BIRDS OF THE WESTERN CHAIN, SNARES ISLANDS 1983-84

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ABSTRACT

Birds observed during landings on four islets of the Western Chain, Snares Islands, in February 1984 are discussed. A census of Salvin's Mollymawk revealed 586 chicks on two of the islets and one stack, and so the population is not likely to exceed 650 pairs. The numbers of the eight other bird species known to breed on the Western Chain were estimated, and their distribution is described. Measurements of 20 chicks of Snares Crested Penguin indicate that the breeding cycle on the Western Chain is about six weeks later than on Main Island.

Buller's Mollymawk, Mottled Petrel, Sooty Shearwater, Southern Skua and Red-billed Gull are new breeding records for the Western Chain, and eight other species observed had not been reported previously.

INTRODUCTION

The Western Chain is a group of five islets and a number of smaller stacks that lie 4.5 km south-west of the main Snares Islands (48°02'S, 166°36'E; Fig. 1). The islets are steep sided, rising to fairly uniform heights of 29-45 m (Fig. 2), and are composed largely of muscovite-rich granite, with overlying biotite-rich schist on some islets (Fleming 1953; Watters & Fleming 1975). From the sea they appear devoid of vegetation other than lichens, but the summit of Tahi, the northern end of Toru, and a tall stack east of Toru have small patches of *Poa astonii*. The succulent herb *Crassula (=Tillaea) moschata*, which was first recorded on the Western Chain from specimens collected by Falla (Fineran 1969), was found on all islets visited (Tahi, Rua, Toru and Rima), occurring usually as isolated patches in crevices but as large mats on the plateau of Rua. Isolated clumps of the rush *Scirpus cernuus* were on Toru and Rima, and mats up to 10 m² were on Rua.

The first recorded visit by a scientist to the Western Chain was by R. A. Falla, who landed with A. J. Black on Rua Islet for an hour on 4 December 1947 (Stead 1948). They confirmed the breeding of Cape Pigeons *(Daption capense)*, reported "populous penguin colonies," and the presence of "White-capped Mollymawks" on adjacent islets (Fleming 1948). On 13 January 1964, E. W. Dawson

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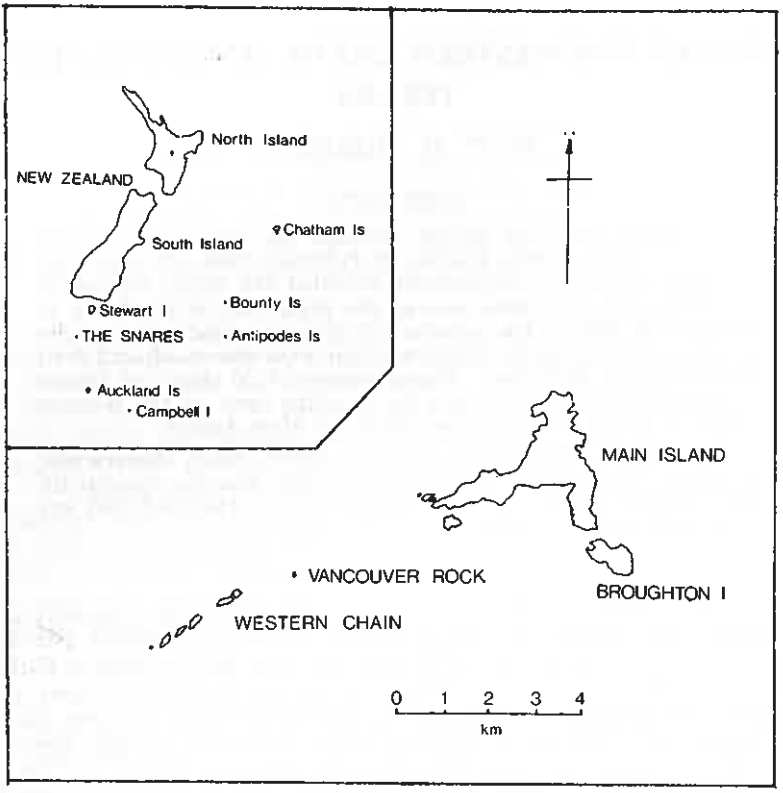

FIGURE 1 — The Snares

and R. Singleton landed on Tahi Islet (Dawson 1964) where they found Cape Pigeons and collected marine invertebrates (Fleming & Baker 1973). C. A. Fleming and A. N. Baker landed on Toru Islet on 2 December 1972, while S. Black and E. McDonald landed on Tahi. Fleming & Baker (1973) gave the first published summary of seabirds on the Western Chain and proposed names for the five main islets. These names were accepted and gazetted by the New Zealand Geographic Board in 1974 (C. A. Fleming, p. 293 *in* Yaldwyn 1975).

This phase of initial exploration of the five main islets of the Western Chain was completed on 21 November 1976 when the five members of the University of Canterbury 1976-77 Snares Expedition (J. W. Early, G. D. Fenwick, D. S. Horning, P. M. Sagar and J. L. Woods) landed on Rima Islet and D. S. Horning landed on Wha Islet. The breeding seabirds on Rima were counted, and a distribution of the four known breeding species on the Western Chain was proposed (Sagar 1977a).

During February 1984, four members of the University of Canterbury 1983-84 Snares Expedition (P. W. Carey, G. J. Eller, C. M. Miskelly and P. J. Wilson) travelled out to the Western Chain on three occasions, once on FV *Sea Way*, skippered by M. Schofield, and twice on FV *Sea Emerald*, skippered by K. Schofield. Landings were made on Tahi Islet (PWC and CMM, 19 February), Rua Islet (PWC and CMM, 19 February), Toru Islet (PWC and CMM, 12 February) and Rima Islet (PWC, CMM and PJW, 11 February; PJW, 19 February). On Tahi Islet we landed in a small protected inlet on the south-western side, apparently at the point where Dawson and Singleton got ashore (Fleming & Baker 1973). On Rua Islet we landed on a steep face on the north-western side of the islet, and on Toru we went ashore about halfway along the steep western face, while leaving from the penguin and seal landing spot on the south-eastern side (where Fleming and Baker are presumed to have landed). We landed on the northern point of Rima Islet, at the same location where the 1976/77 Expedition party landed (G. D. Fenwick and P. M. Sagar, pers. comm.). All the landing points known to have been used on the Western Chain are shown in Fig. 3. Some points are taken from Figure 1 of Fleming & Baker (1973). The landing point used by D. S. Horning on Wha Islet was supplied by G. D. Fenwick (pers. comm.).

FIGURE 2 — Main Island and Broughton Island (right) viewed from the summit of Rima Islet, with other islets of the Western Chain in foreground

Photo P. Carey

The main objectives of our visits were to count fur seals *(Arctocephalus forsteri)* and Salvin's Mollymawks *(Diomedea cauta salvini)*, to determine the precise delay in breeding of Snares Crested Penguins *(Eudyptes robustus)* compared with those on Main Island to search areas of tussock for burrowing petrels and to make entomological collections. The observations made while on the Western Chain are supplemented by observations made from FV *Sea Emerald* on 26 January 1983 (CMM) and 15 January 1984 (GJE), and from FV *Sea Way* on 10 February 1984 (GJE and CMM).

SYSTEMATIC ACCOUNT

BLUE PENGUIN *Eudyptula minor*

The head of a freshly dead Blue Penguin (presumed skua-killed) was found near the south end of Toru, c. 15 m a.s.l. on 12 February 1984. This is the southernmost known record for this species, which has been recorded from The Snares on four previous occasions.

SNARES CRESTED PENGUIN *Eudyptes robustus*

This species was breeding on Toru and Rima Islets. (It also breeds on Main and Broughton Islands.) Contrary to the distribution proposed by Sagar (1977a), it does not breed on Rua Islet.

Fleming & Baker (1973) and Sagar (1977a) commented on the later breeding cycle of Snares Crested Penguins on the Western Chain than on Main Island. On 2 December 1972, Fleming & Baker (1973) found the penguins on Toru sitting on eggs when " . . . nests on the main Snares Island all had downy chicks," and Sagar (1977a) found incubating birds on Rima Islet on 21 November 1976. On 11 February 1984, most of the chicks on Rima Islet were totally downy, but a few were starting to lose down from the flippers and the base of the tail. Chicks were in a similar but slightly more advanced stage on Toru Islet on 12 February 1984. We caught 20 chicks on Toru to describe the stage of down loss and measure their bills. This sample was not random (chicks were selected for ease of capture among the rock piles) but was thought to be representative. Three chicks were totally downy, 11 were downy except for the anterior edge of the flipper, three had also lost down from the base of the tail, and three had lost some down from the centre of the belly or lower back. Bill measurements averaged 43 mm ± 2 mm (range 40-50 mm).

Most chicks had left Main Island by the end of January, the last being observed in Station Cove on 13 February 1984.

During the 1968-69 breeding season chicks on Main Island were first seen shedding down about 24 December and most were down free by 16 January (Warham 1974). In 1983-84 some chicks had started losing down by 11 December (G. J. Eller, pers. comm.). Judged by the pattern of down loss described by Warham (1974),

the Western Chain chicks were at least 44 days later in their development than chicks on Main Island. Sagar (1977a) calculated that the breeding cycle was delayed by at least 15 days at the time of his visit and by at least 26 days at the time of Fleming & Baker's visit. (No eggs were collected by either party to determine stage of development.)

Hatching is presumed to occur around mid-December on the Western Chain, compared with early November on Main Island (Warham 1974).

The Snares Crested Penguins on Toru and Rima Islets have a similar breeding distribution to the Salvin's Mollymawks (Fig. 3). Most chicks were under boulders and in crevices that were too small for the mollymawks to use, and this, plus the limited time we had on each islet, made an accurate count of penguin chicks impractical. However, we estimated that 100-150 chicks were on Rima Islet and 300-400 on Toru Islet. Sagar (1977a) found 74 occupied nests on Rima in November 1976 but considered this an underestimate.

During February large numbers of moulting non-breeding Snares Crested Penguins are on the main Snares Islands. No moulting birds were seen on Rima Islet, but c. 30 in premoult fat (but not yet losing feathers) were found on Toru Islet in 12 February. Thus, moulting also may be delayed on the Western Chain, and Toru may be the only islet where non-breeders moult.

Only one area on each of the two islets is used by penguins as a landing, our landing point on Rima and the east landing on Toru (Fig. 3). No penguins were seen south of the gut on Toru Islet or on any of the other islets and stacks.

ERECT-CRESTED PENGUIN *Eudyptes sclateri*

An immature Erect-crested Penguin in premoult fat was found at about 15 m a.s.l. on Rima Islet on 11 February 1984. This species has not been found on the Western Chain before but small numbers moult on the main Snares Islands each year.

BLACK-BROWED MOLLYMAWK *Diomedea melanophrys*

On 11 February 1984 an adult Black-browed Mollymawk was observed flying over Toru Islet and another was seen sitting among the Salvin's Mollymawks. When we landed on Toru the following day we found three Black-browed Mollymawks ashore, all of the dark-eyed nominate race *D. m. melanophrys*. Two birds were displaying to each other on the edge of a large group of Salvin's Mollymawks, but there was no sign of a nest. The third bird was sitting among some Salvin's Mollymawks c. 40 m from the pair. All were low on the eastern side of the islet.

Elsewhere in the New Zealand region this subspecies breeds only (in low numbers) on Bollons Island in the Antipodes group. Both races of *D. melanophrys* should have half-grown young in mid-February (Oliver 1955, Serventy *et al.* 1971).

BULLER'S MOLLYMAWK *Diomedea bulleri*

While counting the Salvin's Mollymawks on Toru Islet on 12 February 1984, we found five Buller's Mollymawks sitting on nests, and an additional vacated nest. All the nests were near vegetation *(Poa astonii* or *Scirpus cernuus)* and were the same characteristic earth pillars as on the main Snares Islands. Two of the nests were c. 2 m apart, but the other three and the vacated nest were isolated. Four nests were at the northern end of the islet and two were on the western face. None was less than 10 m from breeding areas of the Salvin's Mollymawks. The four nests that could be reached each contained one fresh egg. Several Buller's Mollymawks were seen flying over both Toru and Rima Islets.

WHITE-CAPPED MOLLYMAWK *Diomedea cauta cauta*

On 12 February 1984 an adult White-capped Mollymawk was found displaying with a group of non-breeding Salvin's Mollymawks on the north-west face of Toru Islet. Two were seen flying over Rima Islet on 11 February 1984.

SALVIN'S MOLLYMAWK *Diomedea cauta salvini*

This race of mollymawk breeds on nine islands and islets in the Bounty Islands (Robertson & van Tets 1982) and Toru and Rima Islets in the Western Chain.

Sagar (1977a) counted 706 adults, 122 live chicks, 13 dead chicks and 9 eggs on Rima Islet on 21 November 1976. This represents a minimum of 144 breeding pairs.

On 11 February 1984, I counted 150 chicks and 263 adults on Rima Islet. No evidence of chick mortality was seen, which indicates that the population has remained fairly stable over the intervening seven years. The lower number of adults present was probably due to a decline in the numbers of non-breeding birds visiting the colony three months later in the season.

On 12 February 1984 we counted 435 chicks and 673 adults on Toru Islet. Two dead chicks were found (one recent, the other just out of the egg and long dead). One chick and two adults were seen on the tall stack east of Toru Islet. Thus the breeding population of Salvin's Mollymawks on the Western Chain is unlikely to exceed 650 pairs (allowing for unobserved egg and chick losses).

Robertson & van Tets (1982) estimated that over 76 000 pairs of Salvin's Mollymawks were breeding on the Bounty Islands, and so only c. 0.8% of the subspecies breed on the Western Chain.

The distribution of Salvin's Mollymawks on the Western Chain is shown in Fig. 3. Most nests were under overhangs or in crevices between boulders, but on the relatively sheltered eastern sides of the islets the mollymawks tended to form open colonies. The largest basin on the eastern side of Toru Islet contained a continuous colony of c. 120 chicks. The nests, constructed mainly from guano with

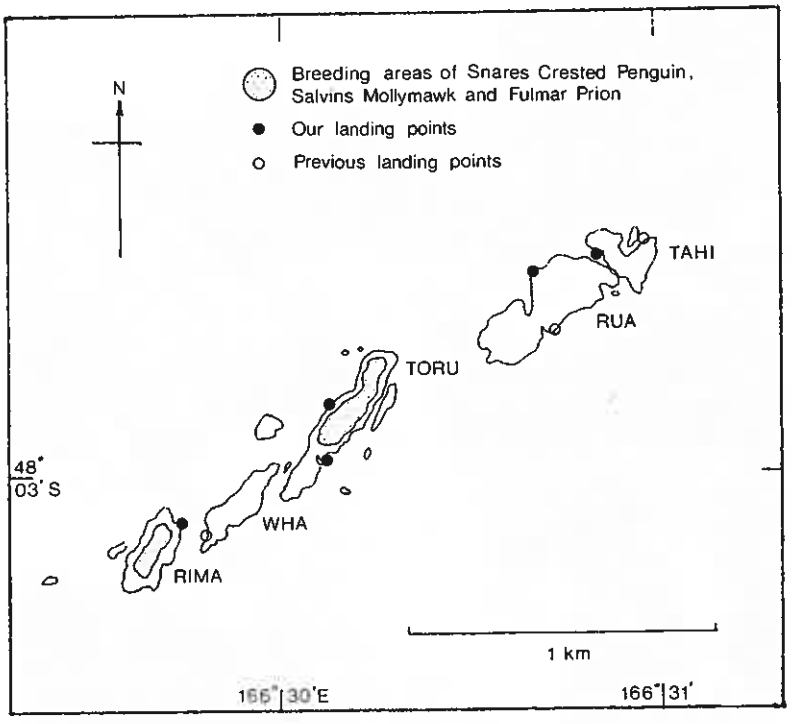

FIGURE 3 — The Western Chain, showing landing points and breeding distribution of Snares Crested Penguin, Salvin's Mollymawk and Fulmar Prion (modified from NZMS 272/1)

some granite fragments, feathers and fish and bird bones, were not as high as those that the Buller's Mollymawks manage to build, even on Toru.

The chicks were well past the guard stage and ranged from the " french-poodle " stage with just the wings free of down (Fig. 4) to being fully feathered except for a large patch of down on the nape. From the hatching dates deduced for The Snares by Robertson & van Tets (1982) from Sagar (1977a), these chicks should have been about 15 weeks old. The fledging date is not known, but I suspect some of the more advanced chicks would have left the islets in early March.

Most chicks responded to our presence by sitting upright on their nests and " clopping " their bills. If we approached closer they would make noises as if they were going to regurgitate, but this only occurred twice (to the dismay of PWC as their capacity exceeds that of Cape Pigeons). Some chicks were observed soliciting food

FIGURE 4 — Salvin's Mollymawk chick on nest, Rima Islet, 11 February 1984

Photo C. Miskelly

from adults and being fed. Fish remains and squid beaks were common around the nests. The more advanced young were seen exercising their wings.

CHATHAM ISLAND MOLLYMAWK *Diomedea cauta eremita*

On 26 January 1983, during the University of Canterbury 1982-83 Snares Expedition, I observed a Chatham Island Mollymawk that was sitting among some Salvin's Mollymawks halfway up the eastern side of Toru Islet. This bird later flew down to the boat and was photographed while feeding with Salvin's and Buller's Mollymawks on fish scraps. On 10 February 1984 GJE and CMM observed a Chatham Island Mollymawk c. 1 km south-west of the Western Chain. Although easily discernible from the many *D. c. salvini* around the boat, this bird was neither as dark on the head nor as brightly coloured on the bill as Chatham Island Mollymawks I have seen before or since. The bird was apparently adult as the only dark area on the bill was the mandibular unguis.

While counting Salvin's Mollymawks on Rima Islet on 11 February 1984 I found two Chatham Island Mollymawks. One was sitting among some unoccupied Salvin's Mollymawk on a granite slab, and the other was sitting on an empty nest with a Salvin's Mollymawk beside it (Fig. 5). A third Chatham Island Mollymawk flew over the islet.

On 12 February 1984 on Toru Islet, two Chatham Island Mollymawks were seen sitting next to adult Salvin's Mollymawks that were on nests. One 'pair' were high at the northern end of the islet, and the other bird was among the lowest group of Salvin's Mollymawks on the eastern side (where one was seen on 26 January 1983).

I am not aware of any published account of *D. c. eremita* on land away from its only known breeding island, Pyramid Rock in the Chatham Islands. Murray Schofield (pers. comm.) has seen several birds at sea near The Snares.

CAPE PIGEON *Daption capense australe*

Cape Pigeons were found breeding on Rua Islet in 1947 (Stead 1948), on Tahi in 1964, on Tahi and Toru in 1972 (Fleming & Baker 1973) and on Wha and Rima in 1976 (Sagar 1977a). We found them breeding on Tahi, Rua, Toru and Rima Islets in February 1984, and observed them sitting on several of the smaller stacks. Cape Pigeons also breed at many localities around the main Snares Islands and associated stacks (Sagar 1979) and at other island groups south of New Zealand (Kinsky 1980).

On 11 and 12 February 1984 on Rima and Toru Islets most of the chicks were almost free of down, and the presence of down in empty nests showed that some had already fledged. We estimated about 500 chicks on Rima and 1000 chicks on Toru. Most nests

were in crevices open from above, rather than under boulders. A week later on Tahi and Rua few chicks remained (c. 10 and 100 respectively) but several thousand pairs must breed on the Western Chain.

MOTTLED PETREL *Pterodroma inexpectata*

An adult Mottled Petrel and a downy chick were removed from separate burrows in *Poa astonii* on Toru Islet on 12 February 1984. A broken egg containing a fully-formed chick was also found. About 20 skua-killed birds were found near the areas of *Poa* on Toru, and two pairs of wings were found on Rua and several in skua middens on Tahi (19 February 1984).

There are sufficient areas of tussock (all intensively burrowed) on Toru for at least 100 pairs and a similar area is on a tall stack to the east of Toru. No Mottled Petrels were found during a quick search of burrows on Tahi Islet, but they may nest there also.

BROAD-BILLED PRION *Pachyptila vittata*

Sagar (1977a) found the skull of a Broad-billed Prion on Rima Islet, 21 November 1976. A freshly killed adult Broad-billed Prion was found in a skua midden on Tahi Islet on 19 February 1984. These birds are presumed to have been caught at sea.

FAIRY PRION *Pachyptila turtur*

Three of the seven identifiable *Pachyptila* skulls found in a skua midden at the southern end of Rua Islet on 19 February 1984 were referable to *P. turtur*. This species is not likely to breed on the Western Chain as the limited breeding habitat is occupied by *P. crassirostris*.

FULMAR PRION *Pachyptila crassirostris*

The nominate race of *P. crassirostris* breeds only in the New Zealand region at the Chatham Islands, The Snares and the Bounty Islands (Harper 1980). The breeding of Fulmar Prions on the Western Chain was confirmed on Toru Islet (Fleming & Baker 1973) and on Rima Islet (Sagar 1977a).

We recorded Fulmar Prions ashore only on Toru and Rima Islets, although flocks were common close off all the islets and one bird was observed circling over the saddle on Rua Islet. Four skulls of *P. crassirostris* were found in a skua midden on Rua Islet.

On Toru and Rima Islets some Fulmar Prions were observed sitting on the surface, but most were deep in crevices under boulders as described by Sagar (1977a). Chicks were presumed to have fledged as none was seen. The birds present were quite vocal, and so a resurgence of courting behaviour may follow chick fledging. We estimated 100-200 pairs on Rima Islet and 300-400 pairs on Toru Islet

Sagar (1977a) found eggs on Rima Islet on 21 November 1976, but no other information is available on the breeding cycle of Fulmar

Prions on the Western Chain, and little from other breeding islands. Robertson & van Tets (1982) suggested that laying started about the beginning of November at the Bounty Islands, and Fleming found eggs on Pyramid Rock (Chatham Islands) on 16 December (Oliver 1955). These dates agree with the findings of Downes *et al.* (1959) for *P. c. eatoni* at Heard Island. Assuming an incubation period of about 56 days and a fledging period of 44-55 days, as in the Fairy Prion (Serventy *et al.* 1971), Fulmar Prions on the Bounty Islands would fledge in the third week of February. Our observations suggest that the Fulmar Prions on the Western Chain have completed fledging by this time, but further data are required from all breeding localities.

SOOTY SHEARWATER *Puffinus griseus*

One adult, one egg and four downy chicks were removed from some of the many burrows in the *Poa astonii* cap of Tahi Islet on 19 February 1984. Sooty Shearwaters may also breed in other areas of tussock on the Western Chain. One skua-killed adult was found on Rua Islet.

DIVING PETREL *Pelecanoides urinatrix*

Remains of skua-killed Diving Petrels were found on Tahi, Rua and Toru Islets and they seemed to comprise the bulk of skua prey items. Fleming & Baker (1973) commented on regurgitated bones of Diving Petrels that had been collected on Tahi Islet. We found no live birds, but small burrows among the tussocks on Tahi and Toru Islets may have been of this species.

BLACK SHAG *Phalacrocorax carbo*

Sagar (1977a) reported four Black Shags that were flushed from Rima Islet at their approach on 21 November 1976, and also 17 on a rock between Toru and Wha Islets on 4 December 1976 (Sagar 1977b). During the period November 1976-February 1977 there were large numbers of Black Shags on The Snares (Sagar 1977b) but these remain the only records.

SOUTHERN SKUA *Stercorarius skua lonnbergi*

Skuas were found breeding on Tahi and Rua Islets on 19 February 1984. On Tahi a pair had raised two large chicks, and on Rua a trio had raised one chick to fledging. Skua regurgitations or middens were found on all islets visited. The main prey species being taken by skuas on the Western Chain were Diving Petrels, prion species and Mottled Petrels. No evidence was found of the skuas preying on the young of Snares Crested Penguins, Salvin's Mollymawks or Cape Pigeons, but this is assumed to occur earlier in the season.

At the southern end of Rua Islet are two areas of bone deposits, each about 10 m^2, being uncovered by wind action. The layers are c. 5 cm thick and covered with *Crassula* and *Scirpus*. These bones

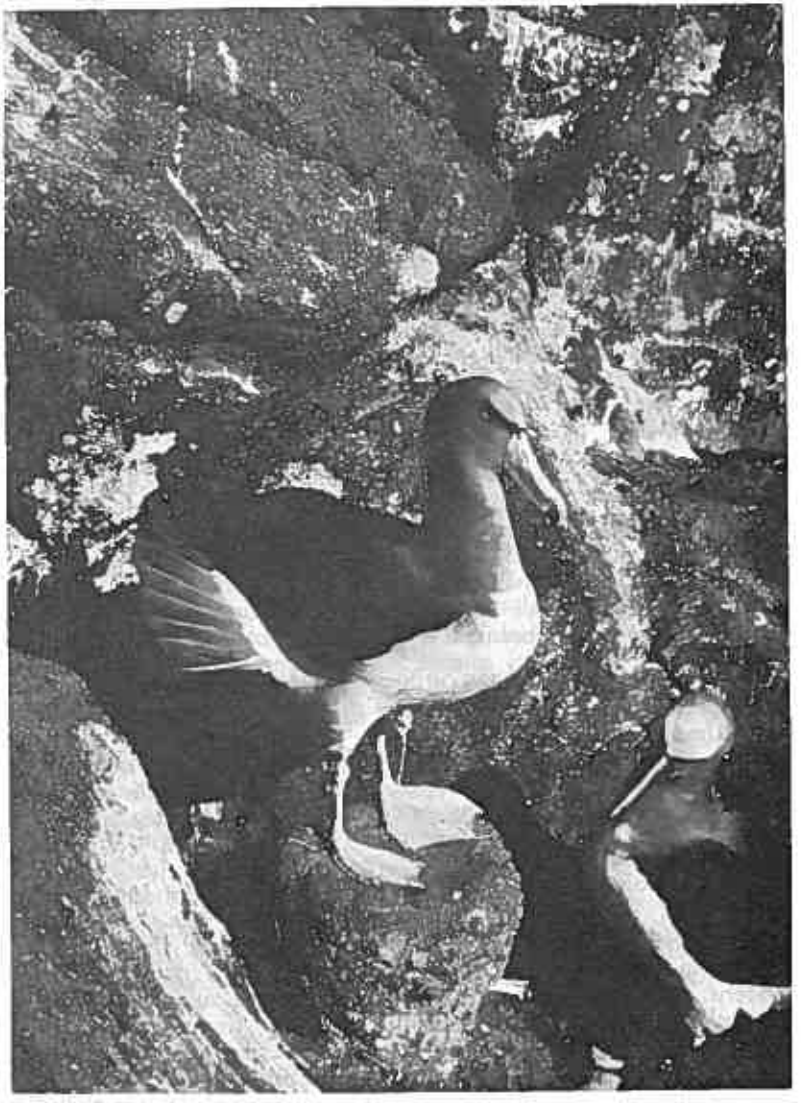

FIGURE 5 — Chatham Island Mollymawk (on nest) displaying to Salvin's Mollymawk. Height of nest exceptional. Rima Islet, 11 February 1984

Photo C. Miskelly

are presumably derived from skua middens and it would be interesting to identify past prey items.

RED-BILLED GULL *Larus novaehollandiae*

Adult and juvenile Red-billed Gulls were found on all the islets we landed on. The largest groups were 40 adults and 9 juveniles on Toru (12 February 1984) and 22 adults and 4 juveniles on Rua (19 February 1984). Fourteen juveniles with 3 adults were seen on Tahi (19 February 1984). Breeding was suspected on Rua and Toru Islets and was confirmed on Rima, where a large chick was seen on 11 February 1984.

ANTARCTIC TERN *Sterna vittata*

Antarctic Terns were observed at sea near the Western Chain during each visit but were not seen roosting on any of the main islets. On 15 January 1984 4 adults, 1 immature and 1 juvenile were roosting on a rock east of Rua Islet. The largest flock seen comprised 5 adults, 3 immatures and 1 juvenile feeding close to the western coast of Rua Islet on 19 February 1984.

WHITE-FRONTED TERN *Sterna striata*

An adult White-fronted Tern was feeding with nine Antarctic Terns west of Rua Islet on 19 February 1984. Although this species breeds as far south as the Auckland Islands (Oliver 1955) there are no recent records from The Snares.

SONG THRUSH *Turdus philomelos*

A fledgling Song Thrush was flushed three times on Toru Islet on 12 February 1984. This bird was a competent flier and so had presumably flown across the strait between the Western Chain and Main Island.

DISCUSSION

The breeding distribution of bird species within the Western Chain apparently depends on the topography and geology of the main islets, except for burrowing petrels, which are confined to the small areas of *Poa astonii*. The Cape Pigeon is the only species known to breed on all five main islets. The breeding distribution of birds on the Western Chain is given in Table 1.

The three southern islets (Toru, Wha and Rima) have several conspicuous joint systems that dissect the granite, forming crevices and piles of boulders. These areas are used for nesting on the two higher islets (Toru and Rima) by Snares Crested Penguins, Salvin's Mollymawks and Fulmar Prions. The lower relief of Wha (max 37 m a.s.l.) may be the factor preventing Salvin's Mollymawks from breeding, although they nest down to c. 15 m a.s.l. on Toru. Wha is the islet considered most suitable for the mollymawks to spread onto. An absence of suitable landing places may keep penguins from Wha Islet.

TABLE 1 — Breeding distribution of seabirds within the Western Chain, Snares Islands. X = breeding confirmed; ? = breeding suspected

SPECIES	ISLET	Tahi	Rua	Toru	Wha	Rima
Snares Crested Penguin				X		X
Salvin's Mollymawk				X		X
Buller's Mollymawk				X		
Cape Pigeon		X	X	X	X	X
Mottled Petrel		?		X		
Fulmar Prion				X		X
Sooty Shearwater		X		?		
Southern Skua		X	X			
Red-billed Gull			?	?		X

Tahi, and particularly Rua, are lower lying with a covering of schist (Watters & Fleming 1975), which weathers to form shallow pans separated by narrow ridges. Such relief does not provide suitable crevices for Snares Crested Penguins or Fulmar Prions, nor does it appear to provide enough shelter for mollymawks. The summit of Tahi is more like the southern islets — rounded granite with a cap of tussock — but this area is small.

The skuas are presumably confined to the northern islets for breeding to avoid interference by mollymawks and penguins. Skuas are not known to breed on Wha Islet, possibly because of a lack of vegetation for nest construction.

The five sightings of adult Chatham Island Mollymawks on Toru and Rima Islets raise the question of whether these birds are breeding with the Salvin's Mollymawks on the Western Chain, particularly as three were apparently attached to nest sites. No chicks were found associated with these birds, but unaccompanied *eremita* or *eremita* x *salvini* chicks would not have been recognised. The 'cauta' mollymawk seen 1 km south-west of the Western Chain on 10 February 1984 had characteristics suggestive of a hybrid.

The breeding Salvin's Mollymawks on the Western Chain appear to act as a lure for other mollymawks that feed in the area. The few Buller's Mollymawks that breed on Toru may have been attracted by the presence of the Salvin's Mollymawks and managed to find enough soil to construct nests, or they may be the remnant of a larger population that has declined with decreasing vegetation cover and

island size. It would be of interest to measure and map the existing areas of *Poa astonii* on the Western Chain at intervals in order to determine whether the vegetative cover is increasing, static or declining.

Other problems that could be given attention by future visitors to the Western Chain include looking for breeding by the various mollymawks, determining the timing of the breeding cycle of the Fulmar Prions, and working out whether the delay in the breeding cycle of the Snares Crested Penguins on the Western Chain has a genetic or environmental basis.

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LITERATURE CITED

DAWSON, E. W. 1964. Antarctic oceanography, 1963-64. Antarctic 3 (10): 430-432.
DOWNES, M. C.; EALEY, E. H. M.; GWYNN, A. M.; YOUNG, P. S. 1959. The birds of Heard Island. ANARE Rep. Ser. B. Vol. 1, Zoology
FINERAN, B. A. 1969 The flora of the Snares Islands, New Zealand. Trans. R. Soc. NZ, Bot. 3 (17): 237-270.
FLEMING, C. A. 1948. The Snares Islands Expedition, 1947. NZ Bird Notes 2 (8): 181-184.
FLEMING, C. A. 1953. The geology of The Snares Islands, Part 1: General geology. Scientific results of the New Zealand Sub-Antarctic Expedition, 1941-45. Cape Exp. Ser. Bull. 13: 9-27.
FLEMING, C. A.; BAKER, A. N. 1973. The Snares Western Chain. Notornis 20 (1): 37-45.
HARPER, P. C. 1980. The field identification and distribution of the prions (genus **Pachyptila**), with particular reference to the identification of storm-cast material. Notornis 27 (3): 235-286.
KINSKY, F. C. (Convener) 1980. Amendments and additions to the 1970 Annotated Checklist of the Birds of New Zealand. Supplement to Notornis 27.
OLIVER, W. R. B. 1955. New Zealand birds. 2nd ed. Wellington: Reed.
ROBERTSON, C. J. R.; van TETS, G. F. 1982. The status of birds at the Bounty Islands. Notornis 29 (4): 311-336.
SAGAR, P. M. 1977a. Birds of the Western Chain, Snares Islands, New Zealand. Notornis 24 (3): 178-183.
SAGAR, P. M. 1977b. Birds of the 1976-77 Snares Islands Expedition. Notornis 24 (4): 205-210.
SAGAR, P. M. 1979. Breeding of the Cape Pigeon (**Daption capense**) at the Snares Islands. Notornis 26 (1): 23-36.
SERVENTY, D. L.; SERVENTY, V.; WARHAM, J. 1971. The handbook of Australian sea-birds. Sydney: Reed.
STEAD, E. F. 1948. Birdlife on the Snares. NZ Bird Notes 3 (3): 70-79.
WARHAM, J. 1974. The breeding biology and behaviour of the Snares Crested Penguin. J.R. Soc. NZ 4 (1): 63-108.
WATTERS, W. A.; FLEMING, C. A. 1975. Petrography of rocks from the Western Chain of the Snares Islands. NZ J. Geol. Geophys. 18 (3): 491-498.
YALDWYN, J. C. (ed.) 1975. Preliminary results of the Auckland Islands Expedition 1972-73. Dept. Lands and Survey, Wellington.

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