records: PR 1, AIs 1, Ad 1, En 19, Ak 5, Ew 3, Ds 9. The first record was a specimen collected in Port Ross by the German Transit of Venus Expedition in 1874–75 (Miskelly & Taylor 2020 – Chapter 1). The type specimen was supposedly captured at the Auckland Islands and was seen alive by Walter Buller in the 'Fish-house' in Regent's Park,

London; Buller (1888) described it after its death. Given the scarcity of erect-crested penguins at the Auckland Islands, and the wholesale method used by the crew of the *Stella* to capture penguins 'for museum purposes', it is more likely that this bird was captured at Antipodes Island, where the crew '[exchanged] some of our live-stock, by taking on board fresh penguins and letting others go that we had taken from the Snares' (Reischek 1889a), with the wrong locality recorded.

The only record from Adams Island was a bird found dead in Apr 1943 (WD), and the only other coastwatcher-era record was two yearlings moulting on Enderby Island on 6 Feb 1944 (RAF, GP, JS, WI; Canterbury Museum specimens AV3286 & AV22015.1). Moulting birds were observed on Enderby and Ewing Islands, and at Breaksea Point, Matheson Bay, and Webling Bay on the main island in Jan & Feb 1973 (RR, BDB, RN, CR, CC). One or two pairs were reported to be breeding among eastern rockhopper penguins on Disappointment Island on 15 Feb 1973 (four adults & two chicks; CR), a bird on eggs was seen there on 11 Dec 1976 (Bartle & Paulin 1986), and an adult was seen with two downy chicks presumed to have been this species on 20 Jan 1993 (CR; Walker *et al.* 2020 – Chapter 5).

However, all these records must be considered doubtful due to the timing of the observations compared with the expected earlier breeding chronology of erect-crested penguins cf. rockhopper penguins based on Antipodes Island data (Warham 1972a, b), and the rarity with which erect-crested penguins retain two eggs during incubation (authors, *pers. obs.*); it is possible that all these reports were of non-breeding erect-crested penguins associating with, or temporarily adopting, rockhopper penguin nests and chicks (Graeme Taylor, *pers. comm.* to CMM, 7 Aug 2019).

Most subsequent sightings of erect-crested penguins at the Auckland Islands have been of single birds moulting in Jan or Feb, with 14 of these records from Enderby Island. Five were moulting on Disappointment Island on 8 Feb 1988 (GAT). Single birds were seen in rockhopper penguin colonies at Chambres Inlet (north head) on 12 Feb 2000 (sea lion team) and at Musgrave Inlet on 15 Jan 2018 (RF, CGM). Elsewhere, erect-crested penguins breed in large numbers on the Antipodes and Bounty Islands (Miskelly 2013).

Royal penguin *Eudyptes schlegeli*

Ak 1. An immature was moulting at Breaksea Point, Western Harbour, on 9 Feb 1993 (BDB, HEx). Royal penguins breed only on Macquarie Island, 620 km south-west of the Auckland Islands. There are numerous records from Campbell Island, three from the Snares Islands, and one from Antipodes Island (Bailey & Sorensen 1962; Miskelly *et al.* 2001, 2013; Miskelly, Crossland *et al.* 2017).

Northern royal albatross *Diomedea sanfordi*

26 records: AS 18, En 6, CH 2. Early accounts did not differentiate the two royal albatross species. The earliest account that refers specifically to northern royal albatross was Robertson & Jenkins (1986), who saw ten to the north and east of the Auckland Islands on 8 & 13 May 1981. A northern royal albatross flew over Enderby Island on 7 Jan 1982 (PD), and one was standing at an empty nest site there during 6–16 Feb 1988 (GAT). At least one mixed pair (northern × southern royal albatross) bred on Enderby Island during 1992–93 (Gales 1993), with subsequent sightings of a northern royal albatross in flight there on 8 Dec 1998 and on the ground 3 days later (SC, LP). One was reported at the west end of Sandy Bay on 22 Jan 2010 (JW in eBird).

Northern royal albatrosses were recorded in Carnley Harbour on 29 Nov 1996 (HEx) and 24 Nov 2001 (2 birds, ACW in eBird), east of Auckland Island on 26 Nov 2000, 25 Feb 2002, and 23 Nov 2017 (HEx), south of Adams Island on 24 Nov 2001 (4 birds, ACW in eBird), 25 Nov 2001, 1 Dec 2008, 15 Jan 2009, 15 Dec 2014, 17 Dec 2017 and 14 Jan 2018 (all records HEx), north of Enderby Island on 6 Jan 2006 (CMM), 14 Jan 2009 (HEx), and 14 & 16 Jan 2018 (AT, CMM), offshore from Enderby Island on 25 Dec 2015 (HEx), and near the Auckland Islands on 26 Dec 2015 and 7 Jan 2017 (HEx; FR in eBird).

Northern royal albatrosses breed mainly on the Chatham Islands (Sisters and Forty Fours Islands), with about 30 pairs per year breeding at Taiaroa Head, Otago Peninsula (Aikman & Miskelly 2004; Sugishita 2017). They have been recorded offshore from the Snares and Antipodes Islands (Warham & Bell 1979; Miskelly *et al.* 2001).

Grey-headed mollymawk *Thalassarche chrysostoma*

28 records: AS 25, CH 3. Twenty reported north and east of Auckland Islands on 8 & 13 May 1981 (Robertson & Jenkins 1986). All subsequent reports were of 1–2 birds or the numbers were not given: north of Enderby Island on 16 Feb 1997, 25 Nov 2007, 17 Nov 2013, 18 Nov 2015 (2 birds), 31 Jan 2016, and 6 Mar 2018 (all HEx); Carnley Harbour on 28 Feb 1999 (HEx) and 24 & 25 Nov 2001 (ACW & NMC in eBird); south of Adams Island on 25 Nov 2001, 13 Nov & 1 Dec 2008, 13 Feb 2009, 16 Jan, 14 Feb & 4 Nov (2 birds) 2011, 26 Dec 2012 (2 birds), 18 Nov 2013 (2 birds), and 21 Nov 2016 (all HEx); south-east of Adams Island on 26 Jan 2008 and 8 Jan 2011 (HEx); east of Auckland Islands on 3 Jan 2010, 25 Dec 2013, 19 Nov 2015, and 19 Dec 2016 (all HEx); south-west of Adams Island on 13 Nov 2014 (JH); and two off Auckland Islands on 17 Nov 2017 (PN in eBird).

Within the New Zealand region, grey-headed mollymawks breed on Campbell Island (about 6,600 pairs; Moore 2004), with at least one pair on Bollons Island, Antipodes Islands (GPE, *pers. obs.*).

Black-browed mollymawk *Thalassarche melanophris*

Many observers did not distinguish between the two species of black-browed mollymawk (*T. melanophris* and *T. impavida*). The following summaries exclude 23 records that could refer to either taxon.

AS 40. First recorded 29 Nov 1999. All records Nov–Mar, and all records HEx. Ten records north of or off Enderby Island, 12 south of Adams Island, four south-east of Adams Island, ten east of Auckland Island, and four records with location not specified. Most records were of single birds (or numbers not recorded), with two birds south of Adams Island on 24 Nov 2003, and south or east of the islands on 19 Nov 2015.

Within the New Zealand region, black-browed mollymawks breed in low numbers on the Antipodes, Campbell, and Snares Islands (Moore *et al.* 1997; Tennyson *et al.* 1998; Miskelly *et al.* 2001).

Campbell Island mollymawk *Thalassarche impavida*

63 records: AIs 1, AS 59, CH 2, PR 1. A specimen was collected at the Auckland Islands in 1895 (Falla 1937;

Canterbury Museum AV1219). Reported regularly since 1999 (all records Nov–Mar), typically 1–2 birds. Larger numbers reported south of Adams Island on 1 Dec 2008 ('10–100' birds), 13 Nov 2010 (5 birds), 4 Nov 2011 (6 birds), and 18 Dec 2012 (6 birds) (all HEx).

Campbell Island mollymawks breed only on Campbell Island (about 21,000 pairs; Moore 2004), but have been seen around the Snares and Antipodes Islands (Warham & Bell 1979; Miskelly *et al.* 2001).

Buller's mollymawk *Thalassarche bulleri*

109 records: AS 54, CH 49, PR 5, Ad 1. First recorded outside the eastern entrance to Carnley Harbour on 9 Mar 1942 (CF in McEwen 2006). Mainly a winter visitor, with 64 of the 109 sightings recorded during the coastwatcher era (mainly May–Oct), when observers were present year-round. All counts of four or more birds were also during these winter months, apart from 'many' east of Auckland Island on 4 Feb 1944 (JS, RAF), and 100 around fishing boats north and east of Auckland Islands on 2 Mar 1981 (Robertson & Jenkins 1986). The highest count was 310 around fishing boats north and east of Auckland Islands on 8 & 13 May 1981 (Robertson & Jenkins 1986). Many records are imprecise, including 'abundant' (Carnley Harbour, 30 May & 1 Jul 1942; CF), 'numerous' (east of Auckland Island, 10 Jul 1943; RAF), and 'many' (Carnley Harbour on 6, 7, & 13 Jun, and 10 & 11 Aug 1942, CF & GA in McEwen 2006; and 19 Jun 1943, LHP). The Carnley Harbour records were overwhelmingly during the war years (45 out of 49 records). While summer records are few (and typically of 1–2 birds), Buller's mollymawks have been recorded at the Auckland Islands in every calendar month. Their nearest breeding ground is at the Snares Islands, 270 km to the north.

Salvin's mollymawk *Thalassarche salvini*

30 records: PR 2, AS 28. Two in Port Ross, 28 Dec 1972 (KJW, BDB, MFS), and three there on 9 Feb 2017 (JG in eBird). All remaining records mainly of single birds offshore (or numbers not given): offshore from or north of Enderby Island May–Jun 1986 (MC), plus eight records during Nov–Mar, 1996–2018 (HEx, AT, CMM); eight records east

of Auckland Island during Dec–Jan, 2002–2018 (all HEx); and 11 records south of Adams Island during Nov–Feb, 2005–2018 (all HEx). Salvin's mollymawks breed on the Bounty Islands and the Western Chain, Snares Islands, 980 km and 270 km away, respectively (Robertson & van Tets 1982; Miskelly 1984).

Southern giant petrel *Macronectes giganteus*

42 records: AS 21, Ro 1, CH 3, Dn 3, En 12, Ad 2. The distinction between the two giant petrel species was not published until 1966 (Bourne & Warham 1966), and so many early reports of giant petrels at the Auckland Islands could refer to either or both species. The earliest certain record of a southern giant petrel was a white morph bird shot by the crew of the *Ranui* off Cape Bennett (south-east Auckland Island) on 26 Jul 1942 (McEwen 2006). White morph birds have been recorded on seven subsequent occasions, with two white birds together on two occasions. All records of southern giant petrels have been of 1–2 birds (or their numbers were not recorded), apart from five together (two white morph and three dark morph) with about 30 northern giant petrels at Fairchild's Garden, Adams Island, on 11 May 1981 (Robertson & Jenkins 1986).

Other notable records of birds ashore include one 'possibly nesting' on Dundas Island on 20–22 Jan 2012 (sea lion team), and one that was regularly seen beside a nest in the albatross study area on Adams Island in Jan 2017 (KRH, GCP). Southern giant petrels regularly occur as far north as New Zealand coastal waters; the closest breeding ground to the Auckland Islands is at Macquarie Island, 620 km to the south-west. A bird banded as a chick on Macquarie Island on 22 Feb 2004 was recovered dead on Enderby Island on 15 Jan 2007 (Michelle Bradshaw *pers. comm.* to CMM, 17 Jul 2019).

Antarctic fulmar *Fulmarus glacialisoides*

12 records: AS 10, CH 2. Offshore or near Enderby Island on 28 Nov 1996, 24 Nov 2001, and 18 Nov 2009 (HEx; KR *in eBird*); Carnley Harbour on 29 Nov 1996 and 25 Nov 2001 (HEx; NMC *in eBird*); south of Adams Island on 24 & 25 Nov 2001, 24 Nov 2003, 1 Dec 2008, and 4 Nov 2011 (ACW *in eBird*;

HEx); east of Auckland Island on 17 Nov 2009 and 20 Dec 2013 (HEx). There have been several sightings of this Antarctic breeding species around the Snares Islands (Miskelly *et al.* 2001).

Antarctic petrel *Thalassoica antarctica*

AS 1, Ew 1. One unverified report of a bird south of Adams Island on 4 Nov 2011 (HEx), and a humerus found on the south coast of Ewing Island on 31 Jan 2018 (AT). Elsewhere in the New Zealand subantarctic there has been one record of this Antarctic breeding species at the Snares Islands (Miskelly *et al.* 2001).

Kerguelen petrel *Lugensa brevirostris*

En 1. Remains in dune deposits at Sandy Bay, Enderby Island (Tennyson 2020 – Chapter 7). The only record from the New Zealand subantarctic islands.

Chatham Island taiko (Magenta petrel) *Pterodroma magentae*

En 1. Remains in dune deposits at Sandy Bay, Enderby Island (Tennyson 2020 – Chapter 7). The only record from the New Zealand subantarctic islands.

Soft-plumaged petrel *Pterodroma mollis*

AS 16. South-east of Adams Island on 27 Nov 2000 and 31 Dec 2011 (HEx); two south of Adams Island on 24 Nov 2001 (ACW *in eBird*), with subsequent records from there on 25 Nov 2001, 8 Dec 2007, 5 Jan 2008, 1 Dec 2008, 12 Jan 2010, 16 Jan 2011, 14 Feb 2011, 10 Feb 2013, 3 Jan 2014, 21 Nov 2016, and 19 Dec 2016 (HEx). One north of Enderby Island on 25 Jan 2006 (GAT), with three there on 17 Nov 2009, and recorded east of Auckland Island on 19 Dec 2016 (both HEx). Within the New Zealand region, soft-plumaged petrels breed only on Antipodes Island, 900 km east of the Auckland Islands (Imber 1983).

Mottled petrel *Pterodroma inexpectata*

57 records: AIs 1, AS 52, Ak 1, En 2, Oc 1. Buller (1891) exhibited two mottled petrels from the Auckland Islands, leading to the assumption that they bred in the group (Oliver 1955). The next report was of six seen off the east coast of Auckland Island

on 8 Mar 1942 (CF), and one was found in a skua midden at Tucker Point (west of Ranui Cove) on 22 Jan 1944 (Turbott 2002). A decayed corpse was found on Ocean Island on 24 Jan 2018 (NKA, AT). Mottled petrels have been reported regularly in low numbers at sea around the Auckland Islands since 1991, with three additional reports of six birds each seen (all south of Adams Island, on 24 Nov 2003, 4 Nov 2011, and 18 Nov 2013; HEx), and one report of '10–100' south of Adams Island on 13 Nov 2008 (HEx). Their nearest breeding site is at the Snares Islands, 270 km to the north.

Cook's petrel *Pterodroma cookii*

AS 2. Two south of Adams Island, 8 Nov 2007 (HEx); north of Enderby Island, 25 Dec 2011 (HEx). These are the only records from the New Zealand sub-antarctic islands. Their nearest breeding colony is on Whenua Hou/Codfish Island, 435 km to the north-northeast. Cook's petrels from Whenua Hou forage mainly in the southern Tasman Sea; however, tracking of ten breeding adults over 14 days (105 validated locations) revealed some birds ranging to seas south of the Snares Islands (Rayner *et al.* 2008).

Blue petrel *Halobaena caerulea*

Als 1, En 2, AS 1. Specimen collected by WB [c. 1885–95], Canterbury Museum AV.3206 (Dell 1952). South of Adams Island, 20 Nov 2006 (HEx). Six recorded from skua middens on Enderby Island in Jan 2018 (Table 1), plus older remains in dune deposits (Tennyson 2020 – Chapter 7). The nearest breeding ground to the Auckland Islands is at Macquarie Island, 620 km to the south-west. Six skulls were recovered from skua middens on the Snares Islands, and a wing in a midden on Antipodes Island (Miskelly *et al.* 2001; Tennyson *et al.* 2002).

Broad-billed prion *Pachyptila vittata*

En 3, AS 6, Ro 1. Three killed by skuas on Enderby Island, 18 Jan 1964 (one; EWD) and 26–28 Jan 2018 (two; AT); one in a skua midden on Rose Island, 23 Jan 2018 (Table 1); and remains in dune deposits on Enderby found in 1998 (Tennyson 2020 – Chapter 7). Remaining records of birds at sea: south of Adams Island, 15 Jan 2007 & 8 Dec 2016; east of Auckland Island, 6 Dec 2013; east or south of Auckland Islands, 19 Nov 2015 (two birds) and

26 Dec 2015; offshore from Enderby Island, 18 Dec 2016 (all records HEx). Their nearest breeding ground is at the Snares Islands, 270 km to the north.

Fairy prion *Pachyptila turtur*

Ak 1, [?AS 55, ?En 2, ?PR 1]. There are numerous reports of fairy prions being seen in waters around the Auckland Islands, mostly from Heritage Expedition reports. In the absence of specimens or images, it is not possible to assess whether any were of this species or the very similar lesser fulmar prion. The only record that we accept (on the authority of Robert Falla) was one apparently collected at Tagua station, Carnley Harbour, in 1943: 'First record from Auckland Islands – not recorded before 1943' (ATL, Falla MS-Papers-2366-246; Report of Biological Investigations at No.2 [Station, Tagua]). The specimen has not been located in New Zealand museums. The nearest breeding site for fairy prions is at the Snares Islands, 270 km to the north. There have been at least three records from Campbell Island (Kinsky 1969).

Grey petrel *Procellaria cinerea*

AS 2, En 2. Reported only in May. Very plentiful off the entrance to Carnley Harbour, 30 May 1947 (JS). Ten north and east of Auckland Islands on 8 & 13 May 1981 (CR, JAFJ). At least two found in dune deposits on Enderby Island (Tennyson 2020 – Chapter 7). Within the New Zealand region, grey petrels breed on Antipodes and Campbell Islands, 900 km and 270 km away, respectively.

Buller's shearwater *Ardenna bulleri*

AS 2. Off Auckland Islands, 5 Mar 1998 (HEx); south of Adams Island, 16 Jan 2011 (HEx). Buller's shearwaters breed only on the Poor Knights Islands, 1,800 km to the north-northeast. There is one record from the Snares Islands (Esler 1999).

Short-tailed shearwater *Ardenna tenuirostris*

AS 6. South of Adams Island on 1 Dec 2008, 12 Jan 2010, one on 18 Nov 2013, and 7 Jan 2016; north of Enderby Island, 17 Nov 2009 and one on 12 Nov 2014 (all records HEx). Short-tailed shearwaters breed on islands around Tasmania and in Bass Strait. There is one record from the Snares Islands (Miskelly *et al.* 2001).

Subantarctic little shearwater *Puffinus elegans*

113 records: AS 91, CH 7, En 12, OI 1, AIs 1, Mn 1. No live records ashore, but recorded offshore in every month except Oct. First report 30–40 north-east of Port Ross, 5 Mar 1942 (CF in McEwen 2006). Most counts of 20 or fewer birds. High counts of thousands south-east of Adams Island on 13 Jun 1942 (CF in McEwen 2006), more than 200 offshore from Haskell Bay to Norman Inlet on 25 Apr 1943 (RAF), 200 north and east of Auckland Islands on 8 & 13 May 1981 (Robertson & Jenkins 1986), and hundreds north of Enderby Island on 5 Mar 2010 (HEX). Records of birds ashore (Enderby Island, Beacon Rock, and Monumental Island) have been of fragmentary remains in skua middens and dune deposits (Table 1; Tennyson 2009, 2020 – Chapter 7; Canterbury Museum AV27309).

In contrast to the assertion in Russ & Shirihai (2000), there is no evidence that subantarctic little shearwaters breed at the Auckland Islands. The nearest breeding grounds are on the Antipodes Islands, 900 km to the east of the Auckland Islands.

124 Wilson's storm petrel *Oceanites oceanicus*

14 records: CH 2, AS 12. Recorded in Carnley Harbour, 1 Feb 1999 (HEX), with two there on 24 & 25 Nov 2001 (ACW & NMC in eBird). At sea south of Adams Island on 25 Nov 2001, 1 Dec 2008, 7 Dec 2014, 14 Feb 2016, and 14 Feb 2017; south-east of Adams Island on 13 Dec 2001; east of Auckland Island on 20 Dec 2013, 21 Jan 2014, and 23 Nov 2017; and north of Enderby Island on 4 Mar 2016 and 6 Mar 2018 (all records HEX). One at an unspecified location on 19 Nov 2009 (KR in eBird). Wilson's storm petrels are likely to be passage migrants from breeding grounds on and around the Antarctic coast. There are two records from Campbell Island (Kinsky 1969).

Australasian gannet *Morus serrator*

12 records: AIs 1, PR 2, CH 2, En 2, AS 5. One in Jan 1963 (BDB in Kinsky 1969); one off Ranui Cove, 26 Jan 1966 (RT, RAF); one in Carnley Harbour, 7 Feb 1968 (M.M. Darby 1970) and 29 Nov 1996 (HEX). A gannet appeared to have a nest among Auckland Island shags at Butterfield Point (south-west Enderby Island) on 5 Jan 1999 (SC), and one was roosting among shags on Enderby Island on

22 Nov 2000 & 6 Jan 2001, with the comment '*Spent some time with the shags – 1 gannet was still there*' on 22 Nov 2000 (HEX). At sea east of Auckland Island, 8 Dec 1999; north of Enderby Island on 2 Feb 2000 & 14 Jan 2009 (HEX); in Port Ross, 24 Jan 2001 (ACW in eBird); off Enderby Island on 30 Jan 2002, and south of Adams Island on 15 Jan 2009 (HEX). The nearest breeding site to the Auckland Islands is a small colony on Little Solander Island in Foveaux Strait, 440 km to the north (Cooper *et al.* 1986). There have been at least 20 sightings at the Snares Islands, and at least one has reached Campbell Island (Kinsky 1969; Miskelly *et al.* 2001).

Little shag *Phalacrocorax melanoleucos*

CH 1. One at Western Arm, Carnley Harbour, on 25 Jun & 26 Aug 1942 (CF in McEwen 2006). Little shags are regularly reported at the Snares Islands (up to seven at a time; Miskelly *et al.* 2001). Groups of 4–5 reached Campbell Island in 1958 and 1966, and a pair bred there during 1967–68, with two pairs the following year (Kinsky 1969). All the sightings at these islands have been of fully pied birds, likely to be vagrants from Australia as the the white-throated morph is predominant in southern New Zealand (Gill *et al.* 2010).

Black shag *Phalacrocorax carbo*

6 records: PR 2, In 2, CH 1, Ak 1. There was an influx of black shags in Jan 1978, with nine seen off Enderby Island (19 Jan; RT) and seven in Waterfall Inlet (20 Jan; RT, RAF), with birds also noted off Hanfield Inlet and in Carnley Harbour on 20 Jan (RAF). There were subsequent records from Erebus Cove on 5 Dec 1983 (Mayhill & Goulstone 1986), and in Port Ross on 14 Jan 2014 (HEX). Flocks of black shags have reached the Snares Islands (49+ in 1976–77, Sagar 1977; 12 in Nov 2011, Pete McClelland, *pers. comm.* to CMM) and Campbell Island (12 in 1951–52; Bailey & Sorensen 1962).

Little black shag *Phalacrocorax sulcirostris*

PR 1. One on 8 Aug 2012 (HR). The only other record from the New Zealand subantarctic islands was one present at the Snares Islands from at least Apr to Dec 2013 (Miskelly *et al.* 2015; AT & CMM, *pers. obs.*).

Macquarie Island shag *Leucocarbo purpurascens*

PR 1, CH 1. Immature collected Port Ross, 4 Jul 1901; adult collected Carnley Harbour, 9 Jul 1901 (JR); the only known records from New Zealand (Miskelly & Cooper 2020 – Chapter 17).

White heron *Ardea modesta*

Ak 2, PR 1, En 1. Two at Auckland Island (Port Ross) on 27 Oct 1891 (RW). One in Port Ross c. 18 Apr 1945 (AP). One at Derry Castle Reef, Enderby Island, 1–14 Apr 1980 (Pierce 1986). One at Round Point (Carnley Harbour, North Arm), 8–9 May 1981 (CR, JAFJ). Elsewhere in the New Zealand subantarctic there have been two records from the Snares Islands and four from Campbell Island (Bailey & Sorensen 1962; Horning & Horning 1974; Miskelly *et al.* 2015).

Cattle egret *Ardea ibis*

En 1. One found dead on Enderby Island on 16 Jun 1983 (RP; Te Papa specimen OR.023703). Cattle egrets have reached the Snares Islands on at least six occasions (Miskelly *et al.* 2001; CMM, *pers. obs.*).

White-faced heron *Egretta novaehollandiae*

39 records: Ak 15, En 9, CH 4, PR 8, Ad 2, Ms 1. First recorded at Lindley Point, Auckland Island, in Apr 1975 (AL, AW). Most reports of 1–2 birds, apart from 2–3 in Port Ross in Jun 2007 (PM), up to 12 in Port Ross in Jul–Aug 2012 (BD, CL, HM, TW, HR), and 4 on Enderby Island on 2 Jan 2014 (GB in Miskelly *et al.* 2015). Recorded annually since 2009, and so possibly resident, although no reports of breeding known. There have also been numerous reports of white-faced herons at the Snares Islands, one at Antipodes Island, and at least four at Campbell Island (Westerskov 1960; Bailey & Sorensen 1962; Moore & Moffat 1990; Miskelly *et al.* 2001, 2013).

Reef heron *Egretta sacra*

CH 1, In 1. One in Camp Cove and Carnley Harbour Feb–Mar 1982 (Gamble *et al.* 1986; P. Thomson 1986), and one in Smith Harbour on 31 Jan & 10 Feb 2019 (FC, RG, MLL). Unidentified herons were reported by B. Morrell (1832), Dumont d'Urville (1846), and Lukins (1896), and at Ranui Cove Mar–Sep 1942 (per RAF). Marples (1946) and Oliver (1955) listed reef heron as a straggler

to the Auckland Islands. These are the only known records from the New Zealand subantarctic islands.

Swamp harrier *Circus approximans*

10 records: Ro 1, Ak 1, Ew 1, En 7. A harrier was seen at least nine times in Port Ross during Jun–Sep 1943, with the first sighting of a bird flying from Rose Island to Crozier Point on 14 Jun, and subsequent sightings at Crozier Point (15 & 17 Jun), Ewing Island (11 Aug and in Sep), Ocean Island in Sep, and Enderby Island on 19 Aug, in Sep, and one or two birds on 12 Oct (all records RAF). One was on Enderby Island on 10–12 Nov 1954 (KAW, RT), 19 Nov 2006 (HEX), 12 Dec 2006 (sea lion team), 18 Nov 2009 (KR in eBird), and 12 Nov 2010, 9 Jan 2011, and 11 Jan 2013 (HEX). There are numerous records of harriers at the Snares Islands (Miskelly *et al.* 2001), one from Antipodes Island (20 Mar 2009; Dave Boyle, *pers. comm.* to CMM), and at least five records from Campbell Island (Bailey & Sorensen 1962; 13 Jan 2006, CMM, *pers. obs.*).

Spotless crane *Porzana tabuensis*

En 1. One east of Sandy Bay, Enderby Island on 23 Nov 2003 (GW, who had seen the same species on Tiritiri Matangi Island 8 days previously). The only record from the New Zealand subantarctic islands.

Pūkeko *Porphyrio melanotus*

En 1. One at East Bay, Enderby Island on 20 Jan 2011 (CGM). One record from each of the Snares and Campbell Islands (Bailey & Sorensen 1962; Miskelly, Crossland *et al.* 2017).

Australian coot *Fulica atra*

En 1. One on Teal Lake, Enderby Island, on 9 Feb 2012 (JSM). There was one at the Snares Islands in Apr 2013 (Miskelly *et al.* 2015).

Lesser knot *Calidris canutus*

En 6, Dn 1. Three at Derry Castle Reef, Enderby Island, on 17 Mar 1954 (PB, RT, DD); also present on Enderby Island from Dec 1981 to Feb 1982 (Cawthorn 1986c), 9–10 Dec 1989 (Moore & McClelland 1990), 28 Nov 1996, and 27 Nov 2004 (HEX). Four on Dundas Island on 24 Jun 1998 (AT). Two at Sandy Bay, Enderby Island, on 11–16 Jan 2015 (sea lion team & LA), with one at Derry Castle

Reef on 21 Jan 2015 (LA). Three records of knots from Campbell Island are the only other records from the New Zealand subantarctic islands (Bailey & Sorensen 1962; Imber 1988; Oct 2012 to Apr 2013, Kyle Morrison, *pers. comm.* to CMM).

Sanderling *Calidris alba*

En 1. One seen on five occasions at Derry Castle Reef, Enderby Island, between 7 Nov 2007 and 5 Feb 2008 (HEX; RS; Miskelly, Crossland *et al.* 2019). The only record from the New Zealand subantarctic islands.

Curllew sandpiper *Calidris ferruginea*

Ak 1. One at Tandy Inlet, Auckland Island on 23 Dec 1972 (PC, KJW). The only record from the New Zealand subantarctic islands.

Sharp-tailed sandpiper *Calidris acuminata*

En 3. All records from Enderby Island. Three on 29 Dec 1972 (KJW, BDB, GvT); one on 25 Feb 1973 (BDB, RR); one on 18 Nov 2009 (HEX). There are three records from the Snares Islands (Miskelly *et al.* 2001).

Pectoral sandpiper *Calidris melanotos*

En 1. One on Enderby Island on 14 Jan 2015 (SW). The only record from the New Zealand subantarctic islands.

Red-necked stint *Calidris ruficollis*

En 7. One on Enderby Island on 16 Jan 1963, with two the following day (BDB). One there on 11 Mar 1982 (PT) and 8 Dec 1999 (HEX), at least two in mid-Feb 2004 (PM) and recorded also on 6 Mar 2004, 15 Dec 2005, 4 Jan, 5 Feb, & 30 Nov 2008 (all HEX). All records are likely to have been at Derry Castle Reef (specifically noted in 1963, 1982, & 2004). There is one record from the Snares Islands (Oct 2001; Dave Houston, *pers. comm.* to CMM).

Whimbrel *Numenius phaeopus*

En 1. One on Enderby Island on 1 Feb 1994 (HEX). This is the only record from the New Zealand subantarctic islands.

Bar-tailed godwit *Limosa lapponica*

23 records: Ro 1, En 19, CH 1, Ew 1, AS 1. The German Transit of Venus Expedition collected two bar-tailed godwits on Rose Island during the 1874–75 summer (Miskelly & Taylor 2020 – Chapter 1). Most subsequent records have been from Enderby Island (27 records from 18 summer seasons), where they were first encountered on 28 Oct 1891 (*'The carpenter shot some kuakas or godwits'*; RW). Most records were of single birds (or numbers not given), with flocks of 2–5 on 7 Mar 1954 (2; PB, RT, DD), 3 Dec 1972 (3; MFS), 23 Nov 2003 (3; HEX), 31 Jan 2011 (5; sea lion team) and 3 Nov 2011 (2; HEX). The remaining records were four flying over Tagua Bay, Carnley Harbour, on 16 Oct 1942, one on Ewing Island on 9 Nov 1942 (both records CF in McEwen 2006), and one flying at sea east of Auckland Island on 15 Dec 1990 (Dormon 1991). Bar-tailed godwits have been recorded multiple times at the Snares and Campbell Islands (Miskelly 2000; Miskelly *et al.* 2001).

Black-tailed godwit *Limosa limosa*

En 3; one at Derry Castle Reef, Enderby Island, on 17 Jan 1963 (BDB), 8 Dec 1976 (Bartle & Paulin 1986; Te Papa OR.019287), and 19 Feb 2004 (PM). These are the only records from the New Zealand subantarctic islands.

Wandering tattler *Tringa incana*

En 1. One at Derry Castle Reef, Enderby Island, on 6–16 Feb 1988, identified by call and plumage (GAT). This is the only record from the New Zealand subantarctic islands.

Grey-tailed tattler *Tringa brevipes*

En 4. All records are from Derry Castle Reef, Enderby Island. Three during 2–13 Apr 1980 (Pierce 1980); one on 10 Mar 1982 (MJW) and two the following day (P. Thomson 1986). Also present in early-Apr 1983, and Jan & Feb 1984 (MC). There are two records from the Snares Islands (Warham & Keeley 1969; 14 Dec 2005, HEX).

Ruddy turnstone *Arenaria interpres*

123 records: En 104, Dn 11, Ew 4, Ro 2, Oc 1, Ak 1; Enderby Island frequency of occurrence 43%. First record of 'small flocks' on Enderby Island on 6 Feb 1944 (RAF, GP, JS, WI). Present annually on Enderby Island since 1998, with high counts

of 107 in Jan 1980 (Mitchell & Ensor 1986), and 100 at Derry Castle Reef plus 40 at the south-east point in Apr 1980 (Pierce 1980). The highest counts for Ewing and Dundas Islands were 60–70 counted from a helicopter on 23 Nov 1978 (RAF). Many counts in 1973–88 exceeded 50 birds. Since 1998 counts have been consistently lower than 20, apart from 31 on Dundas Island on 17 Jan 2015 (LA), 50–60 at Sandy Bay, Enderby Island, on 18 Jan 2015 (sea lion team), and 25 at Derry Castle Reef on 26 Jan 2018 (AT, CMM).

There are four records of 1–3 turnstones from the Snares Islands (Miskelly *et al.* 2001; and two in Oct–Nov 2002 & 2003, Dave Houston, *pers. comm.* to CMM), four records of up to 15 birds at Antipodes Island (Tennyson *et al.* 2002; two in late-Jan to early-Feb 2008, one on 15 Dec 2009, and one on 1 Jan 2016, Dave Boyle and Eric Woehler, *pers. comm.* to CMM), and two records from Campbell Island (Kinsky 1969; Moore & Moffat 1990).

South Island pied oystercatcher *Haematopus finschi*

En 2. The first oystercatcher reported from the Auckland Islands (Derry Castle Reef, Enderby Island, 15 Feb 2007) was not identified to species (KM). A South Island pied oystercatcher was present at Derry Castle Reef on 6 & 10 Feb 2012 (JSM) and also 9 & 19 Feb 2012 (sea lion team; PJ). Two were present on 11 Jan 2014 (HEX); both were at Sandy Bay on 12 Feb 2014 (AM), with one reported from Enderby Island on 6 Mar 2014 (BS). There are three records from the Snares Islands (Miskelly *et al.* 2001; 15 Feb 2004, CMM, *unpubl. data*) and one from Campbell Island (Bailey & Sorensen 1962).

Pacific golden plover *Pluvialis fulva*

En 4. Flock of 12–15 on 6 Feb 1944 (RAF, GP, JS, WI), four at Derry Castle Reef, Enderby Island, 17 & 18 Mar 1954 (PB, RT, DD), with six there on 31 Dec 1962 (BDB), and 1 on 11 Mar 1982 (PT). Two at South East Point on 17 Jan 1963 (BDB). These are the only records from the New Zealand subantarctic islands.

Banded dotterel *Charadrius bicinctus bicinctus*

En 2. One at Derry Castle Reef, Enderby Island,

on 17 May 1954 (RT in Miskelly & Taylor 2020 – Chapter 1), and one there 2–13 Apr 1980 (Pierce 1980). Both birds associated with Auckland Island banded dotterels. These are the only records from the New Zealand subantarctic islands.

Spur-winged plover *Vanellus miles*

18 records: En 14, Ro 3, Dn 1. The first record was of two at Derry Castle Reef, Enderby Island, on 6 Jan 1985 (MC), with 30 subsequent sightings on the island. Many records were of 2–5 birds, with a maximum of seven at Teal Lake, Enderby Island on 29 Jul 2012 (HM). Six were on Rose Island in late-Nov 1996 (MJW), with two there in Dec 2000 (DB), and three on 2 Dec 2012 (JSM). Two flew over Dundas Island on 24 Jun 1998 (AT). Recorded annually on Enderby Island since 2010 and so may be resident, though breeding has not yet been reported. There are three reports from the Snares Islands (Miskelly *et al.* 2001, 2015; 27 Jul 2001, Paul Sagar, *pers. comm.* to CMM), one each from Bounty and Antipodes Islands (Schmechel 1998; Tennyson *et al.* 2002), and four from Campbell Island (Bailey & Sorensen 1962; Moore & Moffat 1990; Scofield 2005; Miskelly *et al.* 2015).

South Polar skua *Catharacta maccormicki*

PR 1, AS 2, CH 1. One collected at Laurie Harbour, Port Ross, on 28 Mar 1904 was the first recorded from New Zealand (the record was overlooked until 2019; Miskelly 2020b – Chapter 18 in this book). One south of Adams Island on 4 Nov 2011, one in Carnley Harbour on 12 Jan 2013, and one east of Auckland Island on 23 Nov 2017 (all records HEX). There is one record from Campbell Island (Kinsky 1969).

Caspian tern *Hydroprogne caspia*

PR 1. One in Port Ross on 4 Dec 1983 (Mayhill & Goulstone 1986). This is the only record from the New Zealand subantarctic islands.

Arctic tern *Sterna paradisaea*

PR 1, Oc 1. Juvenile female collected off Ewing Island on 12 Nov 1943 (Te Papa OR.013135; RWB, JFJ). One on Ocean Island on 10 Dec 1943 (RAF). Subsequent records may have been of immature Antarctic terns, which can appear extremely similar to Arctic tern (Enderby Island, 14 Dec 1972, GvT & KJW; Carnley

Harbour, 13 Nov 2014 & 6 Mar 2018, HEx). There is one record from each of the Snares, Antipodes, and Campbell Islands (Bailey & Sorensen 1962; Miskelly *et al.* 2001; Tennyson *et al.* 2002).

Antipodes Island parakeet *Cyanoramphus unicolor*

En 1. One bone from Enderby Island (Tennyson 2020 – Chapter 7).

Shining cuckoo *Chalcites lucidus*

Oc 2. One on Ocean Island on 9 Nov 1954 (RAF), and one there on 30 Nov 1989 (McClelland & Moore 1991). Shining cuckoos have reached the Snares Islands on at least six occasions (Miskelly *et al.* 2001).

White-throated needletail *Hirundapus caudacutus*

Ak 1, En 1. One at South West Cape, Auckland Island, 17 Jan 1993 (RR, HEx); one on Enderby Island, 9 Jan 2014 (AB image in eBird). White-throated needletails have reached the Snares Islands at least four times, and Campbell Island twice (Bailey & Sorensen 1962; Miskelly *et al.* 2001).

New Zealand raven *Corvus antipodum*

En 1. A single bone found in Sandy Bay dunes on 18 Jan 1964 (Dawson 1964, 2020 – Chapter 8 in this book) is possibly corroborated by a report of rooks in Carnley Harbour in Jan 1830 (B. Morrell 1832; Miskelly & Taylor 2020 – Chapter 1). Bones of the extinct New Zealand raven have been found at coastal sites around the three main islands, and a similar species occurred on the Chatham Islands (Gill 2003). No further raven bones have been identified among more than 3,500 bones collected on Enderby Island, and so we consider New Zealand raven as having been vagrant to the Auckland Islands (Dawson 2020 – Chapter 8; Tennyson 2020 – Chapter 7).

Eurasian skylark *Alauda arvensis*

11 records: En 9, Ro 1, Ad 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. The first record was one singing on Enderby Island, 26 Sep 1942 (CF in McEwen 2006). Subsequent records on Enderby Island, 29 Nov 1943 (at least two birds, RAF), 1966 (R.H. Taylor 1971), 8 Dec 1976 (Bartle & Paulin 1986), 9 Jan 2009 (BMCK in eBird), 9

Jan 2011, 5 & 17 Dec 2015, 5 Jan 2016, 7 Dec 2016, and 16 Dec 2017 (all records HEx). One or two on Rose Island, 7–10 Nov 1954, and one above Fairchild's Garden, Adams Island, on 13 Nov 1954 (KAW, RT). *Contra* Russ & Shirihai (2000) and Shirihai (2008), there is no evidence that skylarks breed at the Auckland Islands. There are six records from the Snares Islands (Miskelly *et al.* 2001), two from Antipodes Island (Tennyson *et al.* 2002; 12 Apr 2009, Dave Boyle, *pers. comm.* to CMM), and one from Campbell Island (Kinsky 1969).

Welcome swallow *Hirundo neoxena*

9 records: Ak 2, En 6, Ro 1. The first welcome swallow recorded from New Zealand was seen by RAF at Ranui Cove, Auckland Island, on 4 Jun 1943, and was observed on five subsequent dates by RAF & RWB until it was collected by WD on 23 Jul 1943 (Te Papa OR.015697). Six were seen at Round Point (Carnley Harbour, North Arm) during 8–9 May 1981 (CR, JAFJ). Ten to 15 were at Sandy Bay, Enderby Island on 7 Apr 1983 (MC), with six there 4 days later (Claridge 1983). Welcome swallows were recorded subsequently from Enderby Island in May–Jun 1986 (MC), Nov–Dec 1989, and 6 Jan 1990 (Moore & McClelland 1990; MC), 8 Dec 1999 (HEx), 12, 15, & 30 Dec 2011, and 13 Jan 2012 (JSM & JAH; MY; NIA in eBird, with two birds on 30 Dec), and 11 Feb 2018 (HEx). Three were seen on Rose Island on 9 Dec 1983 (Mayhill & Goulstone 1986). *Contra* Russ & Shirihai (2000) there is no evidence that welcome swallows breed at the Auckland Islands.

Welcome swallows have reached the Snares Islands at least eight times (maximum 35 birds; Miskelly *et al.* 2001). There are four records of 1–2 birds from Campbell Island (Bailey & Sorensen 1962; Moore & Moffat 1990, Miskelly *et al.* 2015).

House sparrow *Passer domesticus*

7 records: En 6, Ro 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. The first record was a deserted nest with a dead chick and addled egg in the boatshed at Enderby Island, 15 Feb 1943 (WD). A pair with three newly hatched chicks was at the same site, 31 Dec 1962 (BDB), and an old nest (possibly the same one) on 17 Jan 1966 (RT). There were subsequent records of individual birds from Enderby Island in May–Jun 1986 (MC), on 15 Dec 2005 & 18 Dec 2016 (HEx), and one at Derry Castle Reef on 13 Feb 2011 (BMCK). Reported

from Rose Island in 1954 and/or 1966 (R.H. Taylor 1971). House sparrow was listed as a breeding species by Russ & Shirihihi (2000) and Shirihihi (2008), but we suggest that they are best considered a failed colonist.

House sparrows have reached the Snares Islands at least 13 times (maximum 14 birds, with one old nest found; Warham 1967; Sagar 1977; Miskelly *et al.* 2001). There is one record from Antipodes Island (Tennyson *et al.* 2002), and three from Campbell Island (maximum 9 birds; Kinsky 1969).

Chaffinch *Fringilla coelebs*

29 records: Ak 14, Ew 2, En 11, Ro 2. Introduced to mainland New Zealand; dispersed to the Auckland Islands. First record Dea's Head, Auckland Island, 29 Sep–1 Oct 1942 (CF in McEwen 2006). Multiple records during 1942–47 around both coastwatcher stations (Ranui Cove and Tagua Bay). A pair was reported to be nesting at Ranui Cove on 9 Sep 1943, but the male only was seen after 30 Sep, and so breeding was probably not successful (RAF). The largest flock was 12 birds on Rose Island, 31 Jan 1966 (RT). They continue to be reported regularly around Port Ross (at least 13 records since 2000, mainly HEx). Chaffinch was listed as a breeding species by Russ & Shirihihi (2000) and Shirihihi (2008).

There is a small resident chaffinch population on the Snares Islands (Miskelly *et al.* 2001). One bird has been seen on each of the Bounty Islands and Antipodes Island (Clark *et al.* 1998; Tennyson *et al.* 2002). There were many sightings on Campbell Island during 1942–45, and two birds in Jan 1958 (Bailey & Sorensen 1962).

European greenfinch *Carduelis chloris*

En 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. The only record is two on Enderby Island, 17 Nov 2013 (HEx). Greenfinches have reached the Snares Islands at least 13 times (maximum seven birds; Miskelly *et al.* 2001, and CMM *unpubl. data*), and there are two records from Campbell Island (Bailey & Sorensen 1962; Moore & Moffat 1990).

European goldfinch *Carduelis carduelis*

24 records: AIs 2, Ak 5, Oc 1, Frn 1, En 11, Ds 1, Ad 3. Introduced to mainland New Zealand; dispersed

to the Auckland Islands. First record 1896 (Lukins 1896; location not specified). Largest flock c. 20 feeding in a thistle patch at Webling Bay, Auckland Island, on 17 Apr 1943 (RWB, JFJ). Recorded throughout the group, including a small flock on Disappointment Island on 11 Dec 1976 (Bartle & Paulin 1986), and six on Enderby Island on 17 Nov 2013 (HEx). *Contra* Russ & Shirihihi (2000), Turbott (2002), and Shirihihi (2008), there is no evidence that goldfinches breed at the Auckland Islands.

Goldfinches have reached the Snares Islands at least 15 times (maximum 30+ birds; Miskelly *et al.* 2001, and CMM, *unpubl. data*). There are two records from Antipodes Island (including 20–25 birds in April 2001; Imber 2004), and five from Campbell Island (maximum three birds; Bailey & Sorensen 1962; Moore & Moffat 1990).

Yellowhammer *Emberiza citrinella*

En 1. Introduced to mainland New Zealand; dispersed to the Auckland Islands. The only record was one on Enderby Island, 26 Nov 2000 (HEx). There have been at least nine records from the Snares Islands (Miskelly *et al.* 2001, and AJDT & CMM, *pers. obs.*), one record from Antipodes Island (12 Apr 2009; Dave Boyle, *pers. comm.* to CMM), and two from Campbell Island (Bailey & Sorensen 1962; Moore & Moffat 1990).

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Failed introductions

Four bird species were among the animals introduced to the Auckland Islands between 1837 and 1890 to provide potential food for castaways. With the exception of one goose (for which release details are unknown), and a possible sighting of a weka, none was seen subsequent to their release.

Chicken *Gallus gallus*

Introduced to Port Ross in Nov–Dec 1840 (Ross 1847), Erebus Cove in late-Oct 1865, and Camp Cove in early-Nov 1865 (Greig 1865).

Goose [*Anser anser*?]

Captain Cole of the whaling vessel *Huntress* of New Bedford released two geese at the Auckland Islands in Mar 1837 (journal of John S. Abbott, New Bedford Whaling Museum PMB microfilm

0285, Rhys Richards, *pers. comm.* to CMM, 27 Jul 2019). Krone (1900) referred to team members catching a stray goose at the mouth of the stream near Dea's Head during the 1874-75 summer.

Muscovy duck *Cairina moschata*

Five ducks and a drake were introduced to Carnley Harbour, 27 Oct 1865 (Norman & Musgrave 1866).

Weka *Gallirallus australis*

Introduced to Rose Island c. 1850 (Enderby 1875). Two birds from Stewart Island were introduced to Enderby Island on 1 Feb 1868 (Armstrong 1868), and others were introduced to Auckland Island on 13 Jan 1890 (Chapman 1891). Robert Holding reported catching a bird that may have been a weka (or possibly an Auckland Island rail) on Rose Island in 1864-65 (Allen 1997: 181 & 184). The bird was first noticed feeding on worms from a dead sea lion, and was described as '*long-legged and long necked of a very nice brown colour with a beak like the partridge or pheasant*'. It was evidently large enough to be considered worth eating. Holden caught one when it became entangled in a brush fence around an attempted garden, but it escaped from captivity overnight. Holden confused the bird with a kiwi (*Apteryx* sp.): '*They are stated to have no wings but this one had one joint of a wing only and in consequence could not fly*' (Allen 1997: 184).

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Unverified or invalid vagrant bird species

Many of the potential vagrant bird species listed below were recorded in Heritage Expedition reports with no supporting information or images. Anyone who has information on these species (or other new or rarely seen vagrants) at the Auckland Islands is encouraged to submit supporting information online (via <https://www.osnz.org.nz/webforms/online-reporting-form>).

Marples (1946) listed 58 species (45 breeding) from the Auckland Islands. While he acknowledged assistance from coastwatchers Robert Falla and Charles Fleming, his list contains several species for which we were unable to find supporting evidence of their occurrence before 1946: king penguin, grey-headed mollymawk, Salvin's prion (breeding), reef heron, and shining cuckoo.

Marples listed skylark and goldfinch as breeding on the Auckland Islands, for which we found no other records of breeding attempts. Among the breeding species listed by Marples (1946), chaffinch and house sparrow failed to establish populations. Falla (1965) similarly listed 51 species '*breeding or probably breeding on the Auckland Islands*', including subantarctic little shearwater, Australasian shoveler, swamp harrier, skylark, goldfinch, chaffinch, and house sparrow; we found no supporting information for breeding by the first five species at the Auckland Islands. Russ & Terauds (2009) erroneously listed long-tailed cuckoo and welcome swallow as breeding at the Auckland Islands.

Paradise shelduck *Tadorna variegata*

En 3. Paradise shelducks have been reported from Enderby Island over three summers, but it is likely that most or all of these records were of the similar chestnut-breasted shelduck. We note that no female paradise shelducks (which have strikingly distinct plumage) have been reported, and that during the 2006-07 summer (and on one exact date) both species were reported as being present. 'Paradise shelducks' were reported on 22 & 28 Nov 1996 (HEX), two males on 5 Dec 2006 (sea lion team), at least one on 7 Dec 2006, both species on 14 Jan 2007 (HEX), and a male on 11 Dec 2008 (sea lion team). Chestnut-breasted shelducks have been confirmed to be present during nine summers, including a flock of 13 photographed on 12 Nov 2014 (NKH).

Macaroni penguin *Eudyptes chrysolophus*

A letter from CF to RAF dated 6-7 Mar 1942 referred to a '*chrysolophus*' on Ocean Island, apparently in error for '*chrysocome*' = rockhopper penguin (ATL MS-Papers-2366-254).

Little penguin *Eudyptula minor*

The fragmentary remains of a dead bird on Rose Island (22 Dec 1991) and two records from Enderby Island (25 Dec 2014 & 12 Feb 2017; HEX) are likely to be eastern rockhopper penguins – either misidentified fledglings (which are small with bluish dorsal feathers, dark bills, and few yellow feathers above the eye), or row transcription errors in the Heritage Expedition ticklist.

Wandering albatross***Diomedea exulans***

AS 13. Most if not all records of wandering albatrosses at the Auckland Islands are likely to refer to Gibson's wandering albatross. The following records specifically listed the nominate form in addition to Gibson's wandering albatross: south of Adams Island on 25 Nov 2001, 13 Feb 2009, 13 Nov 2010, 13 Nov 2014, 21 Nov 2016, 8 Dec 2016, and 17 Nov 2017; south-east of Adams Island on 13 Dec 2001; north of Enderby Island on 5 Mar 2010 and 19 Jan 2014; east of Auckland Island on 21 Jan 2014; near Auckland Islands on 26 Dec 2015 and 11 Dec 2017 (all records HEx). Tracking studies of the two New Zealand breeding forms of wandering albatross by GPE & KW show that they both avoid all shelf-waters, except where they have to cross them to return to or depart from their breeding island (Walker & Elliott 2006).

Antipodean wandering albatross
Diomedea antipodensis antipodensis

AS 10. Most if not all records of Antipodean wandering albatrosses at the Auckland Islands are likely to refer to Gibson's wandering albatross (see comments above). Antipodean wandering albatrosses were reported east of Auckland Island on 30 Jan 2002, 21 Jan 2014, & 23 Nov 2017; and south of Adams Island on 15 Jan & 13 Feb 2009, 21 Nov & 8 Dec 2016, 17 Nov & 17 Dec 2017, and 14 Jan 2018 (all HEx). Antipodean wandering albatross breed mainly on Antipodes Island, with a few pairs on Campbell Island and the Chatham Islands (Walker & Elliott 2005; Miskelly *et al.* 2008).

Shy mollymawk
Thalassarche cauta cauta

AS 1. One south of Adams Island on 5 Jan 2008 (HEx). No details are provided to separate it from white-capped mollymawk.

Salvin's prion *Pachyptila salvini*

AS 1. One east of Auckland Island on 23 Nov 2017 (HEx). No details are provided to separate it from Antarctic prion.

Thin-billed prion *Pachyptila belcheri*

AS 10. East of Auckland Island on 6 Dec 2013 and 23 Nov 2017; several at Carnley Harbour entrance on 21 Nov 2016; south-east of Adams Island on

27 Dec 2016 and 10 Dec 2017; south of Adams Island on 15 Jan, 17 Nov, and 17 & 25 Dec 2017, and 14 Jan 2018 (all records HEx). It is likely that most if not all of these records were of Antarctic prions. Thin-billed prions breed on islands in the southern Indian Ocean and South Atlantic, and are mainly recorded from New Zealand during winter (Powlesland 1989). There is one record from Campbell Island (Bailey & Sorensen 1962).

Westland petrel
Procellaria westlandica

AS 1; south of Adams Island, 1 Dec 2008 (HEx). No details are provided to it separate from white-chinned petrel.

Hutton's shearwater
Puffinus huttoni

AS 2; east of Auckland Island, 20 Dec 2009 and 23 Nov 2017 (HEx); possibly sightings of subantarctic little shearwaters.

White-bellied storm petrel
Fregetta grallaria

South of Adams Island, 14 Feb 2016 (HEx); probably refers to the very similar black-bellied storm petrel, individuals of which do not all have an obvious belly stripe. 131

Stewart Island shag
Leucocarbo chalconotus

Smit (1965) referred to two fleas collected from a nest of '*Phalacrocorax carunculatus chalconotus*' on Enderby Island, 31 Dec 1962. This is assumed to be an error for Auckland Island shag, as no other shag species has been reported breeding at the Auckland Islands.

Campbell Island shag
Leucocarbo campbelli

Auckland Island shags have variable throat markings, with the darkest birds appearing very similar, if not identical, to Campbell Island shags. This is the likely explanation for the reported presence of Campbell Island shags at the Auckland Islands, including three specimens collected in Carnley Harbour and on Enderby Island by EoR & FH in January 1901 (Ogilvie-Grant 1905), and birds reported from Enderby Island on 22 Jan 2010 (JW in eBird) and 18 Dec 2016 (JHF). The

1901 specimens remain in the care of the Natural History Museum, UK (registration numbers 1901.10.21.46 to 48; Joanne Cooper, *pers. comm.* to CMM, April 2019).

Lewin's rail *Lewinia pectoralis*

AS 1. Specimen AMNH 545046 in the American Museum of Natural History is considered to be a typical large adult (probably male) Lewin's rail (Mathews & Iredale 1913; Greenway 1958; Falla 1967; Elliott *et al.* 1991). It was claimed to have been collected on the Auckland Islands some time before late 1874 (von Hügel 1875). This Australian species is otherwise unknown from New Zealand, and the provenance of this specimen was questioned by Mathews & Iredale (1913) and subsequent authorities.

Variable oystercatcher *Haematopus unicolor*

B. Morrell (1932) reported 'black sea-pies, with red bills' following his visit to Carnley Harbour in Jan 1830. However, his account included other species more likely to have been seen elsewhere in New Zealand (e.g. lizards and dragonflies), and no subsequent observer has reported black oystercatchers at the Auckland Islands (Miskelly & Taylor 2020 – Chapter 1).

Pomarine skua *Coprotheres pomarinus*

AS 1. One east of Auckland Island, 20 Dec 2013 (HEX). No details are provided to separate it from Arctic skua. A coracoid of an unidentified small skua was found on Enderby Island (Tennyson 2020 – Chapter 7).

Arctic skua *Stercorarius parasiticus*

AS 1. One east of Auckland Island, 26 Nov 2000 (HEX). See comments under pomarine skua above.

Black-billed gull *Chroicocephalus bulleri*

Four reports from Enderby Island during 2007–18 (HEX) are likely to refer to red-billed gulls. Some immature red-billed gulls on the Auckland Islands have a white eye and a black bill (see image from Enderby Island on New Zealand Birds Online, taken in Jan 2018), and so they have the

colouration but not the structure of an adult black-billed gull.

Pigeon [*Hemiphaga* sp.?]

Ak 1. B. Morrell (1932) described a large pigeon similar to a New Zealand pigeon (*Hemiphaga nove-seelandiae*) but with yellow bands on its wings, seen during his Jan 1830 visit to Carnley Harbour, and implied that several birds were present. See Miskelly & Taylor (2020 – Chapter 1) for the full description.

Orange-fronted parakeet *Cyanoramphus malherbi*

Ak 3, Ew 1. Gray (1859) wrote 'Auckland Island (Antarctic Expedition). Presented by the Admiralty' (i.e. the 1840 Ross expedition) as the collection details for a '*Platycercus malherbii*' specimen in the British Museum. However, Finsch (1869) and Salvadori (1891) could not separate the specimen from yellow-crowned parakeets collected on the New Zealand mainland. This specimen (1842.12.16.42, the first yellow-crowned parakeet collected at the Auckland Islands) 'isn't very orange at all' (Jo Cooper, *pers. comm.* to CMM April 2019). Rawlence *et al.* (2015) reported that four parakeet specimens in Te Papa that were collected on the Auckland Islands had orange-fronted parakeet mitochondrial DNA. Based on their morphology, the birds were yellow-crowned parakeets collected at Crozier Point on 26 Jun 1943 (OR.025576; RAF) and at Webbing Bay on 23 Sep 1943 (OR.025578; RAF), a red-crowned parakeet collected at Ranui Cove on 9 Mar 1944 (OR.025565; EGT), and a hybrid red-crowned × yellow-crowned parakeet collected on Ewing Island on 17 Jan 1963 (OR.009957; RAF). Mitochondrial haplotypes are shared between these three parakeet species on the New Zealand mainland, probably due to hybridisation and incomplete lineage sorting (Rawlence *et al.* 2015). As there are several explanations for how orange-fronted parakeet mitochondrial DNA reached the Auckland Islands, it cannot be assumed that orange-fronted parakeets were ever present.

Long-tailed cuckoo *Eudynamis taitensis*

Fleming (1953) and Kinsky (1970) listed long-tailed cuckoo as 'straggling to ... Auckland Island (?)' or '?Auckland Island'. Subsequent authorities

(including Oliver 1955, Bell 1975, Fleming 1982, Turbott 1990 & 2002, Higgins 1999, Shirihai 2008, and Gill *et al.* 2010) apparently based their more definite records on Fleming (1953), with Russ & Shirihai (2000) and Russ & Terauds (2009) even listing long-tailed cuckoo as a breeding species. None of these accounts provides the source of the information, and we have been unable to find any mention of long-tailed cuckoo in original sources, including Fleming's diary (McEwen 2006).

New Zealand fantail *Rhipidura fuliginosa*

Listed in error from Adams Island, Sep 1944 (Turbott 2002, p. 68): the record should be of tomtit (Graham Turbott, *pers. comm.* to CMM, 24 Feb 2005: '*Perhaps at some time when something is written on Auckland Island birds the correction can be made*').

Tree martin *Petrochelidon nigricans*

Ak 1; one at South West Cape, 9 Dec 1999 (HEX). No details are provided to separate it from welcome swallow.

Discussion

Biogeography of the breeding birds of the Auckland Islands

The Auckland Islands are the largest and highest island group in the New Zealand subantarctic region, and have more diverse habitats than the four other island groups. Habitat types on the Auckland Islands that are rare or absent on the other islands include extensive rātā and *Dracophyllum* forest (a source of nectar and honeydew), numerous streams and lakes, salt-marsh and tide pools (as found at Derry Castle Reef, Enderby Island), sand dunes and alpine fellfields. As a result, the Auckland Islands are (or were) able to support breeding populations of numerous bird species from the New Zealand mainland that are absent (or occur only as vagrants) on the other islands: merganser, South Georgian diving petrel, white-faced storm petrel, New Zealand falcon, banded dotterel, white-fronted tern, yellow-crowned parakeet, bell-bird and tui, and possibly shore plover. The Auckland Islands are also the only New Zealand

subantarctic island group to support a species of rail, although a form of banded rail (*Gallirallus philippensis macquariensis*) formerly occurred on Macquarie Island to the south-west (Macquarie Island is an Australian territory and supports a more Antarctic fauna than the New Zealand subantarctic islands; Shirihai 2008).

Once these 'Auckland Islands only' elements are removed from consideration, the remaining bird fauna has strongest links with Campbell Island. If the flightless teal and shags of each island group are treated as equivalent or closely related taxa, 28 of 32 (88%) Campbell Island taxa are shared with the Auckland Islands (Table 3). The Antipodes Islands share 22 of their 30 (73%) breeding bird taxa with the Auckland Islands, while the much smaller Snares Islands share 17 of 26 (65%) breeding taxa (Table 3). The Bounty Islands have almost no terrestrial vegetation and a very limited breeding bird fauna, although five of their seven (71%) breeding taxa are shared with the Auckland Islands. Macquarie Island (620 km to the south-west) shares 18 of its 35 (51%) breeding species with the Auckland Islands.

There are several notable absences among the breeding Procellariiformes of the Auckland Islands. These include mollymawk species other than white-capped mollymawk, and also soft-plumaged petrel, fairy prion, grey petrel, and subantarctic little shearwater. At least three mollymawk species breed on each of the Snares, Antipodes, and Campbell Islands (Moore *et al.* 1997; Tennyson *et al.* 1998; Miskelly *et al.* 2001; GPE *unpubl. data*). Most notably, black-browed and grey-headed mollymawks apparently breed alongside white-capped mollymawks on Bollons Island in the Antipodes Islands (Tennyson *et al.* 1998; plus GPE photographed a grey-headed mollymawk sitting on a nest close to two pairs of white-capped mollymawks on Bollons Island on 16 Jan 2019). In contrast, we are unaware of any records of mollymawks other than white-capped mollymawks alive on land anywhere in the Auckland Islands. Other than black-browed and grey-headed mollymawks, the grey petrel is the only bird species known to breed on both Campbell Island and Antipodes Island, but not on the Auckland Islands (Table 3). The subantarctic little shearwater breeds abundantly on the outlying islands in the Antipodes group (Imber 1983), and

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	Auckland Is	Campbell I	Antipodes I	Snares Is	Bounty Is
A flightless teal	Yes	Yes			
Mallard	Yes	Yes	Few	Yes	
Grey duck	Few	Few		Few	
Eastern rockhopper penguin	Yes	Yes	Yes		
Snares crested penguin				Yes	
Erect-crested penguin	?	Few	Yes		Yes
Yellow-eyed penguin	Yes	Yes			
Antipodean albatross	Yes	Yes	Yes		
Southern royal albatross	Yes	Yes			
Grey-headed mollymawk		Yes	Few		
Black-browed mollymawk		Few	Yes	Few	
Campbell black-browed mollymawk		Yes			
Buller's mollymawk				Yes	
White-capped mollymawk	Yes		Yes		
Salvin's mollymawk				Yes	Yes
Light-mantled sooty albatross	Yes	Yes	Yes		
Northern giant petrel	Yes	Yes	Yes		
Cape petrel	Yes	Yes	Yes	Yes	Yes
White-headed petrel	Yes		Yes		
Soft-plumaged petrel			Yes		
Mottled petrel				Yes	
Broad-billed prion				Yes	
Antarctic prion	Yes	?			
Fairy prion			Yes	Yes	
Fulmar prion	Yes			Yes	Yes
White-chinned petrel	Yes	Yes	Yes		
Grey petrel		Yes	Yes		
Sooty shearwater	Yes	Yes	Yes	Yes	
Subantarctic little shearwater			Yes		
Common diving petrel	Yes	Yes	Yes	Yes	
Grey-backed storm petrel	Yes	Yes	Yes		
Black-bellied storm petrel	Yes		Yes		
An endemic shag	Yes	Yes			Yes
An endemic snipe	Yes	Yes	Yes	Yes	
Subantarctic skua	Yes	Yes	Yes	Yes	
Southern black-backed gull	Yes	Yes	Yes	Yes	Yes
Red-billed gull	Yes	Yes		Yes	
Antarctic tern	Yes	Yes	Yes	Yes	Yes
Parakeet spp.	Two	Extinct	Two		
Tomtit	Yes			Yes	
Fernbird				Yes	
Silvereye	Yes	Yes	?	Yes	
Eurasian blackbird	Yes	Yes	?	Yes	
Song thrush	Yes	?		Yes	
Common starling	Yes	Yes	Yes	Yes	
New Zealand pipit	Yes	Yes	Yes		
Dunnock	Yes	Yes	Yes		
Common redpoll	Yes	Yes	Yes	Yes	
Chaffinch				Yes	

can be seen around the Auckland Islands at any time of year (with October as the only exception), but has yet to be found ashore there alive.

The most anomalous breeding species on the Auckland Islands is the Auckland Island rail, as the genus *Lewinia* has not been reported even as a vagrant elsewhere in the New Zealand region. The Auckland Island rail is likely to have derived from a colonisation event by a shared ancestor with Lewin's rail *L. pectoralis* direct from south-eastern Australia (Garcia-R *et al.* 2016). This unusual colonisation history is further complicated by the possibility that an actual Lewin's rail specimen was collected on the Auckland Islands (see 'Unverified or invalid vagrant bird species').

Differences in the avifaunas of the major islands within the Auckland Islands

The main islands in the Auckland Island group each have a strikingly different breeding bird fauna (Table 4 and Fig. 24). Auckland Island is 4.7 times larger than Adams Island and has similar terrain and vegetation, yet is missing at least nine species that breed on the smaller island. All of the missing species are ground-dwelling species or burrow-nesting petrels that would be vulnerable to cat and pig predation, and all are known or presumed to have been present before the predatory mammals became widespread. Numerous

examples of cat and pig predation on burrow-nesting petrels on Auckland Island are presented by Russell *et al.* (2020 – Chapter 6), and the absence of teal, rail, snipe, and dotterel on the main island is almost certainly due to cat predation. In addition to these complete absences, the presence of introduced mammals on Auckland Island has reduced most other species to much lower densities than on nearby islands, with the only species reported by more than 50% of observers since 1998 being five passerine species (bellbird, tui, tomtit, blackbird, and silvereye; Fig. 24).

Although Enderby Island has high reporting rates for most diurnal bird species (Fig. 24), its bird community still bears the impact of direct human harvest and the dense population of pigs that died out c. 1887, with low densities of burrow-nesting petrels, and Auckland Island rail no longer present (Table 4; Russell *et al.* 2020 – Chapter 6; French *et al.* 2020 – Chapter 4). The bone deposits in dunes behind Sandy Bay reveal that southern royal albatrosses were formerly much more abundant, as were white-chinned petrels and eastern rock-hopper penguins (both now rare or absent as breeding species on Enderby Island; French *et al.* 2020 – Chapter 4; Tennyson 2020 – Chapter 7).

Adams Island has almost the full complement of Auckland Islands breeding bird species, although there are no records yet of fulmar prions or terns breeding there (Table 4). The lower reporting rate for most species from Adams Island compared with Enderby Island (Fig. 24) is partly a reflection of Adams Island's size, which means there can be substantial separation of habitats and seabird breeding locations. Whereas most habitats on Enderby Island can be visited on the established ecotourism circuit walk, it takes more effort (and suitable weather conditions) to view even such obvious surface-nesting species as the four albatross species and two penguin species that breed on Adams Island. The extraordinarily dense bellbird population in rātā forest on Adams Island also affects recording rates for other forest-dwelling passerine species, with lower reporting rates for all passerines compared with Auckland Island (Fig. 24; Elliott *et al.* 2020 – Chapter 3). The impact of high bellbird densities is similarly evident on Rose and Ocean Islands, where tomtits, tui, and silvereyes are rare or absent (Table 4, Figs 17 & 20).

TABLE 3 (OPPOSITE). A comparison of the breeding bird faunas of New Zealand subantarctic island groups. Nine species known only from the Auckland Islands (either endemic, or shared with mainland New Zealand) are not included: Auckland Island merganser, South Georgian diving petrel, white-faced storm petrel, New Zealand falcon, Auckland Island rail, banded dotterel, white-fronted tern, bellbird, and tui. Scientific names are given in the text, apart from fernbird *Bowdleria punctata*. Taxa referred to collectively are Auckland Island species plus similar taxa from other island groups: Campbell Island teal *Anas nesiotis*, Campbell Island shag *Leucocarbo campbelli*, Bounty Island shag *L. ranfurlyi*, Campbell Island snipe *Coenocorypha aucklandica perseverance*, Antipodes Island snipe *C. a. meinertzhagenae*, Snares Island snipe *C. huegeli*, Antipodes parakeet *Cyanoramphus unicolor*, and Reischek's parakeet *C. hochstetteri*.

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Island name: Island area (ha):	Auckland 45,889	Adams 9,693	Enderby 695	Disptmnt 284	Rose 78	Ewing 58	Ocean 12
Auckland Island teal	Extinct	Yes	Yes	Yes	Yes	Yes	Yes
Mallard	Yes	?	Yes		?	?	
Grey duck	Few	?	Few				
Eastern rockhopper penguin	Yes	Yes		Yes			
Yellow-eyed penguin	Yes	Yes	Yes	Few	Yes	Yes	Yes
Gibson's wandering albatross	Few	Yes		Yes			
Southern royal albatross	Few	Yes	Yes				
White-capped mollymawk	Yes	Yes		Yes			
Light-mantled sooty albatross	Yes	Yes	Yes	Yes	Yes		
Northern giant petrel	Few	Yes	Yes	Yes	Extinct	Yes	Yes
White-headed petrel	Extinct	Yes	Yes	Yes	Yes	Yes	Yes
Antarctic prion	Few	Yes	Few	?	?	?	Yes
Fulmar prion			?	Yes	Yes	Yes	Yes
White-chinned petrel	Few	Yes	Few	Yes		Yes	
Sooty shearwater	Extinct	Yes	Yes	Yes	Yes	Yes	Yes
Common diving petrel	Extinct	Yes	Yes	Yes	Yes	Yes	Yes
Grey-backed storm petrel	Few	Yes	Yes	Yes	Yes	Yes	?
Black-bellied storm petrel		Yes	Yes	Yes	Yes	Yes	?
Auckland Island shag	Few	Yes	Yes	Yes	Yes	Yes	
New Zealand falcon	Few	Yes	Yes		Few		
Auckland Island rail	Extinct	Yes	Extinct	Yes	Extinct	?	
Auckland Island snipe	Extinct	Yes	Yes	Yes	Yes	Yes	Yes
Auckland Island banded dotterel	Extinct	Yes	Yes		Yes		
Subantarctic skua	Extinct?	Yes	Yes	Yes	Yes	Yes	Yes
Southern black-backed gull	Yes	Yes	Yes		Yes	?	?
Red-billed gull	?	Yes	Yes		?	?	?
White-fronted tern	?		Yes				
Antarctic tern	Few		Yes		Yes	Yes	?
Red-crowned parakeet	?	Yes	Yes		Yes	Yes	
Yellow-crowned parakeet	Yes	Few	Few			Few	
Bellbird	Yes	Yes	Yes		Yes	Yes	Yes
Tui	Yes	Few	Few			Few	Few
Tomtit	Yes	Yes	Yes		Extinct	Yes	
Silveryeye	Yes	Few	Yes	Yes	Extinct	Yes	Yes
Eurasian blackbird	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Song thrush	Few		Few				
Starling	Few	Few	Yes	Yes	Yes	Yes	
Auckland Island pipit	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dunnock	Few	Few	Yes	Yes	Few	Yes	Yes
Common redpoll	Yes	Yes	Yes	Yes	Yes		Yes

The absence of forest and fellfield, and the very short waterways, on Disappointment Island has resulted in a much-reduced land-bird diversity there compared with other islands (Table 4 and Fig. 24). Species that have not been recorded on Disappointment Island even as vagrants include mallard, grey duck, falcon, banded dotterel, red-crowned parakeet, yellow-crowned parakeet, bellbird, tui, and tomtit. The absence of parakeets on Disappointment Island is difficult to explain given that two species of *Cyanoramphus* parakeets thrive in similar tussock and megaherb-field habitats on Enderby, Adams, and Antipodes Islands, and that parakeets formerly occurred on unforested Campbell and Macquarie Islands further south (R.H. Taylor 1975b, 1979; Holdaway *et al.* 2010).

Migrant and vagrant bird species at the Auckland Islands

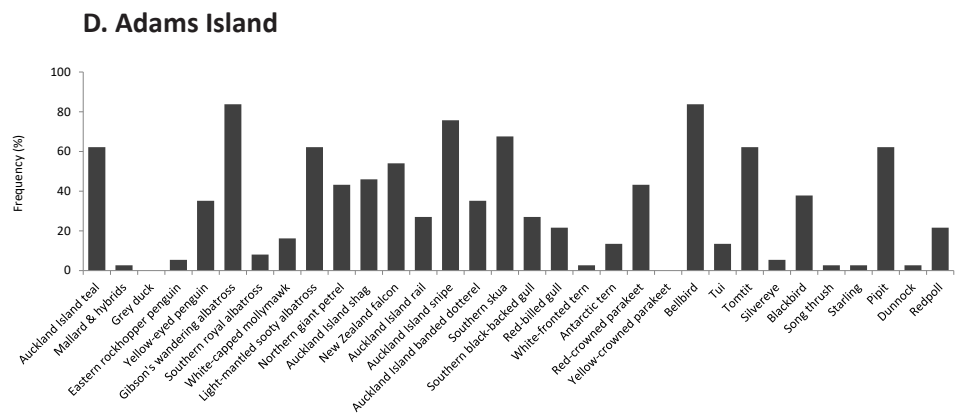
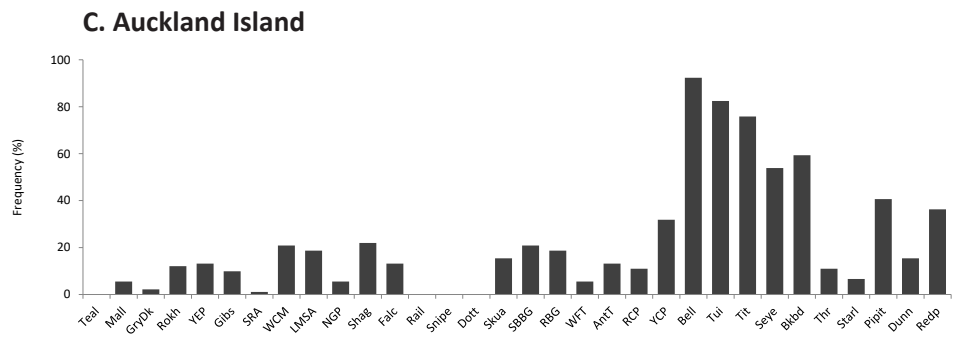
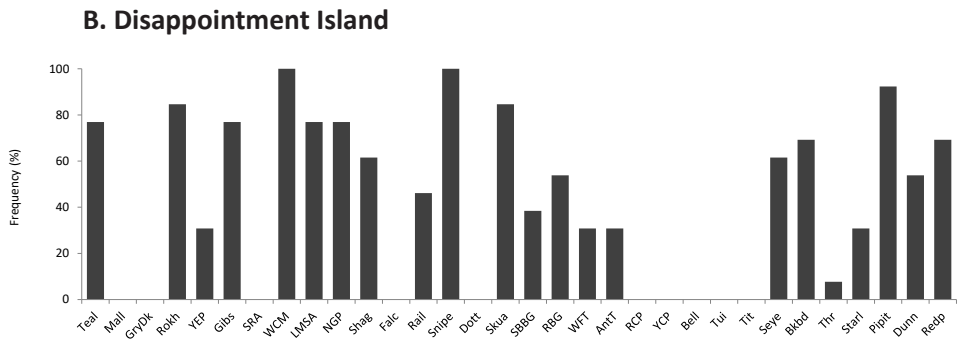
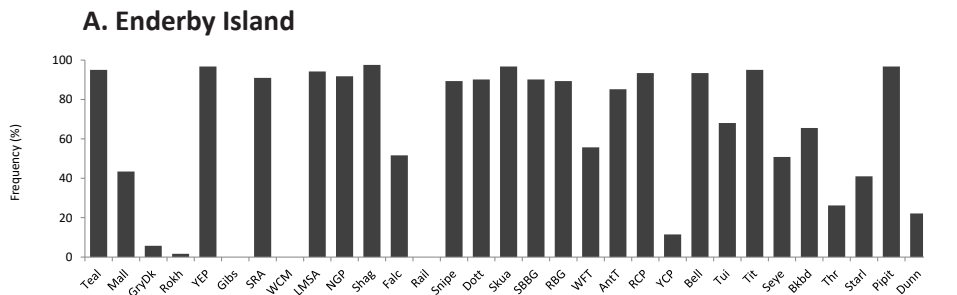
We recognise 76 migrant or vagrant species as having reached the Auckland Islands, most of which have also been encountered on other subantarctic islands south of New Zealand. The main sources of these birds have been mainland New Zealand (22 species), holarctic migrants (particularly waders; 14 species), and either New Zealand or Australia (8 species). Other sources have included Australia (6 species), Antarctica (5 species), and islands in the Southern Ocean beyond the New Zealand region (2–5 species), with the remaining 16–19 species coming from the other island groups south of mainland New Zealand, or the Chatham Islands.

Among the vagrant species recorded at the Auckland Islands are 14 species that to date have not been recorded at any of the other New Zealand subantarctic island groups or Macquarie Island:

black swan, blue duck, Cook's petrel, reef heron, spotless crake, sanderling, curlew sandpiper, pectoral sandpiper, whimbrel, black-tailed godwit, wandering tattler, Pacific golden plover, banded dotterel (nominat subspecies), and Caspian tern. Half of these 'Auckland Islands only' species are holarctic migrant waders, and most of the remainder are also strong-flying birds. Banded dotterels are tran-Tasman migrants, and reef heron, spotless crake, and Caspian tern have all reached the Chatham Islands as vagrants (L.C. Bell 1955; Müller 1989; Turbott 1990; Miskelly, Bester *et al.* 2006). The most unlikely vagrant species recorded at the Auckland Islands was blue duck (a flock of five in 1883). Blue ducks were much more abundant on mainland New Zealand in the 1880s than they are now; contemporary accounts referred to as many 40–50 being taken in a day, including several taken far out at sea (Buller 1888).

Records of new vagrant species continue to accumulate from the Auckland Islands almost annually, with no suggestion that an asymptote has been reached (Fig. 19 in Miskelly & Taylor 2020 – Chapter 1). At least 40 additional vagrant bird species recorded on other islands south of Stewart Island have not yet been seen in the Auckland Islands. The most notable absence is the gentoo penguin (*Pygoscelis papua*), which breeds on Macquarie Island and has been recorded as a vagrant from the Snares, Antipodes, and Campbell Islands (Kinsky 1969; Miskelly *et al.* 2001; Tennyson *et al.* 2002). Species recorded as vagrants on three of the other subantarctic island groups south of New Zealand but not yet on the Auckland Islands include macaroni penguin (*Eudyptes chrysolophus*) and common greenshank (*Tringa nebularia*) (both species recorded from Snares, Campbell, Macquarie), and rock pigeon/racing pigeon (*Columba livia*) (Snares, Antipodes, Macquarie). Species that have reached both the Snares Islands and Macquarie Island (i.e. north and south of the Auckland Islands) but not other islands include hoary-headed grebe (*Poliiocephalus poliocephalus*), nankeen night heron (*Nycticorax caledonicus*), Japanese snipe (*Gallinago hardwickii*), and tree martin (*Petrochelidon nigricans*), while nankeen kestrel (*Falco cenchroides*) has reached Campbell and Antipodes Islands, fork-tailed swift (*Apus pacificus*) has reached Antipodes and Macquarie Islands, and sooty albatross (*Phoebastria*

TABLE 4 (OPPOSITE). A comparison of the breeding bird faunas of the seven largest islands in the Auckland Islands, based on recent records (mainly since 1990). Globally extinct taxa and those no longer known to breed at the Auckland Islands are not shown; nor is the Cape petrel, which is not known to breed on any of the seven largest islands in the group. Scientific names are given in the text. Disptmnt = Disappointment Island.



fusca) has been recorded ashore on Antipodes and Macquarie Islands, as well as at sea north of the Auckland Islands (Kinsky 1969; Imber 1988; Marchant & Higgins 1990; Medway 2000, 2003; Miskelly *et al.* 2001, 2015; Tennyson *et al.* 2002; Copson & Brothers 2008). Eleven bird species from the New Zealand mainland have reached the Snares Islands (270 km north of the Auckland Islands) but have not yet been recorded (or confirmed present) further south: little penguin (*Eudyptula minor*), grey-faced petrel (*Pterodroma gouldi*), pied shag (*Phalacrocorax varius*), spotted shag (*Stictocarbo punctatus*), variable oystercatcher (*Haematopus unicolor*), black-billed gull (*Chroicocephalus bulleri*), black-fronted tern (*Chlidonias albotriatus*), long-tailed cuckoo (*Eudynamis taitensis*), morepork (*Ninox novaeseelandiae*), grey warbler (*Gerygone igata*), and New Zealand fantail (*Rhipidura fuliginosa*) (Miskelly *et al.* 2001; Bartle & Tennyson 2009).

We hope that the summary of records presented here will encourage observers of additional species to submit evidence of their sighting to the Birds New Zealand Records Appraisal Committee (via <https://www.osnz.org.nz/webforms/online-reporting-form>).

FIGURE 24 (OPPOSITE). Differences in reporting rates for 32 bird species on the four largest islands in the Auckland Islands. The frequency of reports is the proportion of recent visits to each island during which at least one individual of each species was reported (number of full lists per island: Enderby 122, Disappointment 9, Auckland 91, Adams 22). Species abbreviations in A–C are given in full in panel D, and scientific names are given in the text. Burrow-nesting petrels are not included as they are rarely reported during daytime landings (see relevant species accounts for information on petrel distribution within the group).

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Literature cited

- Adams, C.J. 1983. Age of the volcanoes and granite basement of the Auckland Islands, Southwest Pacific. *New Zealand Journal of Geology and Geophysics* 26: 227–237.
- Aikman, H.; Miskelly, C. 2004. *Birds of the Chatham Islands*. Wellington, Department of Conservation. 116 pp.
- Alexander, D. 1902. Cruise of the *Tutanekai* to the southern islands December 1901–January 1902. Manuscript MSY-4600-04. Alexander Turnbull Library, Wellington.

- Allen, M.F.** 1997. *The wake of the Invercauld*. Auckland, Exisle. 256 pp.
- Anderson, A.** 2005. Subpolar settlement in South Polynesia. *Antiquity* 79: 791–800.
- Anderson, A.** 2009. Prehistoric archaeology in the Auckland Islands, New Zealand subantarctic region. pp 9–37 In: Dingwall, P.R.; Jones, K.L.; Egerton, R. (eds) *In care of the Southern Ocean – an archaeological and historical survey of the Auckland Islands*. New Zealand Archaeological Association Monograph 17.
- Armstrong, H.** 1868. Cruise of the brig *Amherst* – Official report. *New Zealand Government Gazette, Province of Southland* Vol. 6 (no. 9): 51–56. [11 April 1868].
- Atkinson, T.** 2001. 'St Michael' goes south; a 31 foot motor-sailer in support of the 1972/73 Auckland Islands Scientific Expedition. Wellington, Department of Conservation. 136 pp.
- Bailey, A.M.; Sorensen, J.H.** 1962. *Subantarctic Campbell Island*. Proceedings No. 10. Denver Museum of Natural History. 305 pp.
- Baker, A.J.; Miskelly, C.M.; Haddrath, O.** 2010. Species limits and population differentiation in New Zealand snipes (Scolopacidae: Coenocorypha). *Conservation Genetics* 11: 1363–1374.
- Baker, G.B.; Elliott, G.P.; French, R.K.; Jensz, K.; Muller, C.G.; Walker, K.J.** 2020. Development of aerial monitoring techniques to estimate population size of great albatrosses (*Diomedea* spp.). *Notornis* 67: 321–331.
- Baker, G.B.; Jensz, K.** 2014. Light-mantled sooty albatross aerial survey Auckland Islands 2014. Draft report prepared by Latitude 42 for the New Zealand Department of Conservation. 9 pp.
- Baker, G.B.; Jensz, K.; Cunningham, R.** 2018. White-capped albatross aerial survey analysis of 2015 & 2016 breeding season data. Draft report prepared by Latitude 42 Environmental Consultants Pty Ltd for Ministry for Primary Industries Contract SEA2016–29. 24 pp.
- Bartle, J.A.; Paulin, C.D.** 1986. Bird observations, Auckland Island, December 1976. pp. 51–61 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Bartle, J.A.; Tennyson, A.J.D.** 2009. History of Walter Buller's collections of New Zealand birds. *Tuhinga* 20: 81–136.
- Barton, R.J.** (compiler) 1927. *Earliest New Zealand. The journals and correspondence of the Rev. John Butler*. Masterton, Palamontain & Petherick. 449 pp.
- Beer, K.J.** 2010. Distribution of yellow-eyed penguins (*Megadyptes antipodes*) on the Auckland Islands: November–December 2009. Dunedin, Department of Zoology, University of Otago. 58 pp.
- Bell, B.D.** 1975. Report on the birds of the Auckland Islands Expedition 1972–73. pp. 136–142 In: Yaldwyn, J. (ed.) *Preliminary results of the Auckland Islands Expedition 1972–73*. Wellington, New Zealand Department of Lands and Survey.
- Bell, E.A.** 2017. White-chinned petrel. In: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz [viewed 28 Apr 2019].
- Bell, L.C.** 1955. Notes on the birds of the Chatham Islands. *Notornis* 6: 65–68.
- Blundell, S.** 2017. Paradise regained: predator-free Enderby Island. *The Listener* 18 Mar 2017 <https://www.noted.co.nz/currently/environment/paradise-regained-predator-free-enderby-island> [viewed 25 Mar 2019].
- Bourne, W.R.P.; Warham, J.** 1966. Geographical variation in giant petrels of the genus *Macronectes*. *Ardea* 54: 45–67.
- Buckingham, R.; Elliott, G.; Walker, K.** 1991. Bird and mammal observations on Adams Island and southern Auckland Island 1989. Science & Research Internal Report No. 105. Wellington, Department of Conservation. 16 pp.
- Bugayer, J. (ed.)** Accepted ms. *Antarctic's voyage to the Southern Ocean or the Norwegian landing on South Victoria Land*. Seattle, Ayer and Land Books.
- Buller, W.L.** 1888. *A history of the birds of New Zealand*. Vol. 2. 2nd edn. London, published by the author. 359 pp.
- Buller, W.L.** 1891. An exhibition of new and interesting forms of New Zealand birds, with remarks thereon. *Transactions of the New Zealand Institute* 23: 36–43.
- Burton, R.; Croxall, J.** 2012. *A field guide to the wildlife of South Georgia*. Princeton, Princeton University Press. 200 pp.
- Cass, C.** 2014. *We three go south; the 1890 diary of Ethel Richardson's trip to the sub-Antarctic*. Wellington, Phantom House. 151 pp.
- Cawthorn, M.W.** 1986a. Hooker's sea lion research, Enderby Island, Auckland Islands, April 1983. pp. 30–34 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to*

- the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Cawthorn, M.W.** 1986b. Hooker's sea lion research at Enderby Island, Auckland Islands, January–February 1984. pp. 35–38 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Cawthorn, M.W.** 1986c. Hooker's sea lion research at Enderby Island, Auckland Islands, December 1981–February 1982. pp. 24–29 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Challies, C.N.** 1975. Feral pigs (*Sus scrofa*) on Auckland Island: status, and effects on vegetation and nesting sea birds. *New Zealand Journal of Zoology* 2: 479–490.
- Chance, G.R.** 1992. Falcons in the subantarctic. *OSNZ News* 62: 8.
- Chapman, F.R.** 1891. The outlying islands south of New Zealand. *Transactions of the New Zealand Institute* 23: 491–522.
- Childerhouse, S.; Robertson, C.; Hockly, W.; Gibbs, N.** 2003. Royal albatross (*Diomedea epomophora*) on Enderby Island, Auckland Islands. *DOC Science Internal Series* 144: 1–19.
- Chilvers, B.L.; Baker, G.B.; Hiscock, J.A.; McClelland, P.J.; Holdworth, M.; Jensz, K.** 2015. Comparison of breeding population survey methods for Auckland Island shag (*Phalacrocorax colensoi*). *Polar Biology* 38: 1847–1852.
- Claridge, J.C.R.** 1983. Welcome swallows at the Auckland Islands. *Notornis* 30: 282.
- Clark, G.; Booth, A.; Aimey, J.** 1998. The "Totorore" expedition to the Bounty Islands, New Zealand, October 1997 to February 1998. Unpublished report submitted to the Department of Conservation.
- Cooper, W.** 1992. Rockhopper penguins at the Auckland Islands. *Notornis* 39: 66–67.
- Cooper, W.J.; Miskelly, C.M.; Morrison, K.; Peacock, R.J.** 1986. Birds of the Solander Islands. *Notornis* 33: 77–89.
- Copson, G.R.; Brothers, N.P.** 2008. Notes on rare, vagrant and exotic avifauna at Macquarie Island, 1901–2000. *Papers and Proceedings of the Royal Society of Tasmania* 142: 105–116.
- Darby, J.T.; Seddon, P.J.** 1990. Breeding biology of the yellow-eyed penguin. pp. 45–62. In: Davis, L.S.; Darby, J.T. (eds) *Penguin biology*. Orlando, Florida, Academic Press.
- Darby, M.M.** 1970. Summer seabirds between New Zealand and McMurdo Sound. *Notornis* 17: 28–55.
- Dawson, E.W.** 1964. Antarctic oceanography 1963–64. *Antarctic* (June): 430–432.
- Dawson, E.W.** 2012. *The Auckland Islands/Motu Maha/Maungahuka/subantarctic New Zealand: a working bibliography*. The Hutton Foundation New Zealand Special Papers No. 7. Eastbourne, Wallypug Press. 507 pp.
- Dawson, E.W.** 2020. An extinct New Zealand raven (*Corvus antipodum*) on the Auckland Islands – an osteographic enigma? *Notornis* 67: 295–297.
- de Lisle, J.F.** 1965. The climate of the Auckland Islands, Campbell Island and Macquarie Island. *Proceedings of the New Zealand Ecological Society* 12: 37–44.
- Dell, R.K.** 1952. The blue petrel in Australasian waters. *Emu* 52: 147–154.
- Dingwall, P.R.** 2009. Pastoral farming at the Auckland Islands. pp 107–122 In: Dingwall, P.R.; Jones, K.L.; Egerton, R. (eds) *In care of the Southern Ocean – an archaeological and historical survey of the Auckland Islands*. New Zealand Archaeological Association Monograph 17.
- Dormon, P.** 1991. Subantarctic islands bird cruise. *OSNZ News* 60: 1.
- Dumont d'Urville, J.S.C.** 1846. *Voyage au Pole sud dans l'Océanie sur les corvettes l'Astrolabe et la Zélée*. Paris. 295 pp.
- Egerton, R.; Burgess, S.; Petchey, P.; Dingwall, P.R.** 2009. The Auckland Islands shipwreck era. pp. 123–190 In: Dingwall, P.R.; Jones, K.L.; Egerton, R. (eds) *In care of the Southern Ocean – an archaeological and historical survey of the Auckland Islands*. New Zealand Archaeological Association Monograph 17.
- Elliott, G.; Walker, K.; Buckingham, R.** 1991. The Auckland Island rail. *Notornis* 38: 199–209.
- Elliott, G.; Walker, K.; Parker, G.; Rexer-Huber, K.** 2016. Gibson's wandering albatross census and population study 2015/16. Report on CSP Project 4655. Wellington, Department of Conservation. 19 pp.
- Elliott, G.; Walker, K.; Parker, G.; Rexer-Huber, K.** 2018. Gibson's wandering albatross population study and census 2017/18. Report prepared by Albatross Research for the Department of Conservation. 16 pp.

- Elliott, G.P.; Walker, K.J.; Parker, G.C.; Rexer-Huber, K.; Miskelly, C.M.** 2020. Subantarctic Adams Island and its birdlife. *Notornis* 67: 153–187.
- Enderby, C.** 1875. In: *The New Zealand Pilot* (4th edition). London, Hydrographic Office, Admiralty.
- Escott-Inman, H.** 1911. *The castaways of Disappointment Island*. London, Partridge. 319 pp.
- Esler, L.** 1999. Regional roundup, Southland. *OSNZ News* 9: 15.
- Eunson, K.** 1974. *The wreck of the General Grant*. Wellington, Reed. 168 pp.
- Everitt, D.A.; Miskelly, C.M.** 2003. A review of isabellinism in penguins. *Notornis* 50: 43–51.
- Falla, R.A.** 1933. Notes on New Zealand petrels; with descriptions of new forms and some new records. *Records of the Auckland Institute and Museum* 1: 173–180.
- Falla, R.A.** 1937. Birds. *B.A.N.Z. Antarctic Research Expedition 1929–1931. Reports – Series B, Vol. 2*. Adelaide, B.A.N.Z.A.R.E. Expedition Committee. 103 pp.
- Falla, R.A.** 1965. Birds and mammals of the subantarctic islands. *Proceedings of the New Zealand Ecological Society* 12: 63–68.
- Falla, R.A.** 1967. An Auckland Island rail. *Notornis* 14: 107–113.
- Falla, R.A.** 1975. Memorandum on the field research programme proposed for the Auckland Islands expedition 1972–73. pp. 405–410 In: Yaldwyn, J. (ed.) *Preliminary results of the Auckland Islands Expedition 1972–73*. Wellington, New Zealand Department of Lands and Survey.
- Falla, R.A.** 1978. Banded dotterel at the Auckland Islands: description of a new sub-species. *Notornis* 25: 101–108.
- Falla, R.A.; Taylor, R.H.; Black, C.** 1979. Survey of Dundas Island, Auckland Islands, with particular reference to Hooker's sea lion (*Phocarctos hookeri*). *New Zealand Journal of Zoology* 6: 347–355.
- Fennell, J.F.M.** 1986. Annual report of the OSNZ Rare Birds Committee. *OSNZ News* 39: 3.
- Finsch, O.** 1869. Notes on Mr. Walter Buller's "Essay on the ornithology of New Zealand". *Transactions and Proceedings of the New Zealand Institute* 1: 58–70.
- Fischer, J.H.; Debski, I.; Miskelly, C.M.; Bost, C.A.; Fromant, A.; Tennyson, A.J.D.; Tessler, J.; Hiscock, J.H.; Taylor, G.A.; Wittmer, H.U.** 2018. Analysis of phenotypic differentiations among South Georgian diving petrel (*Pelecanoides georgicus*) populations reveal an undescribed and highly endangered species from New Zealand. *PLOS One*: <https://doi.org/10.1371/journal.pone.0197766>
- Fischer, J.H.; Hjorsvarsdottir, F.O.; Hiscock, J.A.; Debski, I.; Taylor, G.A.; Wittmer, H.U.** 2017. Confirmation of the extinction of South Georgian diving petrels (*Pelecanoides georgicus*) on Enderby Island. *Notornis* 64: 48–51.
- Fleming, C.A.** 1950. New Zealand flycatchers of the genus *Petroica* Swainson. *Transactions of the Royal Society of New Zealand* 78: (Pt 1) 14–47 & (Pt 2) 127–160.
- Fleming, C.A.** (convener) 1953. *Checklist of New Zealand birds*. Wellington, Reed. 80 pp.
- Fleming, C.A.** 1982. *George Edward Lodge; the unpublished New Zealand bird paintings*. Wellington, Nova Pacifica. 410 pp.
- Flux, I.A.** 2002. New Zealand white-capped mollymawk (*Diomedea cauta steadi*) chicks eaten by pigs (*Sus scrofa*). *Notornis* 49: 175–176.
- Fraser, C.** 2014. *The Enderby settlement: Britain's whaling venture on the subantarctic Auckland Islands 1849–52*. Dunedin, Otago University Press. 256 pp.
- French, R.K.; Miskelly, C.M.; Muller, C.G.; Russ, R.B.; Taylor, G.A.; Tennyson, A.J.D.** 2020. Birds of Enderby Island, Auckland Islands, New Zealand subantarctic. *Notornis* 67: 189–212.
- French, R.K.; Muller, C.G.; Chilvers, B.L.; Battley, P.F.** 2018. Behavioural consequences of human disturbance on subantarctic yellow-eyed penguins *Megadyptes antipodes*. *Bird Conservation International* 1–14. doi:10.1017/S0959270918000096.
- Gales, R.** 1993. *Co-operative mechanisms for the conservation of albatross*. Hobart, Australian Nature Conservation Agency. 132 pp.
- Gamble, J.A.; Turnbull, I.M.; Ritchie, D.D.; Adams, C.J.** 1986. Geology of Carnley Harbour, Auckland Islands, February–March 1982. pp. 159–168 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Garcia-R, J.C.; Elliott, G.; Walker, K.; Castro, I.; Treweek, S.A.** 2016. Trans-equatorial range of a land bird lineage (Aves: Rallidae) from tropical forests to subantarctic grasslands. *Journal of Avian Biology* 46: 219–226.

- Gardiner, M.J.** 1986. General observations from Auckland Islands Expedition, January 1976. pp. 211–214. In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Gill, B.** 2003. Osteometry and systematics of the extinct New Zealand ravens. *Journal of Systematic Palaeontology* 1: 43–58.
- Gill, B.J.; Bell, B.D.; Chambers, G.K.; Medway, D.G.; Palma, R.L.; Scofield, R.P.; Tennyson, A.J.D.; Worthy, T.H.** 2010. *Checklist of the birds of New Zealand, Norfolk and Macquarie Islands, and the Ross Dependency, Antarctica*. 4th edn. Wellington, Te Papa Press in association with the Ornithological Society of New Zealand. 501 pp.
- Godley, E.** 1965. Notes on the vegetation of the Auckland Islands. *Proceedings of the New Zealand Ecological Society* 12: 57–63.
- Godley, E.J.** 1979. The 1907 expedition to the Auckland and Campbell Islands, and an unpublished report by B.C. Aston. *Tuatara* 23: 133–158.
- Gray, G.R.** 1845. Birds. I. Birds of New Zealand. pp. 1–20. In: *The zoology of the voyage of H.M.S. Erebus and Terror, under the command of Captain Sir James Clark Ross, R.N., F.R.S., during the years 1839–43*. Vol. I. London, E.W. Janson.
- Gray, G.R.** 1859. *List of the specimens of birds in the collection of the British Museum*. Part 3. Section 2. Psittacidae. London, The Trustees. 110 pp.
- Greenway, J.C.** 1958. *Extinct and vanishing birds of the world*. New York, American Committee for International Wild Life Protection Special Publication No. 13. 518 pp.
- Greig, J.B.** 1865. Expedition to the Auckland Islands. *Southland Provincial Government Gazette* 3 (23): 120–122 (5 Dec 1865).
- Guthrie-Smith, H.** 1925. *Bird life on island and shore*. Edinburgh, William Blackwood. 195 pp.
- Guthrie-Smith, H.** 1936. *Sorrows and joys of a New Zealand naturalist*. Dunedin, Reed. 252 pp.
- Harper, G.A.** 2010. Diet of feral cats on subantarctic Auckland Island. *New Zealand Journal of Ecology* 34: 259–261.
- Heather, B.D.** 1987. The chestnut-breasted shelduck in New Zealand 1983–1986. *Notornis* 34: 71–77.
- Hector, J.** 1881. New Zealand Institute, 1880–81 (13th annual report). *Appendices to the Journals of the House of Representatives*, 1881 Session I, H-25.
- Hemmings, A.D.** 1994. Cooperative breeding in the skuas (Stercorariidae): history, distribution and incidence. *Journal of the Royal Society of New Zealand* 24: 245–260.
- Higgins, P.J. (ed.)** 1999. *Handbook of Australian, New Zealand and Antarctic birds. Parrots to dollarbird*. Vol. 4. Melbourne, Oxford University Press. 1248 pp.
- Higgins, P.J.; Davies, S.J.J.F. (eds)** 1996. *Handbook of Australian, New Zealand and Antarctic birds, Snipe to pigeons*. Vol. 3. Melbourne, Oxford University Press. 1028 pp.
- Holdaway, R.N.; Thorncroft, J.M.; McClelland, P.; Bunce, M.** 2010. Former presence of a parakeet (*Cyanoramphus* sp.) on Campbell Island, New Zealand subantarctic, with notes on the island's fossil sites and fossil record. *Notornis* 57: 8–18.
- Hombron, [J.B.]; Jacquinot, [H.]** 1841. Description de plusieurs oiseaux nouveaux ou peu connus, provenant de l'expédition autour du monde faite sur les corvettes l'*Astrolabe* et la *Zélée*. *Annales des Sciences Naturelles* (Second series) 16: 312–320.
- Horning, D.S.; Horning, C.J.** 1974. Bird records of the 1971–73 Snares Islands, New Zealand, expedition. *Notornis* 21: 13–24.
- Hyde, N.H.S.; Worthy, T.H.** 2010. The diet of New Zealand falcons (*Falco novaeseelandiae*) on the Auckland Islands, New Zealand. *Notornis* 57: 19–26.
- Imber, M.J.** 1983. The lesser petrels of Antipodes Island, with notes from Prince Edward and Gough Islands. *Notornis* 30: 283–298.
- Imber, M.J.** 1988. Annual report of the Rare Birds Committee 1987/88. *OSNZ News* 47: 5.
- Imber, M.J.** 2004. Attempted colonisation of Antipodes Island by goldfinches (*Carduelis carduelis*). *Notornis* 51: 163–164.
- Johnson, P.N.; Campbell, D.J.** 1975. Vascular plants of the Auckland Islands. *New Zealand Journal of Botany* 13: 665–720.
- Kear, J.; Scarlett, R.J.** 1970. The Auckland Islands merganser. *Wildfowl* 21: 78–86.
- Kinsky, F.C.** 1969. New and rare birds on Campbell Island. *Notornis* 16: 225–236.
- Kinsky, F.C. (convener)** 1970. *Annotated checklist of the birds of New Zealand including the birds of the Ross Dependency*. Wellington, Reed. 96 pp.
- Krone, H.** 1875. Die deutsche Expedition zur Beobachtung des Venusdurchganges, am 9. Dezember 1874, auf den Auckland-Inseln. *Sitzungs-Berichte der naturwissenschaftlichen Gesellschaft Isis zu Dresden* (7–12): 126–138.

- Krone, H.** 1877. Die Auckland-Inseln. XIII. und XIV. *Jahresberichte des Vereins für Erdkunde zu Dresden*: 35–44.
- Krone, H.** 1900. *Vater und Sohn auf der Weltreise 1874, 1875 zur Beobachtung des Venusdurchgangs 1874 Dezember 9, Station Auckland-Inseln*. [Father and son on a voyage around the world 1874, 1875 to observe the transit of Venus, Auckland Islands station.] Vol. 2: 1–312; Vol. 3: 1–234. Halle a. d. Saale, Otto Hendel.
- Lalas, C.; McConnell, H.** 2012. Prey of Auckland Island shags (*Leucocarbo colensoi*) in winter. *Notornis* 59: 130–137.
- Lukins, E.** 1896. *Round southern isles*. Nelson, Bond, Finney & Co. 28 pp.
- Malone, R.E.** 1854. *Three years' cruise in the Australasian colonies*. London, Bentley. 304 pp.
- Marchant, S.; Higgins, P.J. (eds)** 1990. *Handbook of Australian, New Zealand & Antarctic Birds. Ratites to Ducks*. Vol. 1. Melbourne, Oxford University Press. 1400 pp.
- Marples, B.J.** 1946. List of the birds of New Zealand. *New Zealand Bird Notes* (supplement), 7 pp.
- Martin, R.M.** [1852]. *The British colonies; their history, extent, conditions and resources*. New Zealand, Tasmania, etc. Vol. 3. London, London Printing and Publishing. 886 pp.
- Mathews, G.M.; Iredale, T.** 1913. A reference list of the birds of New Zealand. Part II. *Ibis* (series 10) 1: 402–452.
- Mayhill, P.; Goulstone, J.F.** 1986. Landsnails of the Auckland Islands December 1983. pp. 86–99 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- McClelland, P.** 1993. Subantarctic teal recovery plan (*Anas aucklandica*). Threatened Species Recovery Plan No. 7. Wellington, Department of Conservation, Threatened Species Unit. 27 pp.
- McClelland, P.J.; Moore, P.J.** 1991. New species for the Auckland Islands. *Notornis* 38: 80.
- McCormick, R.** 1884. *Voyages of discovery in the Arctic and Antarctic seas and round the world*. 2 vols. London, Sampson Low, Marston, Searle and Rivington. 843 pp.
- McEwen, M. (ed.)** 2006. *Charles Fleming's Cape Expedition diary: Auckland Islands, 1942–43*. Wellington, McEwen Associates. 256 pp.
- McGlone, M.S.** 2002. The Late Quaternary peat, vegetation and climate history of the southern oceanic islands of New Zealand. *Quaternary Science Review* 21: 683–707.
- Medway, D.G.** 2000. Rare Birds Committee – combined report for 1992–1999. *Notornis* 47: 64–70.
- Medway, D.G.** 2003. Rare Birds Committee – 6 monthly report. *Southern Bird* 14: 14–15.
- Miskelly, C.M.** 1984. Birds of the Western Chain, Snares Islands 1983–84. *Notornis* 31: 209–223.
- Miskelly, C.M.** 1987. The identity of the hakaawai. *Notornis* 34: 95–116.
- Miskelly, C.M.** 1999. Social constraints on access to mates in a high density population of New Zealand snipe (*Coenocorypha aucklandica*). *Notornis* 46: 223–239.
- Miskelly, C.M.** 2000. Historical records of snipe from Campbell Island, New Zealand. *Notornis* 47: 131–140.
- Miskelly, C.M.** 2005. Evidence for 'hakaawai' aerial displaying by Snares Island snipe (*Coenocorypha aucklandica huegeli*). *Notornis* 52: 163–165.
- Miskelly, C.M.** 2013. Erect-crested penguin. In: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz [viewed 28 Mar 2019].
- Miskelly, C.M.** 2014. Legal protection of New Zealand's indigenous terrestrial fauna – an historical review. *Tuhinga* 25: 25–101.
- Miskelly, C.M.** 2017. Chatham Island snipe. In: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz [viewed 28 Apr 2019].
- Miskelly, C.M.** 2020a. Endemic is good, introduced is boring? Biases in bird reporting rates at the Auckland Islands. *Notornis* 67: 431–434.
- Miskelly, C.M.** 2020b. First record of South Polar skua (*Catharacta maccormicki*) from New Zealand – Auckland Islands, March 1904. *Notornis* 67: 427–429.
- Miskelly, C.M.; Baker, A.J.** 2010. Description of a new subspecies of *Coenocorypha* snipe from subantarctic Campbell Island, New Zealand. *Notornis* 56: 113–123.
- Miskelly, C.M.; Bell, E.A.; Elliott, G.P.; Walker, K.J.** 2006. 'Hakaawai' aerial displaying by three populations of subantarctic snipe (genus *Coenocorypha*). *Notornis* 53: 375–381.
- Miskelly, C.M.; Bester, A.J.; Bell, M.** 2006. Additions to the Chatham Islands' bird list, with further records of vagrant and colonising bird species. *Notornis* 53: 215–230.

- Miskelly, C.M.; Cooper, J.H.** 2020. Macquarie Island shags (*Leucocarbo purpurascens*) at the Auckland Islands – an addition to the New Zealand list. *Notornis* 67: 419–426.
- Miskelly, C.M.; Crossland, A.C.; Sagar, P.M.; Saville, I.; Tennyson, A.J.D.; Bell, E.A.** 2013. Vagrant and extra-limital bird records accepted by the OSNZ Records Appraisal Committee 2011–2012. *Notornis* 60: 296–306.
- Miskelly, C.M.; Crossland, A.C.; Sagar, P.M.; Saville, I.; Tennyson, A.J.D.; Bell, E.A.** 2015. Vagrant and extra-limital bird records accepted by the Birds New Zealand Records Appraisal Committee 2013–2014. *Notornis* 62: 85–95.
- Miskelly, C.M.; Crossland, A.C.; Sagar, P.M.; Saville, I.; Tennyson, A.J.D.; Bell, E.A.** 2017. Vagrant and extra-limital bird records accepted by the Birds New Zealand Records Appraisal Committee 2015–2016. *Notornis* 64: 57–67.
- Miskelly, C.M.; Crossland, A.C.; Saville, I.; Southey, I.; Tennyson, A.J.D.; Bell, E.A.** 2019. Vagrant and extra-limital bird records accepted by the Birds New Zealand Records Appraisal Committee 2017–2018. *Notornis* 66: 150–163.
- Miskelly, C.M.; Gilad, D.; Taylor, G.A.; Tennyson, A.J.D.; Waugh, S.M.** 2019. A review of the distribution and size of gadfly petrel (*Pterodroma* spp.) colonies throughout New Zealand. *Tuhinga* 30: 93–173.
- Miskelly, C.M.; McNally N.; Seymour R.; Gregory-Hunt D.; Lanauze J.** 2008. Antipodean wandering albatrosses (*Diomedea antipodensis*) colonising the Chatham Islands. *Notornis* 55: 89–95.
- Miskelly, C.M.; Sagar, P.M.; Tennyson, A.J.D.; Scofield, R.P.** 2001. Birds of the Snares Islands, New Zealand. *Notornis* 48: 1–40.
- Miskelly, C.M.; Stahl, J.-C.; Tennyson, A.J.D.** 2017. Do grey-backed storm petrels (*Garrodia nereis*) breed in Fiordland, New Zealand? *Notornis* 64: 109–114.
- Miskelly, C.M.; Taylor, R.H.** 2020. Ornithological discovery, exploration, and research on the Auckland Islands, New Zealand subantarctic. *Notornis* 67: 11–58.
- Miskelly, C.M.; Walker, K.J.; Elliott, G.P.** 2006. Breeding ecology of three subantarctic snipes (genus *Coenocorypha*). *Notornis* 53: 361–374.
- Mitchell, S.J.; Ensor, P.H.** 1986. Hooker's sea lion survey, Enderby Island, Auckland Islands, January 1980. pp. 15–23 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Moore, P.J.** 1990. Population survey of yellow-eyed penguins on the Auckland Islands, Nov–Dec 1989. Science and Research Internal Report No. 73. Wellington, Department of Conservation. 26 pp.
- Moore, P.J.** 1992a. Population estimates of yellow-eyed penguin (*Megadyptes antipodes*) on Campbell and Auckland Islands 1987–90. *Notornis* 39: 1–15.
- Moore, P.J.** 1992b. Breeding biology of the yellow-eyed penguin *Megadyptes antipodes* on Campbell Island. *Emu* 92: 157–162.
- Moore, P.J.** 2004. Abundance and population trends of mollymawks on Campbell Island. Science for Conservation 242. Wellington, Department of Conservation. 62 pp.
- Moore, P.J.; Larsen, E.J.; Charteris, M.; Pryde, M.** 2012. Southern royal albatross on Campbell Island/ Motu Ihupuku: solving a band injury problem and population survey. DOC Research and Development Series 333. Wellington, Department of Conservation. 53 pp.
- Moore, P.J.; McClelland, P.J.** 1990. Notes on the birds of the Auckland Islands, November–December 1989. Science and Research Internal Report No. 93. Wellington, Department of Conservation. 9 pp.
- Moore, P.J.; Moffat, R.D.** 1990. Research and management projects on Campbell Island 1987–88. Science and Research Internal Report No. 57. Wellington, Department of Conservation.
- Moore, P.J.; Taylor, G.A.; Aney, J.M.** 1997. Interbreeding of black-browed albatross *Diomedea m. melanophrys* and New Zealand black-browed albatross *Diomedea m. impavida* on Campbell Island. *Emu* 97: 322–324.
- Moore, P.J.; Walker, K.** 1990. Auckland Island teal on Ewing and Adams Island, Auckland Islands, November 1989. Science and Research Internal Report No. 82. Wellington, Department of Conservation. 12 pp.
- Moore, P.J.; Walker, K.** 1991. Auckland Island teal *Anas aucklandica aucklandica* revisited. *Wildfowl* 42: 137–144.
- Morrell, A.J.** 1833. *Narrative of a voyage to the Ethiopic and South Atlantic Ocean, Indian Ocean, Chinese Sea, North and South Pacific Oceans in the years 1829–30*. New York, Harper. 230 pp.
- Morrell, B.** 1832. *A narrative of four voyages: the South Sea, North and South Pacific Ocean, Chinese Sea, Ethiopic and Southern Atlantic Ocean, Indian and*

- Antarctic Ocean from the year 1822 to the year 1831*. New York, Harper. 492 pp.
- Morrison, K.W.** 2017. Eastern rockhopper penguin. In: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz [viewed 28 Apr 2019].
- Muller, C.G.; Chilvers, B.L.; French, R.K.; Hiscock, J.A.; Battley, P.F.** 2020. Population estimate for yellow-eyed penguins (*Megadyptes antipodes*) in the subantarctic Auckland Islands, New Zealand. *Notornis* 67: 299–319.
- Müller, H.H.** 1989. Beitrag zur Avifauna der Chatham Islands (Neuseeland). *Seevögel* 10: 47–62.
- Musgrave, T.** 1865. *Castaway on the Auckland Isles: a narrative of the wreck of the "Grafton" from the private journals of Capt. Thos. Musgrave*, edited by J.J. Shillinglaw. Melbourne, Dwight. 112 pp.
- Norman, W.H.; Musgrave, T.** 1866. *Journals of the voyage and proceedings of H.M.C.S. Victoria in search of ship-wrecked people at the Auckland and other islands*. Melbourne, Government Printer. 45 pp.
- Ogilvie-Grant, W.R.** 1905. On birds procured by the Earl of Ranfurly in New Zealand and the adjacent islands. *Ibis* 5 : 543–602.
- 146 Oliver, W.R.B.** 1955. *New Zealand birds*. 2nd edn. Wellington, Reed. 661 pp.
- Parker, G.; Bell, M.** 2017. Northern giant petrel population estimates and trends in New Zealand. Information document Inf 17 to PaCSWG4, Agreement on the Conservation of Albatrosses and Petrels. Dunedin, Parker Conservation. 3 pp.
- Parker, G.C.; French, R.K.; Muller, C.G.; Taylor, G.A.; Rexer-Huber, K.** 2020. First northern giant petrel (*Macronectes halli*) breeding population survey and estimate for the Auckland Islands, New Zealand. *Notornis* 67: 357–368.
- Parker, G.C.; Muller, C.G.; Rexer-Huber, K.** 2016. Northern giant petrel *Macronectes halli* breeding population survey, Auckland Islands, December 2015 – February 2016. Report to the Conservation Services Programme, Department of Conservation. Dunedin, Parker Conservation. 16 pp.
- Peale, T.R.** 1848. *United States Exploring Expedition, during the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes, U.S.N.* Vol. 8, Mammalia and ornithology. Philadelphia, C. Sherman. 338 pp.
- Penniket, A.** 1986. Miscellaneous notes on the birdlife of Enderby, Ewing and Ocean Islands, Auckland Islands, February–March 1982. pp. 78–79 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Pierce, R.J.** 1980. Habitats and feeding of the Auckland Island banded dotterel (*Charadrius bicinctus exilis* Falla 1978) in autumn. *Notornis* 27: 309–324.
- Pierce, R.** 1986. Report on banded dotterel research, Auckland Islands, April 1980. pp. 62–69 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Potts, T.H.** 1874. On the birds of New Zealand. *Transactions of the New Zealand Institute* 6: 139–153.
- Powlesland, R.G.** 1989. Seabirds found dead on New Zealand beaches in 1986 and a review of *Pachyptila* recoveries since 1960. *Notornis* 36: 125–140.
- Prickett, N.** 2009. Sealing in the Auckland Islands. pp. 39–57 In: Dingwall, P.R.; Jones, K.L.; Egerton, R. (eds) *In care of the Southern Ocean – an archaeological and historical survey of the Auckland Islands*. New Zealand Archaeological Association Monograph 17.
- Quilty, P.G.** 2007. Origin and evolution of the subantarctic islands: the foundation. *Papers and Proceedings of the Royal Society of Tasmania* 141: 35–58.
- Rainsley, E.; Turney, C.S.M.; Gollidge, N.R.; Wilmshurst, J.M.; McGlone, M.S.; Hogg, A.G.; Li, B.; Thomas, Z.A.; Roberts, R.; Jones, R.T.; Palmer, J.G.; Flett, V.; de Wet, G.; Hutchinson, D.K.; Lipson, M.J.; Fenwick, P.; Hines, B.R.; Binetti, U.; Fogwill, C.J.** 2019. Pleistocene glacial history of the New Zealand subantarctic islands. *Climate of the Past* 15: 423–448.
- Rawlence, N.J.; Kennedy, M.; Scofield, R.P.; Tennyson, A.J.D.; Boussès, P.; Chambers, G.K.** 2015. Taxonomic status of *Cyanoramphus* parakeets on the Auckland Islands and implications for the validity of the orange-fronted parakeet as a discrete species. *Journal of the Royal Society of New Zealand* 45: 197–211.
- Raynal, F.E.** 1874. *Wrecked on a reef, or, twenty months in the Auckland Islands*. London, Thomas Nelson. 215 pp.

- Rayner, M.J.; Hauber, M.E.; Clout, M.N.; Seldon, D.S.; Van Dijken, S.; Bury, S.; Phillips, R.A.** 2008. Foraging ecology of the Cook's petrel *Pterodroma cookii* during the austral breeding season: a comparison of its two populations. *Marine Ecology Progress Series* 370: 271–284.
- Reischek, A.** 1889a. Notes on the islands to the south of New Zealand. *Transactions of the New Zealand Institute* 21: 378–389.
- Reischek, A.** 1889b. The habits and home of the wandering albatross. *Transactions of the New Zealand Institute* 21: 126–128.
- Rexer-Huber, K.** 2017. White-chinned petrel distribution, abundance and connectivity have circumpolar conservation implications. PhD thesis, Dunedin, University of Otago. Available at: <http://hdl.handle.net/10523/7778>.
- 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. Draft final report to the Conservation Services Programme, Department of Conservation. Dunedin, Parker Conservation.
- Rexer-Huber, K.; Parker, G.** 2019. Maukahuka indicator species 2018: Enderby, Rose, Frenchs, Adams and Disappointment Islands. Final report to DOC Maukahuka Project. Dunedin, Parker Conservation.
- Rexer-Huber, K.; Parker, G.C.; Sagar, P.M.; Thompson, D.R.** 2017. White-chinned petrel population estimate, Disappointment Island (Auckland Islands). *Polar Biology* 40: 1053–1061.
- Rexer-Huber, K.; Thompson, D.R.; Parker, G.C.** 2020. White-chinned petrel (*Procellaria aequinoctialis*) burrow density, occupancy, and population size at the Auckland Islands. *Notornis* 67: 387–401.
- Rexer-Huber, K.; Walker, K.J.; Elliott, G.P.; Baker, G.B.; Debski, I.; Jensz, K.; Sagar, P.M.; Thompson, D.R.; Parker, G.C.** 2020. Population trends of light-mantled sooty albatross (*Phoebastria palpebrata*) at Adams Island and trial of ground-, boat-, and aerial methods for population estimates. *Notornis* 67: 341–355.
- Richdale, L.E.** 1943. The white-faced storm petrel or takahi-kare-moana. Part 1. *Transactions of the Royal Society of New Zealand* 73: 97–115.
- Robertson, C.J.R.** 1975. Report on the distribution, status and breeding biology of the royal albatross, wandering albatross and white-capped mollymawk on the Auckland Islands. pp. 143–151. In: Yaldwyn, J. (ed.) *Preliminary results of the Auckland Islands Expedition 1972–73*. Wellington, New Zealand Department of Lands and Survey.
- Robertson, C.J.R.; Bell, B.D.** 1984. Seabird status and conservation in the New Zealand region. pp. 573–586. In: Croxall, J.P., Evans, P.G.H. & Schreiber, R.W. (eds) *Status and conservation of the world's seabirds*. International Council for Bird Preservation Technical Publication 2. Cambridge, International Council for Bird Preservation. 778pp.
- Robertson, C.J.R.; Jenkins, J.** 1986. Bird observations, Auckland Islands February–June 1981. pp. 70–74. In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Robertson, C.J.R.; Robertson, G.G.; Bell, D.** 1997. White-capped albatross (*Thalassarche steadi*) breeding at Chatham Islands. *Notornis* 44: 156–158.
- Robertson, C.J.R.; van Tets, G.F.** 1982. The status of birds at the Bounty Islands. *Notornis* 29: 311–336.
- Ross, J.C.** 1847. *A voyage of discovery and research in the southern and Antarctic regions, during the years 1839–43*. Vol. 1. London, John Murray. 366 pp.
- Russ, R.; Shirihai, H.** 2000. The birds, marine mammals, habitat and history of the subantarctic islands off New Zealand. *Alula* 6: 82–147.
- Russ, R.; Terauds, A.** 2009. *Galapagos of the Antarctic: wild islands south of New Zealand*. Christchurch, Heritage Expeditions. 224 pp.
- Russell, J.C.; Horn, S.R.; Miskelly, C.M.; Sagar, R.L.; Taylor, R.H.** 2020. Introduced land mammals and their impacts on the birds of the subantarctic Auckland Islands. *Notornis* 67: 247–268.
- Sagar, P.M.** 1977. Birds of the 1976–77 Snares Islands expedition. *Notornis* 24: 205–210.
- Sagar, P.M.** 2013. Antarctic tern. In: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz [viewed 8 Apr 2019].
- Sagar, P.M.; Tennyson, A.J.D.; Miskelly, C.M.** 1996. Breeding and survival of Snares Cape pigeons *Daption capense australe* at The Snares, New Zealand. *Notornis* 43: 197–207.
- Salvadori, T.** 1891. Catalogue of the Psittaci, or parrots, in the collection of the British Museum. *Catalogue of the Birds of the British Museum* 20. London, The Trustees. 659 pp.

- Salvin, O.** 1896. Tubinares (petrels and albatrosses). pp. 340–475 In: Saunders, H.; Salvin, O. Catalogue of the Gaviæ and Tubinares in the collection of the British Museum. *Catalogue of the birds in the British Museum*, Vol. XXV. London, Trustees of the British Museum. 475 pp.
- Saunders, H.** 1896. Gaviæ (terns, gulls, and skua). pp. 1–339 In: Saunders, H.; Salvin, O. Catalogue of the Gaviæ and Tubinares in the collection of the British Museum. *Catalogue of the birds in the British Museum*, Vol. XXV. London, Trustees of the British Museum. 475 pp.
- Schmechel, F.** 1998. Expedition to the Bounties. *OSNZ News* 87: 1–3.
- Scofield, R.P.** 2005. Rare Birds Committee report for the six months to 31 July 2005. *Southern Bird* 23: 7–9.
- Scofield, R.P.** 2006. Rare Birds Committee report for the year to 31 July 2006. *Southern Bird* 27: 8–9.
- Scofield, R.P.** 2008. Rare Birds Committee report for the two years to 31st July 2008. *Southern Bird* 36: 5.
- Scott, J.M.; Turnbull, I.M.** 2019. Geology of New Zealand's sub-Antarctic islands. *New Zealand Journal of Geology and Geophysics*, doi: 10.1080/00288306.2019.1600557.
- Shaffer, S.A.; Tremblay, Y.; Weimerskirch, H.; Scott, D.; Thompson, D.R.; Sagar, P.M.; Moller, H.; Taylor, G.A.; Foley, D.G.; Block, B.A.; Costa, D.P.** 2006. Migratory shearwaters integrate oceanic resources across the Pacific Ocean in an endless summer. *Proceedings of the National Academy of Sciences* 103: 12799–12802.
- Shepherd, L.D.; Bulgarella, M.; Haddrath, O.; Miskelly, C.M.** 2020. Genetic analyses reveal an unexpected refugial population of subantarctic snipe (*Coenocorypha aucklandica*). *Notornis* 67: 403–418.
- Shirihai, H.** 2008. *The complete guide to Antarctic wildlife: birds and marine mammals of the Antarctic continent and the Southern Ocean*. 2nd edn. Princeton, Princeton University Press. 544 pp.
- Smit, F.G.A.M.** 1965. Siphonaptera of New Zealand. *Transactions of the Royal Society of New Zealand, Zoology* 7: 1–50.
- Soper, M.F.** 1976. *New Zealand birds*. 2nd edn. Christchurch, Whitcoulls. 251 pp.
- Springer, K.; Carmichael, N.** 2012. Non-target species management for the Macquarie Island pest eradication project. *Proceedings 25th Vertebrate Pest Conference*: 38–47.
- Stead, E.F.** 1932. *The life histories of New Zealand birds*. London, Search. 162 pp.
- Sugishita, J.** 2017. Northern royal albatross. In: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz [viewed 27 Mar 2019].
- Taylor, G.A.** 2000. *Action plan for seabird conservation in New Zealand. Part B: Non-threatened seabirds*. Threatened Species Occasional Publication No. 17. Wellington, Department of Conservation. 201 pp.
- Taylor, G.A.; Elliott, G.P.; Walker, K.J.; Bose, S.** 2020. Year-round distribution, breeding cycle, and activity of white-headed petrels (*Pterodroma lessonii*) nesting on Adams Island, Auckland Islands. *Notornis* 67: 369–386.
- Taylor, R.H.** 1968. Introduced mammals and islands: priorities for conservation and research. *Proceedings of the New Zealand Ecological Society* 15: 61–67.
- Taylor, R.H.** 1971. Influence of man on vegetation and wildlife of Enderby and Rose Islands, Auckland Islands. *New Zealand Journal of Botany* 9: 225–268.
- Taylor, R.H.** 1975a. The distribution and status of introduced mammals on the Auckland Islands, 1972–73. pp. 233–243 In: Yaldwyn, J. (ed.) *Preliminary results of the Auckland Islands Expedition 1972–73*. Wellington, New Zealand Department of Lands and Survey.
- Taylor, R.H.** 1975b. Some ideas on speciation in New Zealand parakeets. *Notornis* 22: 110–121.
- Taylor, R.H.** 1979. How the Macquarie Island parakeet became extinct. *New Zealand Journal of Ecology* 2: 42–45.
- Tennyson, A.J.D.** 1999. Confirmation of a nocturnal aerial display by Auckland Island snipe (*Coenocorypha aucklandica aucklandica*). *Notornis* 46: 241–242.
- Tennyson, A.** 2009. Archaeological and fossil bird bones found at the subantarctic Auckland Islands. pp. 297–307 (Appendix E) In: Dingwall, P.R.; Jones, K.L.; Egerton, R. (eds) *In care of the Southern Ocean – an archaeological and historical survey of the Auckland Islands*. New Zealand Archaeological Association Monograph 17.
- Tennyson, A.J.D.** 2020. Holocene bird bones found at the subantarctic Auckland Islands. *Notornis* 67: 269–294.
- Tennyson, A.J.D.; Bartle, J.A.** 2005. A scientific name for fulmar prions nesting at Auckland and Heard Islands. *Notornis* 52: 47–55.

- Tennyson, A.; Imber, M.; Taylor, R.** 1998. Numbers of black-browed mollymawks (*Diomedea m. melanophrys*) and white-capped mollymawks (*D. cauta stadi*) at the Antipodes Islands in 1994–1995 and their population trends in the New Zealand region. *Notornis* 45: 157–166.
- Tennyson, A.; Taylor, R.; Taylor, G.; Imber, M.; Greene, T.** 2002. Unusual bird records from the Antipodes Islands in 1978–1995, with a summary of other species recorded at the island group. *Notornis* 49: 55–58.
- Thompson, D.R.; Bearhop, S.; Ross, B.** 2005. Spread of Australasian pipit (*Anthus novaeseelandiae*) onto Campbell Island following eradication of Norway rats (*Rattus norvegicus*). *Notornis* 52: 52–55.
- Thompson, D.; Sagar, P.** 2008. A population and distributional study of white-capped albatross (Auckland Islands). 2006/7 annual report. Wellington, Conservation Services Programme, Department of Conservation.
- Thompson, D.; Sagar, P.; Torres, L.** 2009. A population and distributional study of white-capped albatross (Auckland Islands). Contract number: POP 2005/02. Draft annual report. Wellington, Conservation Services Programme, Department of Conservation.
- Thomson, G.M.** 1922. *The naturalisation of animals and plants in New Zealand*. Cambridge, Cambridge University Press. 607 pp.
- Thomson, P.** 1986. Bird observations, Auckland Islands February–March 1982. pp. 75–77 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.
- Torr, N.** 2002. Eradication of rabbits and mice from subantarctic Enderby and Rose Islands. pp. 319–328 In: Veitch, C.R.; Clout, M.N. (eds) *Turning the tide: the eradication of invasive species*. Gland, Switzerland, IUCN.
- Torres, L.G.; Thompson, D.R.; Bearhop, S.; Votier, S.; Taylor, G.A.; Sagar, P.M.; Robertson, B.C.** 2011. White-capped albatross alter fine-scale foraging behaviour patterns when associated with fishing vessels. *Marine Ecology Progress Series* 428: 289–301.
- Turbott, E.G. (convener)** 1990. *Checklist of the birds of New Zealand and the Ross Dependency, Antarctica*. 3rd edn. Auckland, Random Century. 247 pp.
- Turbott, G.** 2002. *Year away; wartime coastwatching on the Auckland Islands, 1944*. Wellington, Department of Conservation. 153 pp.
- von Hügel, A.** 1875. Letter to Bowdler Sharpe. *Ibis* (3rd series) 5: 389–394.
- Waite, E.R.** 1907. The southern islands – notes on the Governor's trip. *The Press*, Christchurch, 19 Feb.
- Waite, E.R.** 1909. Vertebrata of the subantarctic islands of New Zealand. pp. 542–600 In: Chilton, C. (ed.) *The subantarctic islands of New Zealand*. Vol. 2. Wellington, Philosophical Institute of Canterbury and New Zealand Government Printer.
- Waite, E.R.** 1916. Fishes. *Australasian Antarctic Expedition 1911–1914*. Report Series C, Volume 3, Part 1. 92 pp.
- Walker, K.; Elliott, G.** 1999. Population changes and biology of the wandering albatross *Diomedea exulans gibsoni* at the Auckland Islands. *Emu* 99: 239–247.
- Walker, K.; Elliott, G.** 2005. Population changes and biology of the Antipodean wandering albatross *Diomedea antipodensis*. *Notornis* 52: 206–214.
- Walker, K.; Elliott, G.** 2006. At-sea distribution of Gibson's and Antipodean wandering albatrosses, and relationships with longline fisheries. *Notornis* 53: 265–290. 149
- Walker, K.; Elliott, G.; Rexer-Huber, K.; Parker, G.** 2017. Gibson's wandering albatross population study and census 2016/17. Report prepared for the Department of Conservation, Wellington. 17 pp.
- Walker, K.J.; Elliott, G.P.; Rexer-Huber, K.; Parker, G.C.; Sagar, P.M.; McClelland, P.J.** 2020. Shipwrecks and mollymawks: an account of Disappointment Island birds. *Notornis* 67: 213–245.
- Walker, K.; Moore, P.; Elliott, G.** 1991. The Auckland Island banded dotterel has apparently increased. *Notornis* 38: 257–265.
- Warham, J.** 1967. The white-headed petrel *Pterodroma lessoni* at Macquarie Island. *Emu* 67: 1–22.
- Warham, J.** 1972a. Breeding seasons and sexual dimorphism in rockhopper penguins. *Auk* 89: 86–105.
- Warham, J.** 1972b. Aspects of the biology of the erect-crested penguin. *Ardea* 60: 145–184.
- Warham, J.; Bell, B.D.** 1979. The birds of Antipodes Island, New Zealand. *Notornis* 26: 121–169.
- Warham, J.; Keeley, B.R.** 1969. New and rare birds at Snares Island during 1968–69. *Notornis* 16: 221–224.

Warham, J.; Wilson, G.J.; Keeley, B.R. 1982. The annual cycle of the sooty shearwater *Puffinus griseus* at the Snares Islands, New Zealand. *Notornis* 29: 269–292.

Wassilieff, M.C. 1986. Vegetation at several different sites on the Auckland Islands, January 1981. pp. 102–107 In: Penniket, A.; Garrick, A.; Breese, E. (compilers) *Preliminary reports of expeditions to the Auckland Islands Nature Reserve 1973–1984*. Reserve Series. Wellington, New Zealand Department of Lands and Survey.

Wagh, S.M.; Tennyson, A.J.D.; Taylor, G.A.; Wilson, K.-J. 2013. Population sizes of shearwaters (*Puffinus* spp.) breeding in New Zealand, with recommendations for monitoring. *Tuhinga* 24: 159–204.

Weller, M.W. 1975. Ecological studies of the Auckland Islands flightless teal. *Auk* 92: 280–297.

Westerskov, K.E. 1960. *Birds of Campbell Island*. New Zealand Department of Internal Affairs Wildlife Publication 61, Wellington. 83 pp.

Wilkes, C. 1845. *Narrative of the United States Exploring Expedition, during the years 1838, 1839, 1840, 1841, 1842*. Vol. 2. Philadelphia, Lea and Blanchard. 476 pp.

Williams, M. 1995. Social structure, dispersion and breeding of the Auckland Island teal. *Notornis* 42: 219–262.

Williams, M. 2012. A merganser at Auckland Islands, New Zealand. *Wildfowl* 62: 3–36.

Williams, M. 2013. Auckland Island teal. In: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz [viewed 13 Apr 2019].

Williams, M.; Holdaway, R.N.; Rogers, K.M. 2012. Feeding environments of New Zealand's extinct merganser revealed by stable isotope analyses. *Wildfowl* 62: 190–203.

Williams, M.; Tennyson, A.J.D.; Sim, D. 2014. Island differentiation of New Zealand's extinct mergansers (Anatidae: Mergini), with description of a new species from Chatham Island. *Wildfowl* 64: 3–34.

Wilmshurst, J.M.; McGlone, M.S.; Turney, C.S.M. 2015. Long-term ecology resolves the timing, region of origin and process of establishment for a disputed alien tree. *AoB Plants* 7: plv104; doi:10.1093/aobpla/plv104.

Wilson, E. 1966. *Diary of the 'Discovery' Expedition to the Antarctic 1901–1904*. London, Blandford Press. 416 pp.

Wilson, K.-J.; Barthel, A.; Lipson, M.; Fogwill, C.; Turney, C. 2018. New breeding records of seabirds at Carnley Harbour (Auckland Islands), Cossack Rock (Campbell Island) and south coast of The Snares. *Notornis* 65: 168–173.

Worthy, T.H. 1998. Fossils indicate *Pelecanoides georgicus* had large colonies at Mason Bay, Stewart Island, New Zealand. *Notornis* 45: 229–246.

Xavier, J.C.; Walker, K.; Elliott, G.; Cherel, Y.; Thompson, D. 2014. Cephalopod fauna of South Pacific waters: new information from breeding New Zealand wandering albatrosses. *Marine Ecology Progress Series* 513: 131–142.

Appendix 1

Abbreviations for observers: AA Andris Apse, AB Adrian Boyle, AC Andy Cox, ACW Angus Wilson, AD Alison Davis, ADC Allan Crookenden, AE Allan Eden, AG Anthea Goodwin, AJW Alan Wiltshire, AL Anthony Lealand, AM Andy Maloney, AP Alan Paine, AT Alan Tennyson, AW Annette Wilde, BA Brian Ahern, BB Barry Baker, BC Bart Challis, BCA Bernard Aston, BD Bill Dickson, BDB Brian Bell, BLC Louise Chilvers, BM Bill Morris, BMCK Bruce McKinlay, BP Bob Preston, BR Bruce Robertson, BS Brent Stephenson, BT Ben Thorpe, BZB Brent Beaven, CC Chris Challies, CD César Desgraz, CDL Callum Lilley, CE Charles Eyre, CF Charles Fleming, CGM Chris Muller, CH Christine Hanel, CL Chris Lalas, CMM Colin Miskelly, COD Colin O'Donnell, CR Christopher Robertson, CS Carol Sutherland, CW Chrissy Wickes, CY Colin Young, DAG Dan Godoy, DB Dave Barker, DD Dick Dell, DG Don Geddes, DH Dave Hansford, DJC John Campbell, DK Douglas Knowles, DL David Lawrie, DV Dale Vitt, ED Ed Doley, EG Edward Gourlay, EGT Graham Turbott, EoR Earl of Ranfurly, ER Ethel Richardson, ES Edgar Stead, EW Edward Wilson, EWD Elliot Dawson, FC Finlay Cox, FH Frederick Hutton, FK Fred Kinsky, FR Forrest Rowland, GA George Anderson, GAT Graeme Taylor, GB Graham Barwell, GC Gerry Clark, GCP Graham Parker, GE George Easton, GK George Knox, GL George Lindsay, GM Gus McAllister, GP Geoff Prichard, GPE Graeme Elliott, GRW Gordon Williams, GT George Turner, GvT Gerry van Tets, GW Gordon Wilson, HB Hugh Best, HEx Heritage Expeditions,

HGS Herbert Guthrie-Smith, HH Hugo Hanify, HM Helen McConnell, HMcF Hamish McFarlane, HR Hiltrun Ratz, HW Hugh Wenham, JA John Alexander, JAFJ John Jenkins, JAH Jo Hiscock, JAm Jacinda Amey, JAr James Armstrong, JAS Jane Sedgely, JB John Bollons, JBG John Greig, JC Jeremy Carroll, JCG John Greenwood, JCS Jean-Claude Stahl, JD Jack Dumbleton, JF John Fairchild, JFJ John Jones, JG Judith Gillespie, JH James Holmes, JHF Johannes Fischer, JJ Jo Joice, JJA John Andrew, JK Josh Kemp, JL Jo Ledington, JLK John Kendrick, JM Jason Malham, JR John Rolleston, JS Jack Sorensen, JSM Jack Mace, JW John Woods, JY John Yaldwyn, KAW Kazimierz Wodzicki, KB Kate Beer, KG Katja Geschke, KJW Kerry-Jayne Wilson, KM Kerri Morgan, KP Kevin Parker, KR Keith Riding, KRH Kalinka Rexer-Huber, KS Karin Sievwright, KT Kingsley Timpson, KW Kath Walker, LA Lynn Adams, LC Les Clifton, LG Linsley Gressitt, LHP Laurie Pollock, LK Leonard Kristensen, LP Lyndon Perriman, LS Lou Seabeck, LT Leith Thomson, LVS Lou Sanson, MA Mike Aviss, MB Murray Blake, MC Martin Cawthorn, MCW Maggie Wassilieff, MFS Mike Soper, MJW Murray Williams, MLL Mark Le Lievre, MP Moira Pryde, MR Mike Rudge, MS Michael Szabo, MW Murray Willans, MWW Milton Weller, MY Mel

Young, NA Nicholas Acheson, NC Neil Cheshire, NG Nadine Gibbs, NH Norman Hart, NHH Noel Hyde, NIA Nicholas Allen, NJ Nik Joice, NKA Nicki Atkinson, NKH Nikolas Haass, NM Nathan McNally, NMC Narca Moore-Craig, PAT Phil Tisch, PB Peter Bull, PC Peter Connors, PD Paul Dingwall, PG Peter Gaze, PJ Paul Jacques, PJD Peter Dilks, PJM Peter Moore, PM Pete McClelland, PMJ Peter Johns, PN Pete Naik, PP Paul Pearson, PS Paul Sagar, PT Phillip Thomson, RAF Robert Falla, RB Rhys Buckingham, RBM Rod Morris, RdH Richard de Hamel, RF Rebecca French, RG Richard Griffiths, RH Robert Holding, RLS Rachael Sagar, RM Robert McCormick, RN Ron Nilsson, RO Ron Ordish, RP Ron Peacock, RR Rodney Russ, RS Richard Schofield, RT Rowley Taylor, RW Robert Wilson, RWB Ron Balham, SaB Sandy Black, SB Stan Blow, SC Simon Childerhouse, SE Sandra Eadie, SG Stephen Gast, SH Sheryl Hamilton, SK Sandy King, SR Shirley Ralston, SW Steve Wood, SWC Stuart Cockburn, TA Tudor Atkinson, TM Ted Mitchell, TW Trudi Webster, WB William Bethune, WD William Dawbin, WH Wally Hockly, WI Wally Ineson, WRO Reginald Oliver, WW W. Webling (source details in supplementary materials <http://notornis.osnz.org.nz/node/4445>).