SNARES ISLAND BIRDS

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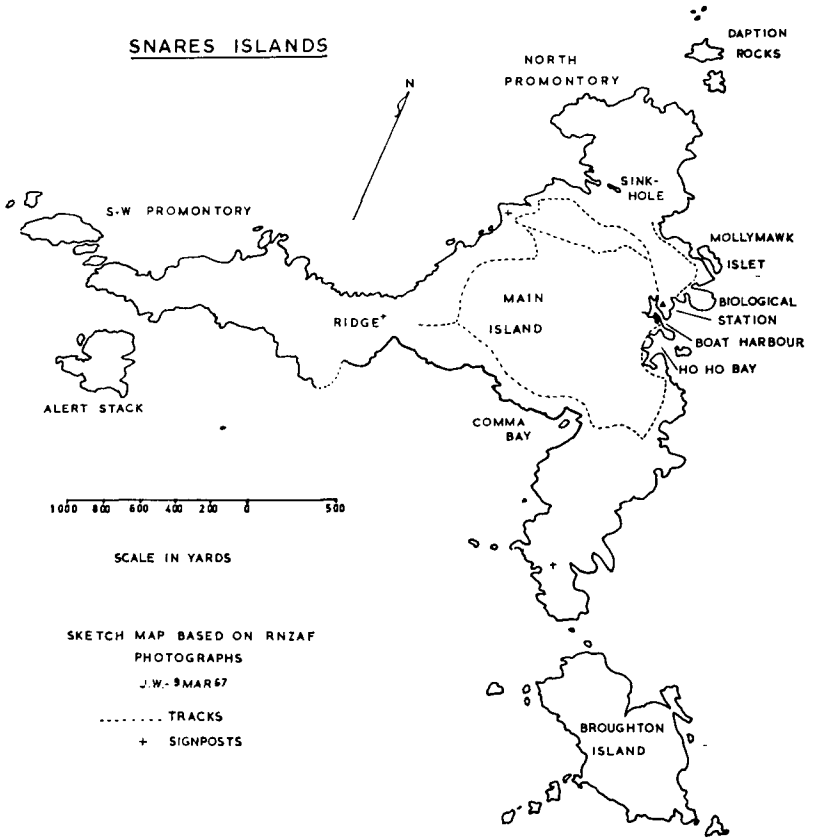
Though small in area, the Snares Islands at 48°S, 166°E are important zoologically in being one of the very few southern island groups whose condition has not been modified substantially by introduced or alien animals and plants. Despite the attentions of the sealers in the last century which involved the presence ashore of parties for extensive periods, rats and mice have not become established. Only two alien plants, Chickweed (*Stellaria media*) and the grass *Poa annula* are now present and the non-indigenous birds consist of small passerines that do not appear to compete significantly with the avian endemics.

The University of Canterbury plans to continue its research on the main islands where a Biological Station was erected in 1961 and this seems to be an appropriate time to set out the present status of the birds of the group so far as this is known.

Most of these visit the islands only for breeding and obtain their food at sea. Their effects on the environment are varied. The nutrients they deposit ashore either in faeces or in the bodies of those, old and young, that die on land are presumably beneficial both to the plants and to the invertebrate fauna and W. F. Harris (in Fleming *et al*, 1953) suggests that the relatively high level of fertility of the Snares Island peat could be due to its enrichment by the animal population. On the other hand, the sparsity of plants on the floor of the forest has often been atrributed to trampling by sea-birds, notably by *Puffinus griseus*.

The flora of the main island has been reported on by several investigators in the past, most recently by Finneran (1964 and *in press*). For details of the geology reference should be made to the paper by Fleming, Reed and Harris (1953). The map accompanying the present paper is based on R.N.Z.A.F. photographs taken in January 1967 and is more detailed and rather different from that previously published which was based on a survey by T. S. Millar and dated 1891.

A. Reischek (1888) seems to have been the first to report on the fauna. He landed on the main island on 22 January of that year and published a brief account. F. R. Chapman (1890) spent part of a day ashore, also in January, and adds a little further information while the botanist T. Kirk apparently landed on the same occasion and in his report on the flora (Kirk, 1890) mentions some of the birds he saw. The collector H. H. Travers also visited the islands probably in May 1894 and brought back specimens of the local Fernbird *Bowdleria punctata*. This was described (as a new species) by Buller in 1894. On 2 January 1901 and 7 January 1902 the Earl of Ranfurly visited the Snares in the course of a trip through the southern islands to collect specimens for the British Museum. On the first of these he was accompanied by F. W. Hutton, then curator of the Christchurch Museum. Specimens of most of the common birds were collected and were reported on by Ogilvie-Grant in 1905. In 1907 the Philosophical Society of Cantrebury's Expedition to the Sub-Antarctic Islands spent most of 15 November ashore and E. R. Waite followed this up by a visit in February 1908 (Waite, 1909).



All these visits were brief, the periodical rounds of the government steamships to replenish the castaway huts on the southern islands being utilised to get the investigators to and from the Snares. E. F. Stead was on the main island on 31 January 1929 and some of the eggs he collected then are in the Canterbury Museum but he appears to have published no account of that visit. R. A. Falla also landed briefly in 1944, but until 1947 no biological party had stayed at the Snares. In that year a group of ten, led by R. A. Falla, was on the main island from 24 November until 6 December. The trip was sponsored by the N.Z. Goverment and the American Museum of Natural History. Dr. and Mrs. R. C. Murphy, together with a party of New Zealand scientists, made extensive observations and collected some birds as a basis for a New Zealand exhibit in the American Museum (Murphy, 1948). Rather little was published on the findings of this expedition. There was a popular account by Mrs. Murphy (G. B. Murphy, 1948) and a brief but useful digest by Fleming (1948). The account by Wilson (1959) adds little to either of these and contains some in-

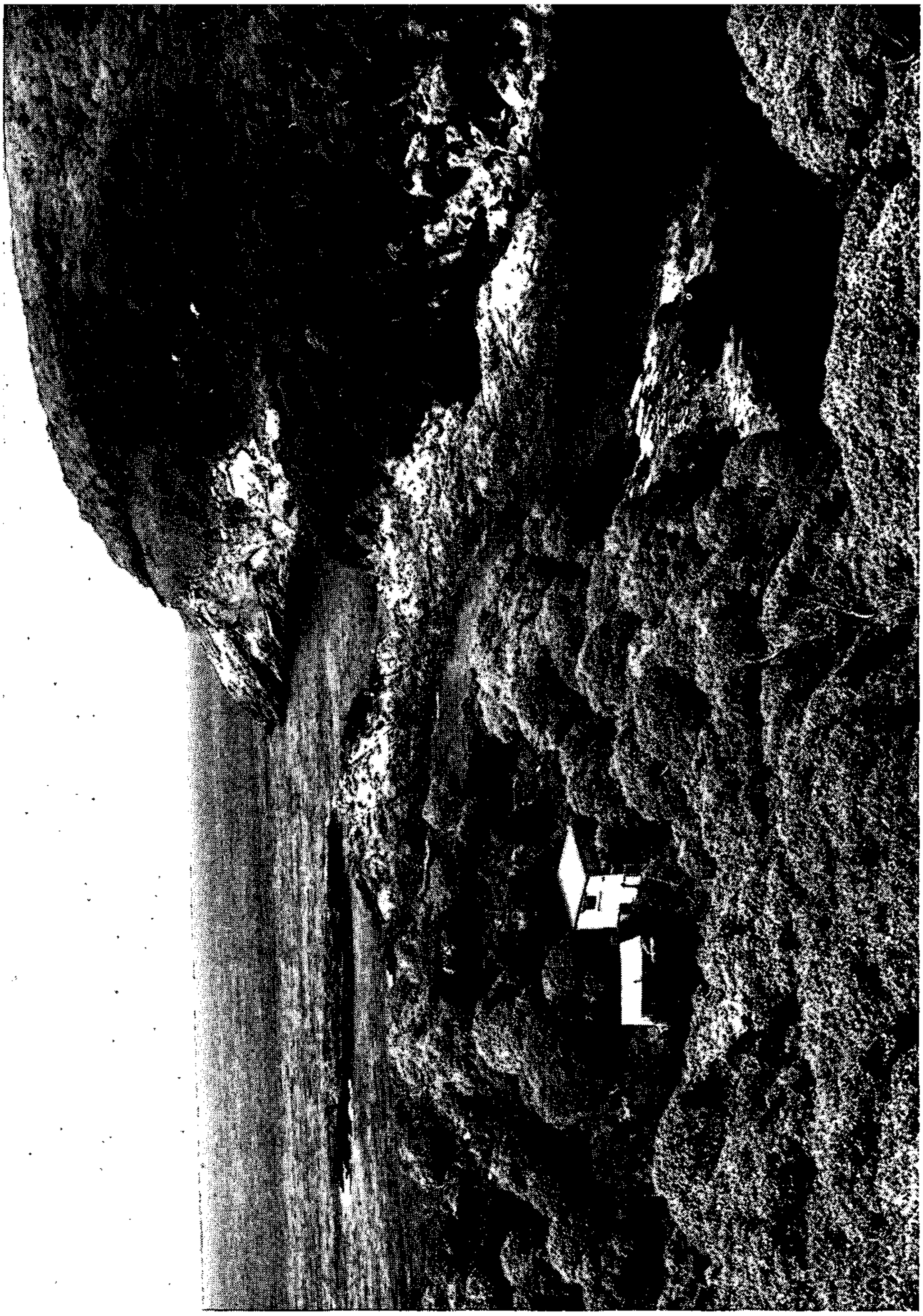


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Plate XXV — Snares Island. University of Canterbury Biological Station and Boat Harbour.

accuracies. A whole issue of " New Zealand Notes " was however devoted to the expedition but this report is strangely incomplete as no mention is made of the commonest bird present, the Sooty Shearwater, or of the Mottled Petrel (*Pterodroma inexpectata*) or the Prions (*Pachyptila turtur*) and (*P. vittata*) (Stead, 1948).

There was activity again the following year when L. E. Richdale and W. M. C. Denham camped in the old castaway hut from January 9 to February 26. One result was a useful popular account (Richdale, n.d.) and the first sustained study of a Snares Island bird, Buller's Mollymawk (*Diomedea bulleri*) (Richdale, 1949 a and b).

Following these visits there appear to have been no further investigations by vertebrate zoologists until the 1961 University of Canterbury Expedition. A four-man team was in the field from 17 January to 13 February and although the major work was in the building of a Biological Station and in sampling invertebrate populations a good deal of information on the birds was gained and a programme of banding Buller's Albatrosses started. In addition, some of the birds banded by Richdale were re-sighted. The second University of Canterbury team of six was in the field from 2 January to 10 February 1967 and worked on the invertebrates and on certain of the birds. Studies of behaviour in the Snares Crested Penguin (*Eudyptes pachyrhynchus atratus*) (= *E. robustus*) were started, based on flipper-banded animals; and detailed measurements of samples of adults, yearlings and young were made. Some specimens were collected and are being used as the basis of an examination of the taxonomic status of this bird (Stonehouse, *in press*). Detailed observations supplemented by tape recordings and film were made on *Puffinus griseus, Pterodroma inexpectata* and *Pachyptila turtur*. Some breeding Buller's Mollymawks were measured and banded birds re-sighted. Samples of stomach oil were taken from all the Procellariiformes present and most species and their nests were examined for ectoparasites of which a comprehensive collection was made.

The following list includes only those species that were seen on or over the island and does not therefore include the Royal Albatross (*Diomedea epemophora*) frequently, and the Wandering Albatross (*D. exulans*), less frequently seen out at sea.

For convenience the scientific names used follow the 1953 " Checklist of New Zealand Birds " although this should not be taken to imply agreement with the nomenclature of that list particularly in regard to its treatment of the genus *Eudyptes*.

Rockhopper Penguin (*Eudyptes crestatus*)

Reischek gives the impression that this species (*E. chrysocomus*) was plentiful at the Snares and Waite, while giving no details, lists the islands as inhabited by Rockhoppers. Our experience agrees with that of Fleming (1948) who notes that Rockhopper Penguins are extremely rare there. Although Falla, Turbott and Sibson (1966) imply that small numbers may nest, they give no evidence and it seems rather unlikely that they are more than stragglers, possibly from the nearest breeding station, the Auckland Islands.

Two birds were found on 1st February 1967. They were short-crested yearlings with the light grey throats characteristic of this age group (Warham, 1963) and weighed 2600 and 2850 g. respectively.

They stood on the rocks by the sea in company with Snares Crested Penguins and were subdued and silent. Compared with the latter their small size and small heads with marked occipital crests were noticeable. Their eyes were bright red, appreciably brighter than those of adult *E. p. atratus* and the Rockhopper is the only species of genus in which the yearlings have such brightly pigmented irides. A bird, possibly one of the above two, was in heavy moult by 7 February, by which date yearlings at Macquarie Island are mostly in a similar condition.

New Zealand Crested Penguin (*Eudyptes pachyrhynchus pachyrhynchus*)

The Checklist of New Zealand Birds gives the Snares Islands as within range of this bird. This is not surprising in a penguin that straggles to eastern Australia and breeds around Stewart Island, which is visible from high ground at the Snares in clear weather.

In 1967 all the frequent examples encountered were yearlings judging by their brown eyes, whitish throats and short crests. At least one was ashore by 11 January; and by 21 January many were in the dull faded plumage that precedes the moult. Some had moulted by 31 January, but a few almost moulted birds were still ashore on 8 February.

The majority remained in retreats among the coastal rocks, but some moved inland and stood around and among colonies of the Snares Crested Penguin, where they were quiet and subdued. No interactions were noted between the two forms. The New Zealand Crested Penguins were readily separated from the others by the light streaks on their cheeks, by their relatively small bills and by the absence of fleshy edgings to the base of the beak.

Snares Crested Penguin (*Eudyptes pachyrhychus atratus*)

This was by far the most abundant penguin and the only one known to be breeding in 1961 and 1967. It was readily distinguished from the New Zealand Crested Penguin by its bigger bill, by the absence of the white streaks on the cheeks seen on many examples of the latter species and by the edgings of bare skin around the base of the bill.

As described by Stead (1948) and Richdale (n.d.) these penguins bred in relatively small scattered colonies to which they gained access from landing places on the eastern side of the island. Many colonies were quite close to the sea, others well inland were served by access trails which followed the lines of the streams. A prominent landing place was an area of shelving rock south of the extreme eastern point of the Northern Promontory and evidently birds nesting as far away as the Sinkhole area used that landing place. No counts of the colonies were made but the species appears to be as plentiful as ever and we encountered no sign of the disease which, according to Reischek's puzzling reference "left thousands rotting among the black sand." As there is no black sand on the main island, indeed no sand beach at all apart from a tiny strip at the end of a tunnel which is not frequented by penguins, it is not at all clear where Reischek saw these dead penguins, if indeed it was on the Snares at all.

According to Fairchild, then captain of the *Hinemoa* (Chapman, 1890) the birds lay on 1 October and hatch their eggs about 5 November. This agrees well with the known incubation periods for other members of the genus e.g. for *E. crestatus* of 34 days.

On 3 January 1967 the breeding birds were caring for large young, most of which still wore down. Some were being guarded by the males. The latter were easily separated from the females by their deeper, longer, and wider bills, differences that were usually very clear when members of a pair were seen together. No pair was seen feeding more than one chick although two eggs are evidently laid and, judging by old eggs that were found, in this species, as with other *Eudyptes*, the first egg is small and unincubated and only the second and larger egg is actually hatched in the normal course of events.

Although few records were gained of marked chicks being fed by marked parents, it was observed that individual chicks were being fed by the same adults on different days so that most probably parents feed only their own offspring as in the Rockhopper Penguin (Pettingill, 1960; Warham, 1962).

Some of the chicks were down-free by 7 January when departures began; and it was about this time that short-crested birds, presumably yearlings, started to come ashore. The colonies were still full of adults; there were those with chicks standing on nests and other adults that stood singly or in pairs around the edges of the colonies. It was only among such pairs that coition still occurred. This was infrequent, but was seen as late as 3 February. Such adult birds without chicks were probably pre-breeders.

Departure of the chicks reached a peak between 13 and 20 January but at least two chicks were ashore on 5 February. By about 20 January the numbers of yearlings ashore had reached their maximum and about half of them had started the moult with a few moulted by 22 January.

Some yearlings and other pre-breeders moulted among the rocks well away from the colonies, but many penetrated inland and moulted on the nesting grounds. By 7 February most of the yearling group had moulted and many had returned to the sea. Meanwhile rather larger crested birds, possibly two-year-olds, were now moulting and a few fully crested birds, fat and bronze-backed and evidently older still, had begun to shed their feathers. Concurrently the numbers of birds on the colonies decreased steadily with the departure of chicks and their parents and this decrease continued up to our leaving the island on 8 February. By this date very few if any of the successful breeders had returned from their pre-moult fattening up period at sea.

At the time of their departure the Snares Crested Penguin chicks had small yellowish crests, narrow anteriorly, where they rose close to the bill, fanning out to very short tufts posteriorly. Their throats were grey, becoming lighter towards the bases of the mandibles due to the light tips of the dark feathers clothing this region. There was a narrow band of bare flesh around the bases of mandible and maxilla. Their slightly glossy bills were blackish-brown for the proximal two thirds of their length, then light brown for the remainder except for a pale cream-horn blotch close to the tip which spread out over mandible and maxilla.

Most of the chicks went to sea in twos and threes mixed up with outgoing adults who showed not the slightest solicitude for their welfare and quite frequently attacked the younger birds. These tended to turn back from the outgoing columns once the sea was reached. And, whereas the old birds remained submerged until far from the shore, the chicks tended to surface much sooner and looked around apparently to get their bearings before diving and proceeding out to sea. At least one chick was heard to use a loud "cheep" on surfacing although for most of them this call had been largely replaced by a more powerful note.

The presumed yearlings had dark grey-black throats due to the light tips to the feathers of this region, no trace of stripes on their cheeks, short and rather pale crests, dark brownish or reddish-horn bills duller than those of the adults, and chocolate brown eyes. They were readily distinguished from yearling New Zealand Crested Penguins by the presence of bare skin at the base of the bill.

Some predation of the newly fledged young by Giant Petrels (*Macronectes giganteus*) occurred, parties of which waited off the departure rocks and coves and presumably killed weakly or ill-orientated chicks, although the assault of seaborne individuals was not seen. Small groups of these petrels were often found feeding on penguin carcases around the coastal rocks, and a chick, entangled in the kelp, was assaulted by a Giant Petrel that came out of the sea to attack. The chick escaped and returned to dry land. However, it was bleeding profusely and its survival seemed doubtful. Skuas were also found eating penguins along the shoreline; but no attacks were seen, although skuas were occasionally found near to inland colonies even under thick *Olearia* forest.

No melanistic birds were observed, but examples with patches of black feathers on their otherwise white bellies and upper breasts were occasionally noted. A few had white areas on the throat instead of being wholly dark as was the great majority. The patterns of the under flippers were somewhat variable, but none was as boldly marked with black as in the Erect-crested Penguin (*E. p. sclateri*). Eye colour in the adults also varied quite widely, and some of either sex had much pinker eyes than the majority whose irides were reddish-brown.

During the first three weeks of 1967 a succession of sunny days dried out much of the ground at the more open colonies and adults and chicks lay prostrate in the sun often with a flipper stretched out on either side. None was seen to pant although the birds kept their bills open. Later, after considerable rain, the colonies became extremely muddy and many single birds and others in pairs built large nests from sticks or from beakfuls of bright green *Callitriche antarctica* and *Tillea moschata* which they tore up from the vegetated areas beyond the boundaries of the colonies.

Erect-crested Penguin (*Eudyptes pachyrhynchus sclateri*)

One bird was ashore on 8 January 1967 and another, a pre-moult "fat," on 7 February. Both were adults with dark chins and no light-throated juveniles were seen, although sought for. The species was expected but does not appear to have been seen by previous parties.

Buller's Mollymawk (*Diomedea bulleri*)

On arrival off the island in 1967 groups of this albatross were resting on the water not far offshore but at this date most nest sites were unoccupied and few birds were on land. Their numbers increased thereafter and the first egg was found on 5 January, 11 days earlier than the first egg reported by Richdale in 1948 (Richdale, 1949 a and b). By 8 January at least four eggs were known to have been laid: over the island as a whole many more must have been present at that date. Eggs now began to appear with increasing frequency and by 16 January of 192 nests having birds in attendance 43 (22%) contained eggs. New nests were still being constructed as late as 29 January and in some of these eggs were laid within a few days of the nests' completion. By 3 February the ratio of nests with eggs to attended nests had risen to about 80% and it seemed that laying, although continuing, was almost complete.

No attempt was made to count the actual breeding pairs. The most concentrated group of nests was above a bay south of Ho Ho Bay on the east coast provisionally named Mollymawk Bay. There were 123 occupied nests in a more or less continuous colony at different levels on the cliffy slopes. Another large assemblage, but composed of rather more scattered groups, was in the vicinity of Comma Bay where there were 192 occupied nests, this being the same area referred to by Richdale (his A and B colonies) who plotted 132 nests in 1948. However, nests were scattered on cliffs and slopes around the island except for the low coastline in the vicinity of the Biological Station. They were also found in small groups in the forest, not always close to cliffs, on small and large offshore stacks, and at least six birds could be seen on nests on Broughton Island and rather more than this on Mollymawk (Rocky) Islet.

In 1961 and 1967 241 adults were ringed and a total of 79 adults previously banded were re-sighted.

Richdale (1949 a) spent six weeks studying behaviour patterns and display in this species and gives a detailed account of events before hatching. Separately he has discussed his incubation data (Richdale, 1949 b). The only behaviour pattern seen in 1967, but not recorded by him, were two separate and extreme examples of interference by bystanders with copulation. Such interference has been recorded before among birds; but the present instances were rather bizarre in that when coition was occurring on a nest a third bird, presumably a male, attempted to mount the male already engaged so that a three tier arrangement of birds was formed! Whether these intruder males were stimulated by the females' submissive postures or by the actions of the copulating males could not be determined and the precise status of any of the participants was unknown. Quite possibly none of the males involved were the established mates of the females in question.

Shy Albatross (*Diomedea cauta*)

Reischek was the first to mention this species and apparently saw both adults and young. He does not indicate where this was; but the *Stella* in which he travelled may have come close enough to the Western Reefs for him to have seen birds there. Stead notes in his catalogue to the Stead collection of eggs now in the Canterbury

Museum "Many young fluffy grey birds on nests on Western Snares that looked like mollymawks, but as we could not land, I was unable to identify them." The date was on or around 31 January 1929. The breeding of the sub-species *salvini* on the Western Reefs was confirmed by the 1947 expedition (Fleming, 1948). Close-up photographs of these islets taken for the University of Canterbury by the R.N.Z.A.F. do not reveal the presence of any birds there in January 1967, though perhaps these are not large enough to show up at the taking distance employed. Shy Albatrosses were not seen at sea from the main island, but they were present about two miles offshore on 30 December 1966.

Light-mantled Sooty Albatross (*Phoebetria palpebrata*)

A single bird was gliding along the southern slopes of the South-west Promontory on 12 January. It was not seen to alight; and there is no evidence that this sub-antarctic species ever breeds here.

Giant Petrel (*Macronectes giganteus*)

The 1967 party examined the main island carefully for signs of breeding without success; and it is very doubtful if these birds nested there that year although they could have done so on Broughton Island. Nor were any nests or young noted in 1961. Various people in the past have speculated that Giant Petrels breed here; and the Snares are given as a breeding station, but without supporting evidence, by Falla et al, 1966. Giant Petrels are very susceptible to disturbance on their nesting grounds and it does seem rather strange that these islands, so seldom visited, should have no resident population when they still nest only about 80 miles away off Stewart Island.

Reischek writes that "the nelly, with its full-grown young, busied itself upon the water." But in his time the blackish-brown, glossy plumage of the Giant Petrel does not seem to have been recognised as that of the fledgling and this casts doubt that any such birds were present.

Most previous writers mention the presence of *Macronectes* and of its preying on penguins. The species was present throughout the expeditions of 1961 and 1967, the favoured location being the sheltered waters of Ho Ho Bay where many emerged to sleep and rest on the ledges just above the *Deauvillea* belt. There were usually about 50 birds dotted about in this bay, the maximum number recorded being 124 on 2 February 1967. On the same date a group of about 30 was resting high on a windswept saddle of the South Promontory.

Many of these Giant Petrels had started moulting the flight feathers, the second to fourth outermost primaries being short and not fully grown. Most had fairly uniform brownish-grey body feathers devoid of gloss, dark grey crowns and somewhat freckled necks. Their throats tended to be lighter and the cheeks pale creamish shade. Bills were mostly dull olive-green with a tinge of brown or brownish-red on the ridge of the maxilla. A few birds appeared to have dark marks on the nails of the bill. The eyes were brown or grey. About five in every hundred had lighter and markedly freckled heads, but no really light-headed examples were seen.

The grey-eyed birds were evidently quite old, as Giant Petrels begin life with brown eyes which lighten with age. Both these and the dark-eyed examples fit the characters for the northern form recently described as a separate species *Macronectes halli* by Bourne and Warham

(1966) and resembled birds of this form seen a few days before at Campbell Island. Such birds nest early from about mid-August to early September generally among quite thick vegetation and not in the tightly-knit colonies usual in the southern *M. giganteus*. At the times of our visits large chicks should still have been ashore and even had the young flown the nests would have been easy to identify from their large size and from the egg shells trampled into them.

The groups in Ho Ho Bay indulged in some social activity billing each other and braying quietly. When feeding round a dead penguin the petrels adopted the tail-cocked threats described and figured by Warham (1962).

No birds ascribable to the southern form were seen. However, immatures of this form, being highly migratory, would be expected to occur and that they do is shown by Wilson's reference to a white-phase bird in the British Museum collected at the Snares (Wilson, 1907) and by Chapman's sighting of a white bird on 9 January 1890.

Cape Pigeon (*Daption capensis*)

During the 1947 Expedition Falla confirmed long-standing accounts of the breeding of this species (the sealers are said to have eaten large numbers of eggs) when he found incubating birds on the Western Reefs. Fleming (1948) also reports seeing these petrels flying into and sitting in crevices along the South-west Promontory, and the 1967 party saw birds flying into possible nest-sites but did not investigate these. A favoured feeding spot after hard weather was the charted shallow ground just off Seal Point 300 yards N.E. of the Biological Station, but many birds in calm weather swam close inshore in deep water pecking small unidentified food items from close to the surface. This occurred mostly along the sheltered eastern side of the island and in the passage between this and Broughton Island.

Broad-billed Prion (*Pachyptila vittata*)

Live birds of this species seem never to have been observed, but like Fleming, we found evidence of their presence in Skua castings. The best collections came from the ridge of the South-west Promontory. The species lays early and the young would mostly have fledged by the times of our arrival in 1961 and 1967.

Fairy Prion (*Pachyptila turtur*)

This species was found nesting solely in rock crevices and talus debris as reported by the 1947 expedition, although Richdale states that they were breeding in holes in the ground. The birds did not appear to be very numerous and they were feeding chicks in heavy down.

A pair nesting in a crevice near the Biological Station was inside a cave and gave excellent opportunities to observe parent-chick feeding. The mode of food transfer was similar to that adopted by many other Procellariiformes like *Puffinus puffinus, P. carneipes* and others studied by the writer and the albatrosses studied by Richdale. The chick inserted its bill across and inside the opened beak of the parent almost at right angles. As the chick's mandible lay on top of the parent's tongue, the regurgitated food was readily diverted from one bill to the other, after which each participant swallowed.

The prions did not come ashore until after dark and although occasionally seen offshore by day, no rafts of these birds were observed. The cave-dwelling group seemed to fly straight to the entrance after the usual preliminary circlings, landing right at the cave mouth.

Sooty Shearwater (*Puffinus griseus*)

This was by far the most numerous bird on the island, the thick peaty soil being extensively burrowed, except in areas which readily became water-logged after rain. The birds not only trampled the vegetation but actively increased their denuding effects by carrying the large fallen leaves of the *Olearia lyalli* trees underground in their bills for lining their nests. Many nests also occurred among the tussock meadows between the cliffs and the forest edge and a few birds utilised rocky crevices, but they avoided the open peat scours and were not numerous beneath the more dense *Hebe elliptica* thickets.

The breeding timetable parallels that of the bird elsewhere in Australasia and eggs were found hatching from about 12 January. By that date numbers of pre-breeders were evidently ashore and pairs without eggs were often seen and heard calling from burrows by day. Copulation was noted on the ground outside the burrows from 4 January and again such birds were presumed to be pre-breeders. The seldom-observed behaviour during copulation in any member of the genus was preceded in the present species by violent billing actions in which the male thrust his beak at the head and neck of its partner before mounting. Copulation lasted several minutes with the male waving outstretched and dangling wings about except during intromission. The mounted male thrust his opened bill into the feathers of his mate's neck and she tended to turn her beak upwards and to probe the male's throat in a manner similar to that seen in *Macronectes* (Warham, 1962).

Rafts of Sooty Shearwaters formed off the main island at any time from about noon onwards unless the sea was rough. The birds tended to form into long columns six or more abreast as newcomers added themselves to the downwind tails of the columns just as *P. tenuirostris* does off the Bass Strait islands. Numbers increased in late afternoon and the columns tended to drift in closer to the shore. Odd birds were seen flying over the island at all times of the day, under clear skies or overcast, and the return of the main body took place long before dusk so that the vanguard was ashore in broad daylight and even in sunshine. Dispersal to individual burrows and courtship could thus be watched with ease. Similarly, the departure of birds back to sea in the morning was sufficiently extended after dawn to enable photographs to be taken with the available ambient light.

This behaviour in coming ashore early is in marked contrast to that of this species elsewhere, even at nearby Stewart Island. It is more in line with that of *P. gravis* at Nightingale Island or of tropical shearwaters like *P. nativitatis*. It has been assumed that such behaviour is possible only in the absence of diurnally-active predators. These are not absent on the Snares which supports a population of Southern Skuas (*Stercorarius skua*) and these certainly eat Sooty Shearwaters, although they were not seen to attack the early arriving birds or those that delayed their departure until after first light. It may be noted that skuas did sometimes penetrate into the forest apparently in search of food, dead mutton-birds being their most likely targets.

As is customary among Procellariiformes, the incoming shearwaters circled the general areas of their nests several times before alighting. The final descents were made through opnings in the *Olearia* canopy. As often occurs in such situations, a few lodged in the trees providing the rather incongruous sight of petrels perched with webbed feet straddling a branch. Such birds simply fluttered and flopped to the ground which many of the incoming shearwaters struck with considerable force. No injuries were seen to result nor were any birds found trapped in the branches.

Some alighted quite close to their burrows, but perhaps because of the limited number of access points through the canopy, many did not. Measured distances from alighting spot to disappearance down a burrow were 8, 8½, 17, 17 and 35 yards but some travelled greater distances than these The paths taken to the burrows were mostly fairly direct, the birds hobbling along with wings almost closed or only slightly lifted from their bodies.

Departure followed the pattern in other members of the genus e.g. that of *P. tenuirostris* (Warham, 1960), this being preceded by a pre-dawn chorus of song. The birds hurried to exposed take-off rocks or grassy slopes and sailed out to sea, streams of birds pouring down the gullies on the eastern slopes. In places the grass was extensively worn by the tread of many feet and appeared to be dying. Below some of the small take-off rocks long trenches had been cut through the tussock by the strike of birds that failed to get enough lift to become airborne. Run-off after rain appeared to be deepening these trenches.

It was noticed that the alleged diagnostic white-wing lining was a rather variable character among the Snares Island population. Some lacked any exposure of white in this region having wing linings virtually identical with those of *P. tenuirostris*. Such birds would be impossible to separate on this character under the viewing conditions usual at sea.

Fluttering Shearwater (*Puffinus gavia*)

According to Waite (1909) an example of this bird collected by Travers at the Snares was in the Rothschild Museum. It is not stated whether the specimen was taken on land or at sea and no one has yet reported any black and white shearwaters on these islands.

Mottled Petrel (*Pterodroma inexpectata*)

Richdale (1964) has given some data on egg sizes and body weights in this species based on material collected during his stay on the Snares. Here the birds are common and they were incubating eggs that on 6 February 1967 seemed to be within a week of hatching. The nests were concentrated in the narrow *Poa astoni* belt at the tops of and part way down the cliffs, particularly along the island's western edge. Some nested also at the bases of the thicker *Poa foliosa* tussocks but none beneath the *Olearia* forest. All were in chambers at the ends of burrows.

Mottled Petrels were not seen off the island by day nor were they seen to form rafts offshore. This parallels the behaviour of *Pterodroma lessoni* at Macquarie Island (Warham, in press) and perhaps significantly, they did not alight until dark. Then some landed very

close to their nests after the usual preliminary circlings. In the early part of the night there was a good deal of aerial activity, in which pairs and trios chased through the sky calling.

The voice included a sharp succession of notes. The sequence usually recorded as " ti, ti, ti . . ." etc. This gives only a vague idea of this call which at close quarters was a high-pitched and hysterical laugh. This often trailed off into a deeper, throaty, chattering " quurrrr, quurrrr . . ." whose final syllables tend to become slurred. Both these calls were rather variable and seemed to be homologous with those of *P. macroptera* described by Warham (1956) and by *P. lessoni*: they may well be important in sex recognition.

Mottled Petrels seemed to be feeding well away from their nesting grounds. On 2 January 1967 they were fairly plentiful in an area about 50 miles S.S.E. of the Snares but the birds' numbers decreased as the islands were approached, none being seen closer than 30 miles from the group.

At sea the birds were readily identified at a distance by their light underparts and their grey upperwings with whitish patches towards the wing tips giving a mottled pattern to the upperwing when the birds banked towards the observer. The effect arises from the way in which the white areas on the posterior vanes of the primaries are revealed when the flight feathers are separated during the course of the birds' aerial manoeuvrings. The underwing stripe figured by Fleming (1954) was also useful, but closer views were generally needed to pick this out.

At the Snares as elsewhere this species was being extensively preyed upon by the Southern Skuas. The habitats of the two coincided and many birds, killed only the previous day, were incorporated into the skeletal collections.

Diving Petrel (*Pelecanoides urinatrix*)

Diving Petrels had large and well feathered chicks on our arrival in 1967 and many fledged young were seen from the beginning of February. The species was not met with out at sea far from the islands but from 30 miles out at 1000 hours on 2 February many were encountered, most of them flying in the general direction of the Snares. This was at a time when the Mottled Petrels were rapidly decreasing in numbers.

At night these birds did not alight until after dark, flying at high speed and alighting with a revealing thud. Contrary to Richdale's observations at Whero Island, most of these petrels did not land near their burrows but ran some distance from the alighting points before disappearing underground.

Of all the noturnal species this was the most phototaxic and could be pulled down from considerable heights with the aid of a spotlight.

Pied Shag (*Phalacrocorax varius*)

Two birds were seen together around the coast in 1961 and single birds on several occasions. A cormorant's nest on a limb of an *Olearia* overhanging the Boat Harbour found in 1961 and still present in 1967 appears to have been that of a White-throated Shag (*P. melanoleucos*). No shags were seen in 1967.

Grey Duck (*Anas superciliosa*)

Not more than three birds were seen at any one time, the most usual places being the pools on Sinkhole Flat and among the coastal rock holes at Station Cove. Ducklings seen on 6 January 1967 were not more than three days old.

Australian Harrier (*Circus approximans*)

A single bird soared over the southern slopes on 8 February 1967.

Snares Island Snipe (*Coenocorypha aucklandica*)

The Snares Island race *huegeli* was plentiful and likely to be found anywhere on the island but particularly in damp situations. The birds were not elusive and were easily caught by hand at night with the aid of a torch. Adults with small downy chicks at heel were seen within a few days of our arrival and as late as 8 February. No nests were found. Some of the snipe frequenting the area around the Biological Station were banded and colour ringed. The calls were of two types: a single note "keerk, keerk . . ." or "kurk, kurk . . ." repeated 10 to 15 times about twice per second that often led to a disyllabic call "queeyoo, queeyoo . . ." repeated 4 to 8 times.

Southern Skua (*Stercorarius skua*)

Breeding skuas mostly had well feathered free-flying young on our arrival in January 1967. They had evidently bred in the open grassy areas above the cliffs and preferred the short wiry *Poa astoni* tussock to the deeper *P. foliosa*. The biggest group of skuas was stationed on Skua Point north east of the Station where quantities of bleached bones from Skua castings were scattered over the rocks. The remains were mainly of *Pachyptila turtur*. The skua predation on the Mottled Petrels has been noted above and skuas were also seen eating dead shearwaters, crested penguins and diving petrels but no birds were seen being killed by skuas. Their predation on the mutton-birds appeared to be quite insignificant in comparison with the large breeding population of that species. How important the breeding sea-birds are to the skua's economy on the islands and how much food they acquire at sea as a result of their own efforts was not determined.

Skuas on the Snares appeared on average to be appreciably lighter in colour than their counterparts seen at Campbell Island a few days previously, suggesting some degree of isolation between the two populations.

Southern Black-backed Gull (*Larus dominicanus*)

Recorded in 1947 and 1948 but uncommon then and not seen in 1961 or 1967 although sought for.

Red-billed Gull (*Larus novaehollandiae*)

Present in scattered groups around much of the coast. Breeding seemed to be almost over and on our arrival in 1967 several pairs were feeding large free-flying young although a small chick was still present on 5 January.

These gulls fed much out at sea but they were also found in ones and twos under the thick *Olearia* canopy usually near penguin colonies. The attraction seemed to be the food often spilled by the adult penguins when feeding their chicks. These items the gulls were

quick to retrieve and in such situations perched freely in the trees and from their reluctance to move when approached were quite at home in the forest.

Antarctic Tern (*Sterna vittata*)

The adults all seemed to have black foreheads during the 1967 visit except for one with a whitening forehead noted on 6 February. The species was noted at several places around the coast but they were most obvious on the south side of the Boat Harbour where there were several nests. One held two 2- to 3-day-old chicks on 5 January; but two days earlier there was at least one fledged chick in the same area.

Snares Black Tit (*Petroica macrocephala*)

The well differentiated local race *dannefaerdi* was tame and plentiful. No nests were seen and the breeding season had evidently ended for adults were feeding free-flying young. A good deal of intra-specific threat and chasing was seen which involved wing fanning and shaking and the erection of the feathers of the crown. Although much food was collected from the ground free-flying insects were also taken. Stead gives useful observations on this subspecies and Fleming (1950), in his important review of the genus, includes the observations he made during his visit with the 1948 party.

Snares Island Fernbird (*Bowdleria punctata*)

This bird, subspecies *caudata,* was very common and ubiquitous in its distribution among the various habitats available on the main island. Feeding was mainly done on the ground, the feet being used for scratching the surface and also for turning over leaves almost as big as the birds themselves. They were often seen entering petrel burrows and had the habit of peering into crevices and also of hanging upside down below branches like *Parus* titmice. Large terrestrial amphipods were taken and chicks were fed largely on the larvae of a noctuid moth. The adults scratched their heads indirectly, i.e. over the drooped wing.

Breeding was in progress and like Stead we found them nesting in the bases of clumps of *Polystichum* fern and also in the *Poa* tussocks. Birds were carrying feathers to line nests on 12 and 13 January but at least two pairs had 3-egg clutches by 16 January. Both sexes brooded the young.

Song Thrush (*Turdus ericetorum*)

Present in small numbers within the forest. Shy. A bird was singing on 3 January but no song was heard thereafter. A free-flying young bird was recorded on 20 January.

Blackbird (*Turdus merula*)

Present in small numbers. Shy. Eggs were seen in nests on 3 January and 3 February but no young were noted. No song was heard. A Blackbird was feeding on a dead mutton-bird on 9 February.

Hedge Sparrow (*Prunella modularis*)

Stead reports a bird seen in 1947. Richdale does not refer to the species; and neither the 1961 or 1967 parties observed or heard this bird.

New Zealand Pipit (*Anthus novaeseelandiae*)

Chapman (1891) refers specifically to this bird which he says was very tame. It has not been recorded since. There are areas at places like Skua Point and Sinkhole Flat that would seem capable of supporting a few pairs, but it is unlikely that the 1967 and previous parties would miss any that were present.

Bellbird (*Anthornis melanura*)

Reischek states that the Bellbirds on the Snares are darker than on the mainland. No one else has reported the species on the islands.

Tui (*Prosthemadera novaeseelandiae*)

An immature bird was seen by Bernard Stonehouse in 1961.

White-eye (*Zosterops lateralis*)

Probably the most plentiful of the passerines after the fernbirds and black tits. No nests were seen.

Goldfinch (*Carduelis carduelis*)

Reported by previous parties but not encountered or heard in 1961 or 1967, although looked for.

Lesser Redpoll (*Carduelis flammea*)

Quite common near the Station where they fed on the seeds of the introduced *Poa annula* and also among the sedges. Young birds in their streaked plumage were present and unlike the rest of the self-introduced British birds these were tame.

Chaffinch (*Fringilla coelebs*)

Only two or three of these birds were seen in 1967. A male was singing on the day of our arrival after which no song was heard. Chaffinches were very shy and gave few opportunities for clear observation. They were not seen by the 1961 party.

House Sparrow (*Passer domesticus*)

House Sparrows had evidently nested under the iron roof of the old castaway hut and were only seen near the Biological Station, where there appeared to be two males and one female. All were extremely timid and it will be interesting to see how the birds fare now that the castaway hut has been re-covered and offers no nesting sites.

Starling (*Sturnus vulgaris*)

Rare. Not observed at all in 1961 and not more than three were seen at any one time in 1967. As on other sub-antarctic islands the birds were shy and unapproachable.

DISCUSSION

No major changes among the bird populations of the Snares Islands are revealed by the present account. It was to be expected that there would be additions to the list of species recorded by past visitors. Perhaps the most notable absentees are the almost complete lack of shags and of the Yellow-eyed Penguin and Southern Black-backed Gull. It will be noted that Reischek's account contains a number of inconsistencies and his record of the Grey-headed Mollymawk

(*Diomedea chrysostoma*) has been excluded. He writes, "On the cliffs were adult and almost fully-grown young of the mollymawk, the grey-headed albatross (*Diomedea chlororhyncha*) and the shy albatross (*Diomedea cauta*)." He was there much too early in the year to encounter Buller's Mollymawk chicks (though he should have seen the adults) and the Snares seem too far north for *D. chrysostoma,* a bird of sub-antarctic seas.

Small petrels like *Garrodia nereis, Fregetta tropica, Pachyptila crassirostris* and *Puffinus assimilis elegans* will be looked for in future but the small size and low elevation may militate against the presence of breeding populations of larger species like *Procellaria cinerea* and *P. aequinoctialis.*

Changes in the status of the Goldfinch and Hedge Sparrow suggest that the smaller self-introduced passerines, like the alien plants, have only a tenuous footing here.

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SHORT NOTE

INLAND OVER-WINTERING OF BANDED DOTTEREL IN THE SOUTH ISLAND

One of the best "birding" places during the winter in Central Otago is near the mouth of the Matukituki River where it enters the western side of Lake Wanaka. The river being low in the cold weather, there are usually plenty of sandbanks and bars for gulls and herons; and nearby, on the damp, lake-edge paddocks of Mr. J. R. Ewing's property, are favourite feeding habitats for Spur-wings (*L. novaehollandiae*). The lake, of course, provides refuge for ducks, geese and swans.

The past three winters we have recorded flocks, totalling up to 50 birds, of the Banded Dotterel (*C. bicinctus*), and to check the fact that they were really over-wintering and not just early arrivals, I have this winter kept a tag on them every month since January, when the usual exodus begins. By 25/2/67 there were only 48 left that I could find (these feeding on bare soil among turnip seedlings); and from the rather scattered groups in the area since that date, I should say that this is the total of the over-wintering ones this year. I counted 39 on 8/7/67, but some others were hidden in hollows. Most of these feed on the damp, grassy pastures among the sheep, although a few are to be found along the muddy, weedy lake-edge or river sand-bars. On 8/7/67 some males were showing brighter breeding plumage bands, although all the females seemed to be still in winter dress.

So far this is the only area where I have been able to find Banded Dotterels in winter in Central Otago, and it would be interesting to know if there are any other far-inland places in the South Island where this behaviour occurs.

— PETER CHILD