THE BIRDLIFE OF SOUTH EAST ISLAND (RANGATIRA), CHATHAM ISLANDS, NEW ZEALAND

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ABSTRACT

South East Island (Rangatira) is the most important reserve for oceanic and terrestrial bird life in the Chatham Islands, and one of the largest islands free of mammalian predators in the New Zealand region. The avifauna consists of 66 species: there are confirmed records of breeding or attempted breeding for 33 of these. The rest are either vagrants or forage in adjacent waters. Two species, Shore Plover *Thinornis novaeseelandiae* and Chatham Petrel *Pterodroma axillaris* breed only on this island. A further six species are endemic to the Chathams, but are rare elsewhere in the group; five of them are abundant. Historical and contemporary records are covered. During the past 150 years, the vegetation of the island has been altered substantially, by fire and grazing. The changes have influenced the fauna greatly, and its original composition and character are unclear.

INTRODUCTION

South East Island (Rangatira: 44°20′ S, 176°10′ W) is the third largest of the nine major vegetated islands in the Chatham group. It has an area of 218 ha and lies 3 km south east of Pitt Island. Its geography and geology are described in West (1994) and West & Nilsson (1994).

The vegetation has been modified extensively by human activity, apparently mostly by Europeans, although the impact of the Moriori is unknown. Sea travel in wash-through canoes was hazardous, so it is probable that the island had no permanent or sustained occupation before European times. Moriori harvested sea birds and seals seasonally.

The first Europeans to visit the island consistently were whalers and sealers. In 1840, former sealers settled permanently, trading pigs and potatoes to whalers. In 1841, 50 merino sheep, and perhaps goats, were introduced. The island was deserted in 1848, but the animals remained (Richards 1982).

Farming resumed in 1880, but stock numbers and composition are unknown. Between 1915 and 1954, however, stock numbered 600-1200 animals. Cattle were introduced. The island was designated as a flora and fauna reserve in 1954, but grazing did not cease until 1961 when the last stock were removed (Ritchie 1970; Merton & Bell 1975). After 120 years of grazing and burning, the forest was still dominated by Chathams endemics, but was significantly reduced in area and quality. Only one-third of the island was forested in 1954, and much of that consisted of tall canopy species only. The sheltered lowland terraces had been converted to pasture. The changes profoundly affected the abundance and diversity of birdlife. By the 1950s,

some forest species known to have been present formerly had not been seen for many years. Nesting seabirds had all but disappeared (Cemmick & Veitch 1985).

Habitat Recovery

Major forest remnants regenerated rapidly after grazing ceased. Although bracken *Pteridium esculentum,* water fern *Histiopteris incisa,* and *Muehlenbeckia australis* overran the abandoned grasslands, the forest margins have encroached increasingly on the low cover.

North of Kokopu Creek, forest remnants are merging. The cover was burned and browsed heavily, and the remnants are still visible as 'bush islands' (total area 44.5 ha, West & Nilsson 1994). The single largest tract of forest (57 ha) to survive is arguably the only original tract of continuous forest remaining. On the cold, south-western slopes of the Kokopu Creek catchment, above the Swamp, it probably escaped the worst effects of fire.

Little has been published on either the vegetation of the island or its rehabilitation. The few accounts of recovery are supplemented by historical anecdotes and disconcertingly few photographs. Ritchie (1970) mentioned the forest regeneration in 1968 (seven years after grazing stopped) but gave no plant list. West & Nilsson (1994) recorded plant species in random quadrats throughout the forests, but did not measure frequency. Taylor (1991) listed plant species, and estimated their relative abundance. He recorded 134 vascular plants, 93 (70%) of which were native.

The island now has a diverse vegetation, dominated by forest (98 ha, 45% of island area). The rest is a composite of grasslands (34 ha, 15.5%); associations of *Muehlenbeckia,* bracken, and *Olearia traversii* trees (24 ha, 11 %), and scrub and herbfield on steep cliffs and eroded soils (32 ha, 15%). The remainder (30 ha, 13.5%) is bare rock, low cliffs, and wave platforms.

Birdlife

In the late 1800s, bird collectors were very active on South East Island; some gathered most of their collections from the island. Fleming and his party visited the island in December 1937. His paper (Fleming 1939) was the first comprehensive description of its avifauna, and the only major source of accurate historical ornithological information.

Only two ornithologists followed Fleming in the next 20 years. Logan Bell visited briefly in 1953, and Elliot Dawson in 1954 (Bell 1955; Dawson 1955). Although their respective insights are welcome, the shortage of solid information from the remainder of the early stages of the island's recovery means that much of the historical record of birdlife is speculative.

The removal of the last sheep by a New Zealand Wildlife Service party in 1961 marked the start of the modern record. Between 1968 and 1993, Crown agency and university parties have visited the island regularly to monitor the endemic birds.

The fauna consists of 29 seabirds, 6 shorebirds, and 31 land and freshwater species. Of these, 33 breed or have attempted to breed on the island. Two further species are likely to breed, but there are, as yet, no

confirmed records. The rest are either occasional visitors or forage in the surrounding waters.

Two species, New Zealand Shore Plover *Thinornis novaeseelandiae* and Chatham Petrel *Pterodroma axillaris* breed only on this island. Six other endemic species that are threatened or rare elsewhere in the group, breed on South East Island: Chatham Island Oystercatcher *Haematopus chathamensis,* Chatham Island Snipe *Coenocorypha pusilla,* Chatham Island Red-crowned Parakeet *Cyanoramphus novaezelandiae chathamensis,* Chatham Island Tomtit *Petroica macrocephala chathamensis*, Black Robin *P. traversi*, and Chatham Island Tui *Prosthemadera novaeseelandiae chathamensis*.

This paper summarises historical and contemporary information on the South East Island avifauna. The information was drawn from records of 23 separate visits made to the island by the authors between 1977 and 1993 (99 weeks of observations), mostly from September to April, and partly from a bird log kept from 1984 at the South East Island hut. The authors acknowledge the following (some observations are also acknowledged in the text): J. Andrew, M. Bellingham, B.D. Bell, D. Bell, M. Bell, D. Brown, P. Burstall, J. Carroll, W. Cash, R. Chappell, P. Clerke, A. Davis, M. Dobbins, R. Empson, A. Grant, A.D. Hemmings, C. Hoskings, M.J. Imber, S. King, T.G. Lovegrove, J. Lyall, G. Marris, P. McClelland, D. Merton, D.V. Merton, M. Merton, N. Millar, C. Miskelly, A. Munn, G. Murman, S. Phillipson, R. Powlesland, C. Reed, A. Saunders, J. Steven, G. Taylor, R. Thorpe, C. Tisdall, S. Walker, E. Young.

Abbreviations Compass directions are in lower case initials; months given by first three letters. MoNZ, Museum of New Zealand Te Papa Tongarewa; pr(s), pair(s); juv(s), juvenile(s).

SYSTEMATIC LIST

Northern Royal Albatross *Diomedea epomophora sanfordi* Individuals seen offshore occasionally.

Chatham Island Mollymawk *Diomedea cauta eremita* Individuals seen rarely offshore (Robertson *et al.* 1980). The only breeding site – The Pyramid – is 14 km sw of South East Island.

Northern Buller's Mollymawk *Diomedea bulleri platei* Occasional offshore; sometimes follows fishing boats close inshore allowing identification (ADH, 29/12/84).

Sooty Shearwater *Puffinus griseus* Largest breeding procellariiform; (West & Nilsson 1994) No large concentrations of Sooty Shearwater burrows, but c.17,000 in total. Adults arrive in late Sep to excavate and reclaim burrows. Eggs laid late Nov; hatching Jan; fledglings depart late Apr-early May.

Burrowing mostly in deep soil on slopes in bush areas modified by farming, and are most frequent under forest cover near forest margins. Most on n and w coasts, and near summit; some groups of burrows in open grassland above w coastline and e of summit. Of c.450 burrows e of summit in early Feb 1986, 52% contained chicks, some adults still incubating infertile or addled eggs (MJI).

Unidentified Shearwater *Puffinus* sp. On 18/1/90, a shearwater was captured in a Sooty Shearwater colony on w coastline (RJN, JAW). The bird was weak and died later (specimen in MoNZ). Thought at first to be represent an undescribed species, the specimen may prove to be a hybrid, possibly with a Sooty Shearwater as one parent, or an aberrant Sooty Shearwater (Millener & Bartle, pers. comm.).

Common Diving Petrel *Pelecanoides urinatrix urinatrix* Abundant and widespread, though outnumbered significantly by White-faced Storm Petrels in Dec 1937 (Fleming 1939). Burrow densities appear to have changed little. Population c.147,000 prs, 11% of all burrows in forest (West & Nilsson 1994).

Burrows widely distributed but rarely in groups. Scattered burrows in coastal tussock and under *Muehlenbeckia*, bracken, and blackberry *Rubus fruticosus* near forest fringes on n terraces.

Laying starts early as second week Oct; hatching early Dec; fledglings depart second week Jan, (peak late Jan) to as late as mid Feb (MJI).

Present all year round, except during late Feb-Mar, when adults moult at sea.

Snares Cape Pigeon *Daption capense australe* Occasionally accompanies fishing boats close inshore. On 29/12/84, all birds seen were darker than Antarctic form *D. c. capense* (ADH).

Southern Giant Petrel *Macronectes giganteus* 1, 16/12/86, white-phased s of island; first of species seen among several thousand Giant Petrels observed in three seasons (including two winters) (ADH).

Northern Giant Petrel *Macronectes halli* Regular; forage along coast in all months; feed on NZ Fur Seal carcasses, especially on s coast; 5/10/88, at least 17 birds ashore or resting just off rocks, Thinornis Bay (DB).

Fairy Prion *Pachyptila turtur* 1, caught by spotlight near woolshed, 3/11/77 (MJI).

Broad-billed Prion *Pachyptila vittata* Abundant in Dec 1937 (Fleming 1939); population probably still increasing; 330,000 pairs in forest (West & Nilsson 1994); most vocal of petrels on ground; burrows widespread, especially under forest; densities significantly (2×) higher in regenerating forest (West & Nilsson 1994). Burrows recognisable by low entrances; large for petrel of its size (Fleming 1939); also in hollow logs, rock crevices, caves (near summit), and under buildings. Eggs late Aug or early Sep; incubation well advanced 7/9/86; hatching as early as second week Oct, generally over by second week Nov; most fledge by mid Jan, some late Jan.

After fledglings depart, all adults go to sea to moult, returning from end of first week Feb, then frequent island until breeding begins; prs reoccupy burrows immediately; multiple occupancy suggests significant pressure for burrows (Bell & Nilsson 1992); compete with Chatham Petrel *Pterodroma axillaris* for nest sites (Kennedy & Taylor 1993a; West & Nilsson 1994).

Periodic, sometimes severe, mortality of chicks and fledglings; attributed to starvation and sometimes to irruptions of avian ticks, with heavy flea infestations.

Black-winged Petrel *Pterodroma nigripennis* First recorded as prospecting and probable breeder in late 1970s (Kinsky 1980). 11/2/80, no evidence of breeding, 22 birds caught at summit (MJI); 1, incubating, 26/1/84; several 100s overhead (Merton 1984); numbers since diminished, no more than 30 birds involved in aerial displays at summits recently, usually fewer.

Few known burrows confined to summits, in low windshorn scrub (mainly *Olearia chathamica*) above forest line, on steep rocky slopes, burrows < 1 m long; earliest incubation date 13 Jan; 3 incubating prs found after intensive search, early Feb 1986, only 1 egg surviving 11/2/86 (MJI). Hatchlings and fledglings not seen on island.

Aerial displays at w end of Skua Gully and over Kokopu Creek at least since 1979, unaffected by bright conditions at night, probably explaining high numbers in Brown Skua middens, 11 on 18/1/79, 36 on 9/2/80 in 2 skua middens on w coast (MJI).

Chatham Petrel *Pterodroma axillaris* This petrel now breeds only on South East Island (Fleming 1939), although it traditionally bred elsewhere in the Chatham group. Population size is unknown, but research in 1992-93 breeding season suggests that 500-1000 birds may survive, with the population probably declining (Kennedy & Taylor 1993b). May be as few as 50 breeding prs (Imber, pers. comm.)

About 300 banded since 1974. Bell (1986) regarded it as endangered. Principal causes of decline perhaps poor recovery from impacts of farming and competition with Broad-billed Prions for burrows (Taylor 1991; Kennedy & Taylor 1993a).

Breeding is discussed in Taylor (1991), Kennedy & Taylor (1993a), and West (1994). Adults reclaim burrows in Nov or early Dec, earliest known reoccupation 12 Nov; eggs as early as third week in Dec, last by c.20 Feb; hatching early Feb-mid-April; fledging from 29 Apr, probably peaking late May, to early Jul.

Fertility high, but many eggs and chicks evicted by prions, depressing productivity to 12.5-31% in 3 breeding seasons since 1990-91; almost all surviving chicks fledged from burrows not affected by prions (Kennedy & Taylor 1993b).

Burrows 0.4-1.5 m long, in friable substrate; most shallow; commonly under fallen logs or at base of mature trees. Non-breeding adults line burrows with fresh material Mar-Apr, when prions are also prospecting (Bell & Nilsson 1992). Absent mid-Jul-mid-Nov (MJI, TGL); may migrate to n Pacific, as do related *Pterodromas*.

Most breeding burrows discovered since 1989 (West 1994); now 60 burrows known but only 20 occupied by breeders in 1992 and 1993 seasons; 33 (55%) in tall unmodified forest sw of Kokopu Swamp, perhaps a remnant of a much larger concentration; burrow density very low elsewhere, especially in damaged forest.

Juan Fernandez Petrel *Pterodroma externa* Breeds only on Isla Mas Afuera, Juan Fernandez Islands, e South Pacific (Imber 1985). Calls heard near w summit Feb 1984 later confirmed as from Juan Fernandez Petrel (Imber *et al.* 1991); possibly prospecting for burrows; calls persisted during summers of 1986 and 1989; 26/1/89, 2, over summit, identified by spotlight; 8/12/89, corpse found near nest of Brown Skua near summit; calls heard again Jan 1990, and from Kokopu Creek area Feb 1992 (GT).

Kermadec Petrel *Pterodroma neglecta* 1/5/86, mid-afternoon, 'petrel-like' bird with brownish dorsal surface, no obvious 'W' marking on upper wing flew below w summit (features consistent with Kermadec Petrel) (RC, CH); thought to have taken off from point on w face of summit. Scarlett (1982) included Kermadec Petrel in Chatham subfossil record; 1975, 1, off Chatham Islands (Turbott 1990).

Grey-backed Storm Petrel *Oceanites nereis* Smallest seabird nesting on island. Fleming (1939) did not find it in 1937, probably because grazing had reduced areas of tall sedges and grasses; now breeding on 63 ha (25% of island) with suitable habitat (*Muehlenbeckia, Phormium tenax, Carex trifida* and *Poa chathamica*, population not known but not at densities reported by Plant (1989) on Houruakopara Island (3.2 ha) (MJI); perhaps a few thousand prs.

Nests in depressions or crevices at base of dense vegetation; eggs from mid Oct; incubation well advanced mid Nov; chicks recently hatched 16 and 18/11/77 (MJI); newly-laid egg, 21/10/90, hatched 1st week Dec, chick mobile by mid Jan (40 days); fledging at about 50 days (Imber 1985).

New Zealand White-faced Storm Petrel *Pelagodroma marina maoriana* Abundance little changed little since 1937; Fleming (1939) described the birds as present in every soil-covered square yard on the island; 1991-92, 63% of all burrows in forest quadrats belonged to this species (West & Nilsson 1994); birds 2 × as numerous as Broad-billed Prions, 6 × Common Diving Petrel; abundances comparable in modified forest, but White-faced Storm Petrels occupied 71% of burrows (4 × Broad-billed Prions) in mature higher altitude forest; total of about 840,000 prs breeding in forest (West & Nilsson 1994).

Excavate burrows wherever space to do so, but will occupy any vacant burrow; adults and chicks evicted or killed by larger species.

Adults return Sep after absence of 5 months; laying from late Oct; 15/11/87, many fresh eggs laid on soil surface in all forested areas (DVM); hatching from mid Dec-Jan; but breeding not synchronous; still incubating 20 Jan, when chicks with developing wing feathers in other burrows; fledging mid Feb-early Apr, when adults visit less frequently; night of 2/3/88, very few adults amongst many fledglings between and summit (GM).

Twice in 1992-93 season, breeding birds seen dying on ground after periods of wet, cold weather, possibly having deserted because of cold, or because weather had prevented partners from relieving them; Nov 1970, estimated 200,000 birds died when they became suspended in vegetation by bracelets of tough fibrous material – a trematode parasite *Distomum filiferum* (Claugher (1976) – linking their tarsi (New Zealand Wildlife

Service); 2 similar mortality events since, in 1980 and 1992 (moderate mortality only).

Yellow-eyed Penguin *Megadyptes antipodes* 1, first seen Nov 1984 (DVM) continued to visit (presence noted by characteristic call) until Feb 1993; not present late Apr 1993 (MJI); seen regularly (many observers) moving to and fro from roost on n coast in all months; captured ashore, measured, identified as ♂ , Dec 1990; not banded, to prevent entanglement in *Muehlenbeckia*; probably same bird visited Owenga at regular intervals (Imber 1994); possibly same bird near The Pyramid in 1989, swimming on surface, towards South East Island.

Blue Penguin *Eudyptula minor* Breeds commonly on n, e, and accessible w coasts; burrows often well inland; most nests are not far above sea level, but some encountered under cliffs in densely vegetated *Muehlenbeckia*/bracken hinterland of Thinornis Bay, and in cliff-edge forest high above, midway from Kokopu Creek to Trig. Penguin burrows comprise about 0.10% of all burrows in forests (West & Nilsson 1994); densities perhaps higher in low *Muehlenbeckia*/bracken/fern/blackberry undergrowth.

Breeding biology not studied in Chathams; laying probably in early Oct; hatching mostly in mid Nov; chicks at nearly all stages of development mid-late Dec 1937 (Fleming 1939). Penguins continue to come ashore after breeding season; 'reasonable numbers' landing at night early May 1986 (GM), late April 1993 (MJI).

Chicks susceptible, in some seasons, to peculiar spinning behaviour symptomatic of tick infestation; Jan 1986 - when Broad-billed Prions also severely affected - many chicks on surface, in latter stages of paralysis which accompanies inner ear tick infestations; all afflicted chicks died.

Moseley's Rockhopper Penguin *Eudyptes chrysocome moseleyi* Penguin caught on se coast, Aug 1968, identified as this subspecies (Moors & Merton 1984); Nov 1970, another bird - possibly same individual - in same place beside empty nest scrape; gone by Nov 1977 (MJI); nearest nesting sites at Isles Amsterdam and St Paul c.8,000 km w, in Indian Ocean.

Erect-crested Penguin *Eudyptes sclateri* Occasional individuals; 1, Dec 1937 (Fleming 1939); several on n coast, Mar-Apr 1992.

Australasian Gannet *Morus serrator* 1, diving off Front Landing, n end of island, 31/1/85; very rare near Chatham Islands (Fleming 1939, fishermen's reports).

Chatham Island Shag *Leucocarbo onslowi* Small numbers occasionally off n coast, foraging; individuals only roosting on island; largest breeding concentration at Star Keys, 20 km ne (Merton & Bell 1975).

Pitt Island Shag *Stictocarbo featherstoni* Centre of breeding distribution s of Pitt Strait, but no estimate of size or status of breeding population on South East Island in 1937 (Fleming (1939); common around island; often roost on favoured parts of coastline; since 1970, several breeding sites noted, particularly on e and s coasts, some abandoned because of heavy seas; preferred nest sites are distinctive cavities in eroded coastal rock and ledges on vertical cliff faces; density of nests apparently limited by number of available sites; 14/12/86, 1 colony, 11 nests with chicks, at least 2 nests

occupied by prs (ADH); 20/12/86, 3 chicks, nearly fledged at second site close to New Zealand Fur Seal rookery; other breeding details not recorded from island; 3 eggs laid in Aug, all chicks fledged by Dec (Van Tets 1985).

White-faced Heron *Ardea novaehollandiae novaehollandiae* Present at least since 1970s; 2 prs 1978-1988, site of 3-egg nest in mid Dec - in vertical fissure between two massive slabs of rocks at base of c.50 m cliff on n coast - suggested species limited by shortage of suitable breeding sites not used by skuas (Hemmings & Chappell 1988); 28 Dec, 2 chicks in nest, chick(s) probably alive early Feb as adults still visited site.

Adults seen walking on *Muehlenbeckia* behind Thinornis Bay on warm days, catching basking Chatham Island Skinks *Leiolopisma n. nigriplantare*; probably one of few predators of New Zealand Shore Plover on island (Davis 1988).

Black Swan *Cygnus atratus* Observed rarely; 2 flying towards Pitt Island Dec 1979 (Robertson *et al.* 1980); 1, Thinornis Bay, 27/2/86; raft of 17, off Front Landing, Nov 1992 (SP).

Paradise Shelduck *Tadorna variegata* 1♂, NZ Fur Seal colony, s coast, 20/1/84 (Fennell & Merton 1984), apparently first dated record from the Chatham Islands.

Mallard *Anas platyrhynchos platyrhynchos* Scarce; 1♂at NZ Fur Seal colony, 12/1/85 (AM); 1♀ visited pool near Front Landing 9/1/88 (PM).

Grey Duck *Anas superciliosa superciliosa* Breeds occasionally (Fleming 1939); a few regularly throughout year, feed in small intertidal pools on rock platforms of e coast. Breeding in spring months; 22 birds, including 2 ♀♀ , with 1-week-old broods - 7 and 9 ducklings, 22/10/88 (DB); duckling survival usually poor.

Australasian Harrier *Circus approximans* Only 1 pr resident, Dec 1937, confined to Top Bush by territorial skuas (Fleming 1939); numbers increased to 20 by Jan 1953 (Bell 1955); 1 pr, nest with 2 eggs, 5/12/79 (Robertson *et al.* 1980); now mostly individuals, mainly commuting from Pitt Island; occasional groups - 4 over Skua Gully, 28/12/84 (AM), 8 soaring over same area, 2/5/86 (DVM), at least 8, late Apr 1993, apparently attracted by starving Sooty Shearwater fledglings (MJI); forage in forest interior and over open spaces for sick fledglings of smaller petrels; elicit aggressive reactions from skuas and terns when flying; 1 forced into sea by skuas and drowned (C. Miskelly, pers comm.)

Chatham Island Oystercatcher *Haematopus chathamensis* Endemic, once widely distributed on rocky coasts of Chatham, Pitt Island, Mangere, and South East islands (Fleming 1939); now endangered (Bell 1986); only 110 birds recorded in first (1987-88) breeding season survey (Davis 1988a); South East Island population has fluctuated over past 50 years, only 3 prs (none breeding) in 1937 (Fleming 1939); 28, 9 nests, Nov 1970, increase attributed to reduction in sheep numbers (Merton & Bell 1975); breeding prs increased to 13 (1977-78), but only 8 (1987-88) (Davis 1988); 6 breeding prs in 1992 and 1993 seasons, but productivity very low (1, 2 fledglings, respectively); South East Island lacks sandy beaches few good nest sites for oystercatchers;

most use shallow scrapes on exposed rocky substrate; skuas eat eggs and gulls eat chicks – most likely causes of breeding failure.

Banded Dotterel *Charadrius bicinctus bicinctus* Recorded only since Dec 1985 when 1 pr raised 1 chick on Clears; 1986, 4 ads; 30/10/86, 1 pr with 2 newly-hatched chicks; Oct 1987, 4 ads in same area but no breeding observed (DB); Clears, 3, Dec 1991; 3, Nov 1992; no more than 4 in each season after 1987 (including 2 juv, Feb 1994).

Shore Plover *Thinornis novaeseelandiae* Formerly in coastal areas of North and South Islands of New Zealand, and in Chathams (Oliver 1955); since c.1900, only one, sedentary, population on South East Island; endangered (Bell 1986); one of the rarest plover species in the world (Johnsgard 1981); population stable, c.40-44 breeding pairs (100-130 individuals) since 1970 (Davis 1988b, 1994; Kennedy 1993); uses rocky shore, salt meadow, and tussockland habitats; feeds on concentrations of marine and terrestrial invertebrates; in 1937 also on grazed pasture (Fleming 1939); several, on grassy slopes near summit - where now wind-shorn scrub - in 1954 (Dawson 1955); with disappearance of pasture breeding territories used above w cliffs in 1970s (BDB) no longer used; favoured habitat presently declining as forest encroaches on Clears and w coastline; as of 1993, only 29 ha of rocky shore, wave platforms, and exposed rock available plus 30 ha of salt meadow and tussockland on Clears.

Spur-winged Plover *Vanellus miles novaehollandiae* 1, heard from hut, 2/7/86 (CM).

Turnstone *Arenaria interpres* 2, roosting on se coast, 5/12/79; 3, at n end of Thinornis Bay, 8/12/79 (Robertson *et al.* 1980).

Chatham Island Snipe *Coenocorypha pusilla* Abundant over most of island in 1937 (Fleming 1939); by early 1950s possibly close to extinction because of habitat degradation by large sheep population, and ground cover regularly burnt – little ground cover was left to support a snipe population; none seen over several days, Jan 1953; only 2 seen by a shearer in 2 weeks before that (Bell 1955); none in 1 day and night ashore, Feb 1954 (Dawson 1955); population had recovered by 1961 (BDB); snipe now abundant over entire island, absent only from areas without overhead cover.

Generally breed late; eggs as early as Oct, but usually Nov-Dec to Mar; possibly coincides with regrowth of *Carex trifida* (mid-late Nov); in cold wet seasons, may not start until late Jan; early nesting missed (or minimal) Nov-Dec 1991; nests on ground, often under *Carex trifida* clumps; 2 eggs; chicks precocial, leave nest within 2 h of hatching; each ad broods and closely attends feeding of 1 chick; dependent fledglings still escorted and fed at end of Apr 1993 (MJI); stooping, a feature of the 'hakawai' display (Miskelly 1987) commonly Nov-Feb, on still bright nights when petrel numbers low.

Eastern Bar-tailed Godwit *Limosa lapponica baueri* 1, on wave platform near Front Landing, 15/11/77 (MJI).

Wandering Tattler *Tringa incana* 1, present for 3 yrs in early 1970s; 2, once, 1970s (BDB).

Brown Skua *Catharacta skua lonnbergi* At least 150 ads in 1937, suggested to be disproportionately large population for such a small island (Fleming

1939?; population still (1993) large; adult mortality very low, breeding population constant at c.45 prs (c.100 birds) for many seasons (Hemmings & Chappell 1988; Young 1994); largest and most successful avian predator on island; population augmented at night by foraging birds from neighbouring islands; hunts on forest floor for adults and chicks of all burrow-nesting seabirds; breeding sites littered with disgorged remains of petrels (not Chatham Petrel) and Blue Penguins.

Pomarine Skua *Stercorarius pomarinus* One bird, with Brown Skuas at several roosts, Nov-Dec 1993 (MD).

Arctic Skua *Stercorarius parasiticus* Light-phase bird, harrying flock of White-fronted Terns, as party approached island by boat from s (Fleming 1939); dark-phase bird, with flight of juv Black-backed Gulls, near Thinornis Bay, Mar 1993.

Southern Black-backed Gull *Larus dominicanus dominicanus* Scattered around coastline, in small numbers; c.30 prs breed on sites not occupied by skuas; nesting density highest on s coastline below Clears; clutch usually 2, laid late Oct-Nov.

Red-billed Gull *L. novaehollandiae scopulinus* Breeds in small groups, in shallow coastal caves or under large boulders, protected from skuas; Oct-Dec, 2 eggs; twice seen to swoop on downy Shore Plover chick, pick it up while in flight, and swallow it whole in mid air (Fleming 1939).

White-fronted Tern *Sterna striata* Called 'noddy' by some local fishermen. Common around island; occasionally, several hundreds of birds forage close inshore, in waters sheltered from prevailing winds; breeding numbers may fluctuate from year to year; colonies may move to new locations, especially if disturbed by heavy seas; clutch usually 2, laid on bare rock, Oct-Dec; first fledglings in Dec; nests and chicks defended vigorously against skuas and gulls; reported by fishermen to leave Chathams Mar-Aug (Fleming 1939); supported by complete absence in Jul 1975 and Jul 1986 (MJI, CM).

Chatham Island Pigeon *Hemiphaga novaeseelandiae chathamensis* Once found on Chatham, Pitt, and Mangere (Oliver 1955), but no records from South East Island (Fleming 1939); 1, c.1945 (Merton & Bell 1975); by 1970s, only a few birds remaining in forest of s Chatham Island, no pigeons seen on Pitt Island for several years (BDB); endangered (Bell 1986); 1 transferred to South East Island in 1976, but probably died from stress after rough sea voyage (C.J. Robertson, pers. comm.). Merton & Bell (1975) recommended larger translocations and New Zealand Wildlife Service moved birds in summers of 1984 and 1985 from Chatham Island; 8 liberated by slow release from aviary in Woolshed Bush; most did not settle on island long; groups (up to 3 birds) on Pitt Island in 1986 and 1987, for the first time in many years, may have been birds from South East Island.

Individuals were seen in late 1986, and through summers of 1987 and 1988; birds may have moved from Pitt Island each summer because no pigeons were observed there for long periods.

None seen until 2 in courtship flight over Kokopu Creek, Nov 1991; nest at 3 m in Macropiper excelsum bush (AS) but no eggs laid; since heard

infrequently in Kokopu Creek bush (Bell & Nilsson 1992; A. Turner, pers. comm.); none sighted in 1992 or 1993 summers.

Chatham Island Red-crowned Parakeet *Cyanoramphus novaezelandiae chathamensis* Formerly on Chatham, Pitt, Mangere, and South East Islands (Oliver 1955), now in reduced numbers on Mangere and Pitt Island and in s Chatham Island forests (Merton & Bell 1975); most common land bird in 1937 (Fleming 1939) and in 1954 (Dawson 1955); second most common bird after Chatham Island Warbler (Robertson et al. 1980); most conspicuous species in series of 5-minute counts, 1983 (West 1988); now amongst most ubiquitous of land birds, and South East Island is species' stronghold.

Nests usually in tree cavities, in *Olearia traversii* and *Plagianthus regius;* nest in deserted Broad-billed Prion burrow, 25/12/85 (RP); clutches of 5-7, Dec 1937 (Fleming 1939); loud calls of nearly-fledged chicks obvious Jan-Feb; nests can be very close; 5 within 20 m of old woolshed (Robertson *et al.* 1980); 1 hybrid (*C. novaezelandiae chathamensis* x *C. auriceps forbesi*) Mar 1990 (C.J. O'Donnell, pers. comm.); 1, summer 1993.

Shining Cuckoo *Chrysococcyx lucidus lucidus* Regular migrant; breeding population difficult to estimate, but fluctuates between years; presence each spring suggests small self-sustaining population. Ads appear early Oct; eggs not yet found, but Chatham Island Warblers are favoured hosts; 1 nestling in Warbler nest, Jan (Dennison *et al.* 1984); Warblers still feeding Cuckoo fledglings in Feb.

Long-tailed Cuckoo *Eudynamys taitensis* 1, at track entrance at Whalers Bay, Dec 1982 (RT).

Fork-tailed Swift *Apus pacificus* 1, Rangatira Trig, Jan 1991 (DB, MB).

New Zealand Kingfisher *Halcyon sancta vagans* 1, heard near hut, 9/6/85 (DVM), observed near Front Landing, 11/6/85; probably first record for Chatham Islands.

Skylark *Alauda arvensis* A few singing each year above Clears; undoubtedly breeds, but no nests recorded.

Welcome Swallow *Hirundo tahitica neoxena* First seen on Chatham Island 1970 (Hollay 1971); now common; seldom on outlying islands; 1, Feb 1993, hawking for some time in narrow gully above seal colony.

Chatham Island Pipit *Anthus novaeseelandiae chathamensis* Resident, a few hold territories above wave platforms, on Clears, and in open shrubland; nest cup-shaped, woven grass, well concealed in long grass; clutch usually 2, Nov-Feb; fledge Dec onwards.

Hedge Sparrow *Prunella modularis* Common but seldom seen; in forests and shrublands; clutch 2-3, Oct-Dec, in old Myrsine chathamica logs near ground, in tree trunk cavities, or in *Muehlenbeckia* tangles.

Blackbird *Turdus merula* Common resident; more often heard than seen. clutch 3, Nov-Jan; nest (modified to Blackbird-size) reconstructed from Chatham Island Tomtit nest, with original moss and feather lining; feeding on copepod paste regurgitated by Broad-billed Prions (GM, 23/10/84), and on Chatham Island skinks (RT, 29/10/87).

Song Thrush *Turdus philomelos* Rarely seen; present 1953 (Dawson 1955); 1 heard, 1 caught in mist net, 1979 (Robertson *et al.* 1980); 1 heard during 5-minute bird counts, Dec 1983 (West 1988); no recent reports of birds or nests (1993).

Chatham Island Warbler *Gerygone albofrontata* More plentiful per acre on South East Island than Grey Warbler *Gerygone igata* in any area of comparable habitat in New Zealand (Fleming 1939); c.10 birds/ha, highest density of breeding birds in regenerating forest remnants (Dennison *et al.* 1984); among the most conspicuous species surveyed in series of 5-min bird counts (West 1988); still one of the most common birds encountered in all vegetation types, 1993. Nesting from Sep; eggs laid as late as Dec; enclosed pendant nest closely resembles Grey Warbler nest; mean height of 17 nests 2.1 m in 1978, 1979 and 1981, most attached by lateral and basal connections in dense foliage; only 1 brood per year, mean clutch 3.1; mean fledging success 2.7 young per year (Dennison *et al.* 1984).

Chatham Island Fantail *Rhipidura fuliginosa penita* On all larger islands in Chatham group (Oliver 1955), except Mangere (Merton & Bell 1975) where never recorded; population on South East Island known to have fluctuated, sometimes violently; prs scarce (Fleming 1939); not mentioned by Bell (1955); a few in 1954 (Dawson (1955); rare in 1961, apparently absent in 1968 (Merton & Bell 1975); numbers recovered by 1970s (Merton & Bell 1975; Robertson *et al.* 1980) low again in early 1980s; common 1984-1987; population crashed in 1987 winter; extremely rare in summers of 1988-1990; increased gradually until abundant in summer 1993; sudden declines may be attributed to prolonged periods of low temperature or unusually severe climatic conditions (e.g., winter 1987, minimum air temperature at sea level -1°C), when few insects flying and birds may die of starvation; 14 Fantails found dead in old woolshed in 1961 (Merton & Bell 1975). Welcome Swallows suffer similar winter mortalities on Chatham Island.

Nesting Oct-Dec; clutch 2-4; nest 1-5 m above ground; few fledged chicks seen; 1 nearly-fledged chick, 28/10/86 (SK); 3 tailless fledglings followed, attended by up to 5 ads, Nov 1992.

Chatham Island Tomtit *Petroica macrocephala chathamensis* Formerly on Chatham, Pitt, Mangere, Little Mangere, and South East Islands (Fleming 1939; Oliver 1955); not found on Chatham Island or Little Mangere, 1968, in small numbers only on Pitt Island and Mangere (Merton & Bell 1975); abundant on South East Island (Fleming 1939; Dawson 1955; Merton & Bell 1975; West 1988); largest population in archipelago. Breeding season Sep-Dec; ♀ builds nest and incubates; nests in shallow tree cavities or in *Muehlenbeckia* vines; clutch 1-3; both adults feed chicks.

Black Robin *Petroica traversi* Endemic, endangered (Bell 1986); originally on Mangere, Little Mangere, Chatham, and Pitt Islands (Fleming 1939; Oliver 1955); disappeared from Chatham Island by 1871 (Travers 1872); no reference in early literature to presence on Pitt Island; Mangere population exterminated by cats c.1900, then survived only on Little Mangere; critically endangered by 1976-1977; remaining 7 birds transferred to Mangere by New Zealand Wildlife Service because of degrading habitat on Little Mangere; introduced to South East Island, 1982 and 1983; managed intensively through

all phases of breeding until 1989; nest and clutch manipulation; cross-fostering of eggs and chicks, first to Chatham Island Warblers, then - more successfully - to Chatham Island Tomtits; clutch production increased by up to 3 per year; numbers increased from 2 to 99 over 7 years (Butler & Merton 1992); all now descended from 1 ♀ ('Old Blue'); full genealogy of population known; management ceased 1989, but population monitored closely; age and sex ratios comparatively stable; populations fluctuated between 99 and 105 in early 1990s; population 103, Mar 1993.

Breeding pair numbers and productivity reasonably constant (28-32 prs; mean 1.57 independent young/pr) early 1990s; by 1993 fewer birds in major forest tracts in centre and s of island; may result from lower survival there in several years of persistently cold weather, perhaps affecting breeding there; principal breeding population now centred on warmer, n terraces in Woolshed and Whalers Bay Bush (Kennedy 1992); early population plateau in apparently underexploited habitat in marked contrast to rate of increase in limited area of habitat on Mangere; South East Island breeding population less dense, less productive, suffers higher rates of adult and juvenile mortality than Mangere population.

Nesting usually Oct-mid-late-Jan; rarely, last clutches early Feb; ♀ builds nest and incubates; nests in tree trunk cavities or Muehlenbeckia tangles, 0-10 m; clutch 1-3; pairs may renest if first clutches lost, especially if experienced; both ads feed young; prs can raise 3 chicks to independence, but usually 1-2; independent within 3-6 weeks of fledging; experienced pairs may raise several broods in season; early broods have higher fledgling survival.

Silvereye *Zosterops lateralis lateralis* Not common, but apparently resident; not recorded by Fleming (1939) or Bell (1955); low numbers (Robertson et al. 1980; West 1988); mostly in small groups of 2-3, at forest margins or canopy; 1, collecting nesting material, 24/12/85 (RP).

Chatham Island Tui *Prosthemadera novaeseelandiae chathamensis* Once widespread on major islands; plentiful on s Chatham Island (but less so in n), abundant Pitt Island in 1937 (Fleming 1939); uncommon on Chatham and Pitt by 1970s (Merton & Bell 1975). South East Island, 'fair numbers', 1937 (Fleming 1939); rare in 1953 (Bell 1955); seen occasionally, 1954 (Dawson 1955); 10-12 prs estimated, 1961 (Merton & Bell 1975); recovered some abundance by 1970s (Merton & Bell 1975); improvement attributed to recovery of vegetation after domestic stock removed in 1961; still abundant early 1990s, usually in family groups, but flock of 60 + birds over Woolshed Bush, 7/10/89 (RT).

Nesting begins late Oct; fledglings from Dec; most nests 2.5-c.8 m; in dense *Muehlenbeckia* draped over large *Olearia traversii* trees; no data on clutch size or number of chicks raised.

Yellowhammer *Emberiza citrinella* 1, Western Landing, 27/12/86 (RP).

Chaffinch *Fringilla coelebs* Recorded once, 1953 (Bell 1955).

Redpoll *Carduelis flammea* Present, no numbers noted (Bell 1955); small flocks on clear areas around island (Robertson *et al.* 1980); very common but seldom seen, Jan 1986 (DVM); same, 1993; almost certainly resident but no nests or breeding behaviour observed.

House Sparrow *Passer domesticus* 1, near hut, 14/11/88 (DVM).

Starling *Sturnus vulgaris* Probably commonest introduced bird; mid-1980s, large flocks crossed from Pitt Island in evenings, roosting in forest, e.g., 1745 h, 29/9/85, groups of 15-20 birds arriving, followed by flocks of hundreds, migration lasted 30 min, total estimated at 10,000; 1700 h, 6/5/86, an equally large flock descended to, and roosted in, w Woolshed Bush (DVM); large flocks arriving to roost not seen early 1990s.

Common breeding species; nests in cavities in large *Olearia traversii* trees, Oct-Dec; hatching peak about mid-Nov; occupies nearly all tree cavities in some areas of forest in some years.

Few observations on diet; regularly forage in splash zones and on barnacled faces of wave platforms; rarely forage in forest interior; 1 ad fed small Chatham Island Skink to fledged young.

Compete aggressively for nest cavities, and may be major threat to Black Robins; no robin eggs or nestlings seen to be evicted by Starlings but high loss rate of robin nests and clutches, particularly near starling nests; incidence of loss greatly reduced in cavities covered with netting to exclude starlings; a few incubating female robins found dead on clutches, had skull lacerations consistent with an attack by a large bird.

DISCUSSION

South East Island is the only forested island in the Chathams group where the habitat has recovered to any extent after a period of sustained modification. For the next half century, at least, it will contain the only assemblage of habitats with reasonable populations of endemic forest birds.

The diversity of the avifauna is comparable to that of other major temperate island sanctuaries elsewhere in the New Zealand region, such as Codfish, Kapiti, and Little Barrier Islands, though the island is significantly smaller. Unlike the others, however, it is rodent-free.

In the absence of rats and mice, the populations of insects, reptiles, and birds are startling to the uninitiated. For example, West & Nilsson (1994) estimated that there were 1.3 million petrel burrows in the forest, belonging to just four of the seven breeding species. The population of all petrel species, including non-breeders, probably exceeds three million individuals.

The island gives a rare glimpse of the Chathams as they used to be, a major oceanic centre for petrels breeding in southern temperate latitudes. The significance of the group to pelagic seabirds is easily overlooked today. No other island in the region, and few near the New Zealand mainland, have comparable vertebrate biomass.

The recovery of the island's habitats has been accompanied by shifts in the abundance and distribution of bird species. For example, Snipe and Tui have recolonised areas after the ground cover had recovered. Skua distribution has contracted as nesting areas have been smothered, as has that of Shore Plover with the loss of the open pasture where it was widespread in 1954 (Dawson 1955). The insectivorous forest species have benefited from the recovery of the invertebrate populations and the expansion of cover at the forest margins. Both factors have been fundamental to the rehabilitation

of the Black Robin. By the 1990s, burrowing seabirds had begun to recolonise the pastures from which they had been excluded by trampling stock by 1953 (Bell 1955).

There are curious absences from the land bird fauna that are difficult to explain. There are no breeding Chatham Island Pigeons at present despite an apparent abundance of food and a source of colonists nearby on Pitt Island. Black Robins may never have been present, until (re)introduced in 1983. Forbes's Parakeets have never been recorded on South East Island, although they survived on Pitt until 1900. There is no evidence that the two recently extinct rails (*Gallirallus dieffenbachii* and *G. modestus*) were ever present. Unfortunately, there are very few sites where substantial fossil deposits could have accumulated, so little chance that the former status of most species could ever be clarified. It is probable that the absences are not entirely the result of habitat alteration, unless the changes were substantially more severe - and perhaps of even earlier origin - than the admittedly thin historical record suggests.

Our knowledge of the original bird diversity and abundance is frustratingly incomplete. Much can be inferred of past conditions from the present, particularly where species have recovered strongly. However, the problems facing some species such as the Chatham Petrel raises doubts about their original distributions, and about their pre-human relationships with other species on the island. It may be that the massive distortions resulting from habitat loss are still operating despite the recovery of the forest cover. Present patterns of distribution and abundance may be poor indicators of those in the undisturbed environment. It may not be prudent to view the species or their associations uncritically as reflections of the past.

ACKNOWLEDGEMENTS

One cannot visit remote islands in the Chathams without the co-operation of the fishermen of the Chatham Islands. Over the years, we have been transported in all weathers at all times of the day and night, and we thank those skippers of vessels (particularly the Pitt Islanders) who have delivered us safely to our destinations. Mike Imber kindly commented on the first draft of this paper. We are grateful to Don Merton and Brian Bell for allowing us to use information from an unpublished manuscript on the endemic birds of the Chatham Islands. We warmly appreciate the companionship of our colleagues (too many to mention here) who accompanied us to South East Island, in often difficult working conditions. And finally, to our partners, who have been left behind on so many occasions, we are profoundly grateful for their accepting our long absences.

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