

ALBATROSS POPULATIONS AT THE CHATHAM ISLANDS

By ELLIOT W. DAWSON

ABSTRACT

An estimate of the breeding population of Royal Albatrosses (*Diomedea epomophora sanfordi*) on the eastern islet of The Sisters group of the Chatham Islands in January 1954 was between 400 and 450 birds. In October 1964 the breeding birds were considered to be occupying only one-quarter of the area as seen in January and the count of birds was accordingly multiplied by four giving a theoretical peak breeding population of 360 pairs.

Similarly, Buller's Mollymawk (*D. bulleri*) at the corresponding dates in 1954 and 1964 was considered to have a breeding population of 250 and 240 pairs respectively. A preliminary count from RNZAF aerial photographs (*vide* C. J. R. Robertson) indicated the presence of 630 pairs of Royal Albatrosses on the eastern Sister at the end of November 1973, and more detailed results are expected from current field studies.

At The Pyramid, a southern outlier of the Chatham Islands, counts of birds along strips of rock faces suggested a total population for the Chatham Island Mollymawk (*D. cauta eremita*) of 2,500 pairs, a figure comparing favourably with earlier estimates of "several thousand" and "between two and three thousand" pairs.

Based on all the information from visits made up to 1969, tentative timetables have been drawn up for the breeding cycles of the Chatham Islands populations of the Royal Albatross and Buller's Mollymawk, both of which also breed elsewhere, and of the Chatham Island Mollymawk which is known to breed only on The Pyramid.

CONTENTS

INTRODUCTION

THE NORTHERN ROYAL ALBATROSS AT THE CHATHAM ISLANDS

Populations on The Sisters

Seasonal differences and unemployed birds

The yearling fledglings

The breeding season of the Chatham Island Royals

World population of the Royal Albatross

BULLER'S MOLLYMAWK

Populations on The Sisters

The breeding seasons of Buller's Mollymawks

THE CHATHAM ISLAND MOLLYMAWK

The Pyramid

The breeding season of the Chatham Island Mollymawk

DISCUSSION

ACKNOWLEDGEMENTS

LITERATURE CITED

INTRODUCTION

Two races of the Royal Albatross breed within the New Zealand Region: the larger, *Diomedea epomophora epomophora* Lesson, nests on Campbell Island and in the Auckland Islands on Enderby Island with a few pairs on Adams Island and on the main Auckland Island; the smaller, northern race, *D. epomophora sanfordi* (Murphy), has its breeding grounds on two small groups of islets in the Chatham Islands, The Sisters and the Forty Fours, and also on the New Zealand mainland at Taiaroa Head, Otago Peninsula, a site made famous by the work of L. E. Richdale and now declared a national responsibility (Robertson 1972; Parry 1972).

A recent summary by Tickell (1969, 1970) of work on the Royal Albatross, made on a comparative basis with his own studies of the Wandering Albatross at South Georgia, and also the report of Robertson & Kinsky (1972) on dispersal movements, has shown many of the gaps existing in our knowledge of this species and it is now appropriate to report on some additional evidence about the population size and probable breeding cycle in the northern race at the Chatham Islands.

During the 'Chatham Islands 1954 Expedition' from 23 January to 12 February 1954 (see Knox 1957), landings were made on several of the outlying islands of the Chatham group, in particular on Pitt Island, The Sisters, the Forty Fours, and on South East Island. Estimates were made of the breeding populations of the Royal Albatross and of Buller's Mollymawk on the Sisters and the Forty Fours, and these figures were later published (Dawson 1955). Earlier observations by L. C. Bell during his visit to the islands on 16 and 17 December 1952 appeared at the same time (Bell 1955). Bell's figure for the Royal Albatross on the eastern islet of the Sisters was twice as great as that given by Dawson.

Ten years later, in October 1964, I was able to land on the Sisters again and make further observations. Another attempt to land in March 1969 was prevented by a dangerous swell. Since no other ornithologists have visited these islands up to the present time, my notes from these two visits now form some basis for an assessment of the albatross and mollymawk populations of these remote islands.

During October 1964, I worked in the Chatham Islands region aboard the m.v. *Taranui* with a team from the N.Z. Oceanographic Institute, DSIR, carrying out a survey of the bottom-living animals and sea floor topography. There were good opportunities for observing sea birds around the ship while working close inshore and landings on the Sisters, on Pitt Island, and on South East Island, as well as on the main Chatham Island, allowed further ornithological observations. Close examinations were made from the ship of the Star Keys and Round Island to follow up 1954 observations and, although the sea conditions were rather too unsettled to allow a safe landing on the Pyramid, some estimate of the breeding population of the Chatham Island Mollymawk, *Diomedea cauta eremita* (Murphy), was made

for comparison with the observations of Fleming (1939) and B. D. Bell (1961 unpubl.), each of whom with his companion of the day belongs to that exclusive club of ornithologists who have risked limb, if not life, to land on this spectacular rock to meet the equally exclusive Chatham Island Mollymawk on its only known nesting ground.

In March 1969 another cruise was made in Chatham Islands waters with the m.v. *Taranui* and, although no landings were made on either the Sisters or the Pyramid, some further information on breedings times was obtained.

THE NORTHERN ROYAL ALBATROSS AT THE CHATHAM ISLANDS

Populations on the Sisters:

The Sisters are a group of two islets (Figs. 1 & 2) and a reef (Fig. 3) lying about 10 miles to the north of the main Chatham Island. They were first made known by Dieffenbach (1841: 215) who said of them: "Rangi tutahi, or 'The Sisters,' are two pyramidal rocks about 100 feet high, covered with scanty bushes, and frequented by countless numbers of sea-birds." The islets are, in fact, moderately flat-topped with some large masses of bare rocks and steep cliffs. A better idea of their topography is given in Figs 1 & 2, 4 & 5. According to Bell (1963: 5) the Sisters are Maori owned. Many stories are told of the illegal poaching of young albatrosses from these islets but there is little real evidence of such happenings on a group so rarely visited by either scientists or wildlife administrators, and the effect of such poaching on the breeding population cannot be demonstrated (but see Coster 1972).

On 29 January 1954, I was ashore on the eastern Sister* from

* There is a belief amongst some members of the 1954 Expedition that the smaller of the Sisters lies to the west with the low reef to the south, and that, accordingly, the larger island on which we did not land should be referred to as the eastern Sister. However, the earliest map of the Chathams consulted (1909 ed., Lands & Survey, "From the surveys of S. P. Smith and John Robertson 1868 & 1883") shows the islands lying along the same latitude with the largest to the west and the reef easternmost. All other charts and maps (British Admiralty 1417, 1879 ed., corrected to date; N.Z. Oceanographic Institute Provisional Bathymetry, Island Series, 1: 200,000, 1967; Lands & Survey NZMS 240, 1: 63,360, 1st ed. 1969; RNZN Hydrographic Office NZ 113, 1: 200,000, June 1971) show a similar arrangement with the largest island unmistakably in the west although the relative positions and shapes of the reef and the smaller island vary. Therefore, in the absence of a specific hydrographic survey (which might well show that an error has been perpetuated), the *smaller* island will be referred to as the *eastern* Sister.



FIGURE 1 — The eastern side of the larger (west) Sister seen from the north-east near the 1954 landing site on the eastern Sister above the surge zone of *Durvillea antarctica* kelp thongs, 29 January 1954.

Photo: E. J. Batham



FIGURE 2 — The smaller (eastern) Sister from the south-east, height about 150 ft, with the low-lying reef visible in the right hand background, 13 October 1964.

Photo: J. Irwin



FIGURE 3 — The reef of the Sisters group, frequented by many fur seals, 29 January 1954.

Photo: A. J. Black

0818 to 1420 hrs. The flat top of the islet carried a population of Royal Albatrosses extending over most of the available area except for some parts near rocky outcrops where fledgling Giant Petrels (*Macronectes giganteus*) were gathered (Fig. 4). There was, however, quite an amount of space between the individual albatross nests. My estimate of the number of nests was between 400 and 450, and certainly no greater than 500. Most of the nests had chipping eggs but a few had newly-hatched chicks. It could, therefore, be considered that this represented the full breeding population of the season. The report of the 1954 expedition gave "about 500 pairs" as the breeding population of the eastern Sister (Dawson 1955: 79).

On 13 October 1964 I revisited the eastern Sister from 0700 to 1315 hrs and counted 120 individual adult Royal Albatrosses beside nests with another 60 adults estimated (Fig. 5). Ten fledglings with remnants of down were found. It was presumed that most, if not all, of the adult birds were the first arrivals of the new breeding season rather than the last of the previous season's breeders, some of which might have still been attending the ten fledglings. However, following Richdale's (1954) argument on the starvation theory, the parents of the ten fledglings might well have been present, but the "unemployed" birds would certainly have departed long since. Only one-quarter of the total nesting area, as seen being used on my 1954



FIGURE 4 — View across top of eastern Sister showing density of nesting Royal Albatrosses, 29 January 1954.

Photo: A. J. Black

visit, was occupied by nests attended by adult birds. It seems valid, therefore, if all the breeding space were to be used, to multiply the observed birds, namely some 90 pairs, by four to bring the numbers to the full population of the breeding season (excluding any "unemployed" birds).

On 30 November and 2 December 1972, the RNZAF made a photo-reconnaissance of the Sisters and the Forty Fours which will allow a detailed count to be made of the Royal Albatrosses as well as giving a clear record of the area and dimensions of the flat tops of each of these islands. Buller's Mollymawks, nesting as they do along the edges of the tops (Fig. 6), are not particularly evident in the photographs and cannot be counted with any degree of accuracy. From a preliminary examination of photographs, both black-and-white and colour, Mr C. J. R. Robertson (pers. comm. 6 June 1973) believes that the population of the eastern Sister at this time of the year numbered 630 pairs and that of the western Sister 1,100 (a figure which compares well with the rough estimate made from sea level in 1954 of 750 pairs by Dawson (1955)). Fuller reports of the Chatham Islands albatross populations in the forthcoming breeding season may be expected shortly from Wildlife Service parties now in the field, and my earlier estimates will give some basis for considering these results.



FIGURE 5 — View across top of eastern Sister showing density of nesting Royal Albatrosses (m.v. *Taranui* in background), 13 October 1964.

Photo: J. Irwin

Seasonal differences and unemployed birds:

Granted that the January (1954) population on the eastern Sister was four times the size of the October (1964) population, one naturally wonders whether this reflects a substantial difference between particular breeding seasons, whether, perhaps, illegal poaching or natural mortality over a period of ten years has reduced the numbers now breeding, or whether there is a noticeable build up of numbers of birds returning to the breeding grounds over the period October to January.

At Bird Island, South Georgia, Tickell's (1968: 19, fig. 18) counts of Wandering Albatrosses arriving on their nesting grounds rose from mid-November towards a peak in early December, reaching a maximum near the end of December with the first egg appearing early in the same month. The earliest arrival was on 9 November, with males returning first and females "somewhat later." In 169 cases, the first male arrived on 12 November and the female on 24 November; the mean date of the males' return was, hence, 11 days before the females' (Tickell, 1968: 17). Accordingly, it seems valid to assume that the Royals of the Sisters build up their populations over a month or so in a similar way. Indeed, the rather higher estimates

made by C. J. R. Robertson from the RNZAF photographs taken in late November and early December might reflect the trend shown in Tickell's graph (his Fig. 18) of numbers of returning birds.

For Buller's Mollymawk on the Snares Islands, Richdale (1949: 17) stated: "It is obvious . . . that individual Buller's Mollymawks arrive on the breeding grounds from their non-breeding sojourn at sea over a period of many weeks."

Tickell (1968) has said little about the non-breeding birds found on the nesting ground, the "unemployed" or "unattached" in Richdale's sense (amongst which he included both failed breeders as well as those that have not yet bred — see Richdale 1950: 14-15, 51-64, 79) or the "subadult" birds as defined by Tickell (1968: 4). My counts on the eastern Sister were of birds associated with nests and I am unable to say what proportion of the total population of birds on this particular island would be "unemployed" or "subadult." A more detailed study, later in the season, of birds on the breeding ground, and of their individual behaviour, would be needed to differentiate between breeders and non-breeders. It might be that the number of "unemployed" birds present by the height of nesting activities would be appreciable in terms of census figures, but this is mere speculation.

The yearling fledglings:

A "Yearling Fledgling" has been defined by Tickell (1968: 4) as: "An advanced fledgling one year of age about to leave the breeding grounds . . ." In view of the alleged difference in departure dates of fledglings related to the return of the breeding adults, it is of interest to see whether the record of young birds at the Sisters in January is relevant to the argument. Tickell (1968: 33-34) reported that the arrival of the breeding adults of Wanderers at South Georgia overlaps the departure of the previous season's young (the yearling fledglings), the first breeding males appearing 8 days before the first fledglings leave. Fledging at South Georgia was found to take 278 days (range 263-303). In contrast, Richdale (1952: 88) showed that the Royal fledglings at Taiaroa spend 236 days (range 216-252) at the nesting area and leave before the next season's adults arrive. The mean date of departure of the chicks was 22 September. In only two cases of 17 studied were fledglings present when the next season's breeding birds returned and the parents of the fledglings were in all instances absent in the new breeding season.

Tickell (1970: 93) suggested that the fledging period for the Royal Albatrosses (at Taiaroa Head) is shorter than that known for the Wandering Albatross because of the milder climate of New Zealand. He noted that when the pairs of breeding adults return to Taiaroa Head, "most if not all of the previous season's fledglings have already left for their first summer at sea" and he added — "No data on this point are available from the colonies of Royals on Campbell

Island and the Chatham." In contrast the fledging period of the Wanderer is so much longer that when breeding adults return there are usually many fledglings still occupying the nesting area.

It is well established that the Royal Albatross chick fledges directly into a white phase like the adult in contrast to the Wanderer chick which is transformed over a period of years from an all brown plumage into the white or so-called "chionoptera" stage (see Fig. 2 in Tickell 1968 for the "Gibson code" for describing the *D. exulans* plumage phases). Considering this fact together with the increased length of the fledging period of *D. exulans* overlapping the return of the adults, Tickell (1970: 93) made an interesting suggestion which could well be tested at the Chathams: "At that time of the year the fledglings are very active and aggressive, behaving in a manner that could easily interfere with the nesting of arriving adults. There could well be a selective value in the dark plumage that makes the wanderer fledglings recognizable at a distance to the adult wanderers. In view of the royal fledglings' early departure date from Taiaroa Head, however, such a ready distinction would be of no importance there."

As mentioned earlier, in October (1964) 10 yearling fledglings were seen on the eastern Sister with about 180 adults at a time when the build up of the population was considered to be incomplete. This relatively small number of remaining fledglings is, perhaps, not incompatible with Richdale's findings and does not, necessarily, have further implications in regard to Tickell's hypothesis on behavioural and morphological differences between the two species of albatrosses related to their evolution (Tickell 1968: 32, 50). He concluded that the similarities between the two species of "great albatrosses" outweigh the differences so far that "one cannot escape the obvious conclusion that *exulans* and *epomophora* . . . most certainly evolved from a common ancestor in the not too distant past." He noted also that two striking differences lay in the juvenile and subadult plumage of each species and in the lengths of their respective fledging periods, and he postulated various conditions accounting for these differences, in particular the more severe climate through which the chicks of *D. exulans* must live, "or, conversely, that *epomophora*'s shorter period is associated with less severe winters," hence his comments on the New Zealand situation. Tickell supported this hypothesis with figures of growth curves showing changes throughout the fledging period.

The breeding season of the Chatham Island Royals:

Tickell (1968: 4) defined the "breeding season" in Wandering Albatrosses as: "The time between the arrival of the first adults (November) and the departure of the last birds that are not feeding chicks (the next May)." Hence, the breeding season of the Chatham Islands race of the Royal Albatross seems to follow these lines:

ARRIVAL — early October (1)

LAYING — early November (2)

PEAK LAYING — mid-November (3)

HATCHING — late January (4)

DEPARTURE OF THE LAST ADULTS — late September ? (5)

DEPARTURE OF YEARLING FLEDGLINGS — late September (6)

This cycle is based on — (1) Richdale's (1950: 46, table 5) mean length of the pre-egg period ("the time between the arrival of the first member of the mated pair . . . and the laying of an egg," Tickell 1968: 18) for the Taiaroa Royals of about 34 days (range 29-45); based on Richdale 1952: 30, table 9 (range 77.5-80.25); (4) Dawson's observations of hatching on 28 January (1954); (5) "Unemployed" birds generally leave as the chicks grow up and may go from the end of April onwards (Richdale 1952: 13) and the parent birds spend progressively less time ashore and may depart about the same time or a little later than the chicks (mid to late September — see Richdale 1954, in relation to his repudiation of the "starvation theory" in albatrosses; (6) a fledging period for Royals at Taiaroa of 236 days (range 216-252), mean departure date 22 September (range 8 September-13 October), Richdale 1952: 88.

Hence, the Chathams birds may have approximately 30 days of pre-egg stage, 79 days of incubation (in the "egg period" of Tickell 1968: 22), and 236 days of fledging period. The Campbell Island and Auckland Islands race is about three weeks later in its cycle (egg laying about the end of November with peak in early December). The Chatham Islands and Taiaroa Head populations of *D. epomophora sanfordi* are approximately synchronous (see table 13 in Tickell 1968: 24 — Taiaroa, 1st egg, 31 October, peak 12 November, and Chathams, 1st egg c. 8 November, peak c. 15 November).

World population of the Royal Albatross:

Tickell (1968: 48, tables 41-42) has suggested the "approximate level of the world breeding populations" of the two great albatrosses, showing that of *D. exulans* as of the order of 20,000 pairs while that of *D. epomophora* is of only half the size at 10,000 pairs. He has pointed out, however, that: "The population dynamics of the great albatrosses are complicated by the birds' biennial breeding cycle. One can only determine the total of nesting pairs in a population by adding two consecutive year's censuses and then subtracting the pairs that failed in the first year and bred again in the second." (Tickell 1970: 91). His figures (1968: table 41) for *D. epomophora* are as follows: New Zealand (Taiaroa Head), 15; Chatham Islands (based on Dawson 1955 and including both the Sisters and the Forty Fours), 5940; Campbell Island, 4140; Auckland Islands*, 22 (1963) and 7 (1964/65),

* The recent 1972/73 expedition to the Auckland Islands has provided more accurate information which will be available shortly in a report to be published shortly by the Lands & Survey Department.

giving a total figure of 10,124 pairs. Hence, the Chatham Islands form the major breeding area of the Royal Albatross with 60% of the breeding population of the species, followed closely by Campbell Island at approximately 40%.

It is important, therefore, that an accurate census of the Chatham Islands birds should be made and a watch kept on population changes both long term and during breeding seasons. The Sisters and the Forty Fours have shown themselves ideally suited for population estimates by aerial photography, and it is to be hoped that further coverage to meet the limitations of the occasional census as stressed by Tickell, and especially at the critical times of the breeding cycle, will be possible as opportunities permit.

BULLER'S MOLLYMAWK

Populations on The Sisters:

Similar assumptions about seasonal population growth and the use of available breeding space were made for Buller's Mollymawk on the eastern Sister. Although the extent to which the flat area of the island top was occupied by Royal Albatrosses and that to which the edges carried nesting Buller's Mollymawks are not strictly comparable, the relative degree to which the "build up" of the returning birds had developed makes a valid comparison. In October 1964, I found only six groups of 10 nests with courting pairs in attendance. Using the four times factor which, based on photographs and observations made along the edges of the flat top in 1954 (Fig. 6), appeared equally valid, the 1964/65 breeding population is likely to have been 240 pairs, a figure close to the "approximately 250 breeding pairs" given by Dawson (1955) for the 1953/54 season.

In January 1954, 44 adult breeding Buller's Mollymawks were banded with OSNZ rings. Of 60 birds examined in 1964, one bird, from almost the same nesting site used in 1954, carried a ring, 19205, which identified it as one of the 44 adults of unknown age found breeding ten years earlier.

A further example of the relative numbers of birds on the island at different phases of the breeding season may be evident in the count of 200 adult Giant Petrels in October 1964, compared with 3 adults and 17 fledglings in January 1954.

It appears from this independent method of estimating the populations of the two albatross species on the Sisters that the differing estimates of Royal Albatrosses, 360 pairs (1964), 400-450 pairs (1954) and of Buller's Mollymawks, 240 pairs (1964), 250 pairs (1954), correspond sufficiently closely to give a reasonable idea of the true size of these populations as well as can be done within the usual limits of bird census work.



FIGURE 6 — Buller's Mollymawks nesting along the edges of the top of the eastern Sister, 29 January 1954.

Photo: J. Moreland

The breeding seasons of Buller's Mollymawk:

During his visit to the Chatham Islands in 1937/38, Fleming was told that egg-laying of Buller's Mollymawk was in October and November and of young birds being "taken for food as fat fledglings in March and April" (Fleming 1939: 393). He recorded also an observation from the Forty Fours of a young bird seen still being fed by its parents on 5 August although by 19 August all the birds had disappeared. This information indicated an earlier breeding season at the Chathams than that known for Buller's Mollymawk on the Snares where it was known to lay in early February. Commenting on the Forty Fours observation, Fleming concluded: "If these latter are correct they indicate an unprecedented variation of three months in breeding dates for this species, and in view of the uniformity of season in other Albatrosses throughout their ranges, the dates given above must therefore be looked upon with suspicion until further field work is done." From his work on the Snares in January and February 1948, Richdale (1949a) gave the laying date for *D. bulleri* as from 16 January to early March (see also Richdale 1949b: 131, and comparison with dates for other species by Richdale 1952: 43, table 15). The earlier time at the Chathams was confirmed by L. C. Bell (1955) on his visit to the Sisters in December 1952 and by myself in January 1954 (Dawson 1955).

Beck (1926: 138) was off the Sisters on 18 March 1926 but did not land due to heavy seas. He mentioned seeing Royal Albatrosses on the islands which he referred to as the "Four Sisters." He made no mention of seeing any Buller's Mollymawks although he recorded about 200 off the Forty Fours on 8 March, some 12 of which he shot for specimens. These were adults found to be undergoing moulting and replacement of the quills (Murphy 1930: 7). On 26 March I saw Buller's Mollymawks still on the Sisters although, like Beck, I was unable to land.

Information from visits to the Sisters in October (1964), December (1952), January (1954), March (1926, 1969), together with observations from the Snares Islands and the Solander Islands in December (1947), January to February (1948, 1961, 1967, 1973), and July (1948), now allows a tentative breeding cycle for northern and southern populations of Buller's Mollymawk to be outlined:

| | CHATHAM ISLANDS | SNARES AND SOLANDERS |
|----------------------------|-----------------------------|---|
| ARRIVAL | early to mid October | early December (4) |
| LAYING | mid November (1) | early January to early March (5) (6) (7) |
| HATCHING | mid to late January (2) | March to early May |
| DEPARTURE OF FLEDGLINGS | late May to mid June (3) | mid August to late September (8) |

This cycle is based on (1) L. C. Bell's (1955) record of birds on eggs on the eastern Sister on 16 December (1952); (2) Dawson's (1955) observations of young chicks and some eggs on the eastern Sister and on the Forty Fours on 29 January and 1 February (1954) and an assumed length of incubation and fledging periods similar to those calculated by Richdale (1952); (3) L. C. Bell's (1955: 66) report that young birds were taken for food in June. Fleming (1937: 393) was told that young were taken earlier, in March and April; (4) Falla's (1948: 53) observations on the Solanders of 9 December (1947) of birds presumably about to return to the breeding ground; (5) Warham's (1967: 129) records of 17 January to 13 February (1961) and 2 January to 10 February (1967) of the appearance of the first egg on 5 January and subsequent laying to 3 February when "laying, although continuing, was complete"; (6) Richdale's (1949b: 131, table 2) observed laying dates of 16 January to early March, with the peak period between 22 January and 14 February (1948) in which approximately 80% of the eggs were laid (see also Richdale 1952: 43, table 15); (7) Wilson's (1973) observations of 26-28 January and 31 January to 3 February (1973) of birds incubating apparently recently laid eggs on the Solanders; (8) Falla's (1948: 53) observations of 20 July (1948) of well-fledged chicks on the Solanders, some of which were considered to be less than a fortnight from

flying; (9) other dates, extrapolated by Richdale (1952: 60, 98, 99, 101) given in his table 50 (arrival), table 53 (hatching), and tables 48 and 49 (assumed fledging period of c. 4½ months).

Note: More information will be available from the Snares regarding first egg appearances and fledging dates in a forthcoming report by Horning & Horning (1974), but this does not invalidate the above timetable.

As Fleming (1939: 393) has noted regarding the record of a young mollymawk being fed on the Forty Fours on 5 August and the presence of another solitary fully-grown bird, "... the presence of even two young Mollymawks as late as August would appear to indicate a later season than the dates of which I was told." Hence, not only is there a difference in breeding times between the southern New Zealand populations of *D. bulleri* and those on the Chathams but there is evidence that at least once the season on the Forty Fours may have been as late (or extended itself) as that customary for the Snares and the Solanders. Richdale (1952: 42, table 15) has noted, however, that Buller's Mollymawk has a laying range much longer than any other species of *Diomedea*, perhaps exceeding 50 days, although Warham's (1967: 129) records indicate that most of the laying is completed in about a month. Judging by what is known of the other species of mollymawks the anomaly of breeding times lies in the Snares and Solander populations. It may be a physiological one such as differing day length with latitude or, resulting from climatic or hydrological conditions, a nutritional one of adjustment to the nature and seasonal availability of the food supply for the chicks, but it is not appropriate to pursue the matter further here.

THE CHATHAM ISLAND MOLLYMAWK

The Pyramid:

The only known breeding site of the Chatham Island Mollymawk (*Diomedea cauta eremita*) is on the steep, isolated rock, some 566 feet (172m) in height, lying nearly five miles to the south of the Chathams, known as The Pyramid. This rock is a volcanic plug or neck of probable Eocene age representing the original source of the Pitt Island Volcanics (see Watters in Hay *et al.* 1968: 67-68). It shows striking differences in profile as one moves around it by ship (Figs 7 & 8).

Conditions were too rough on 17 October 1964 to land on the Pyramid. However, the ship's boat was launched and our party went in to within a few yards of the steep, kelp-covered surge zone, some 15 feet of slippery thongs over which the intrepid explorer must clamber (Fig. 9). Close-up views of the rocky faces with mollymawks sitting on them were photographed and counts of birds per unit area were attempted (Fig. 10). After returning to the ship, we steamed slowly round the Pyramid to make a complete panoramic coverage and to obtain some idea of the relative density of nesting birds on various parts of this rock mass. A complete photographic series of the rock surface was later able to be studied.



FIGURE 7 — The Pyramid (566') from the south, 17 October 1964.
Photo: E. W. Dawson

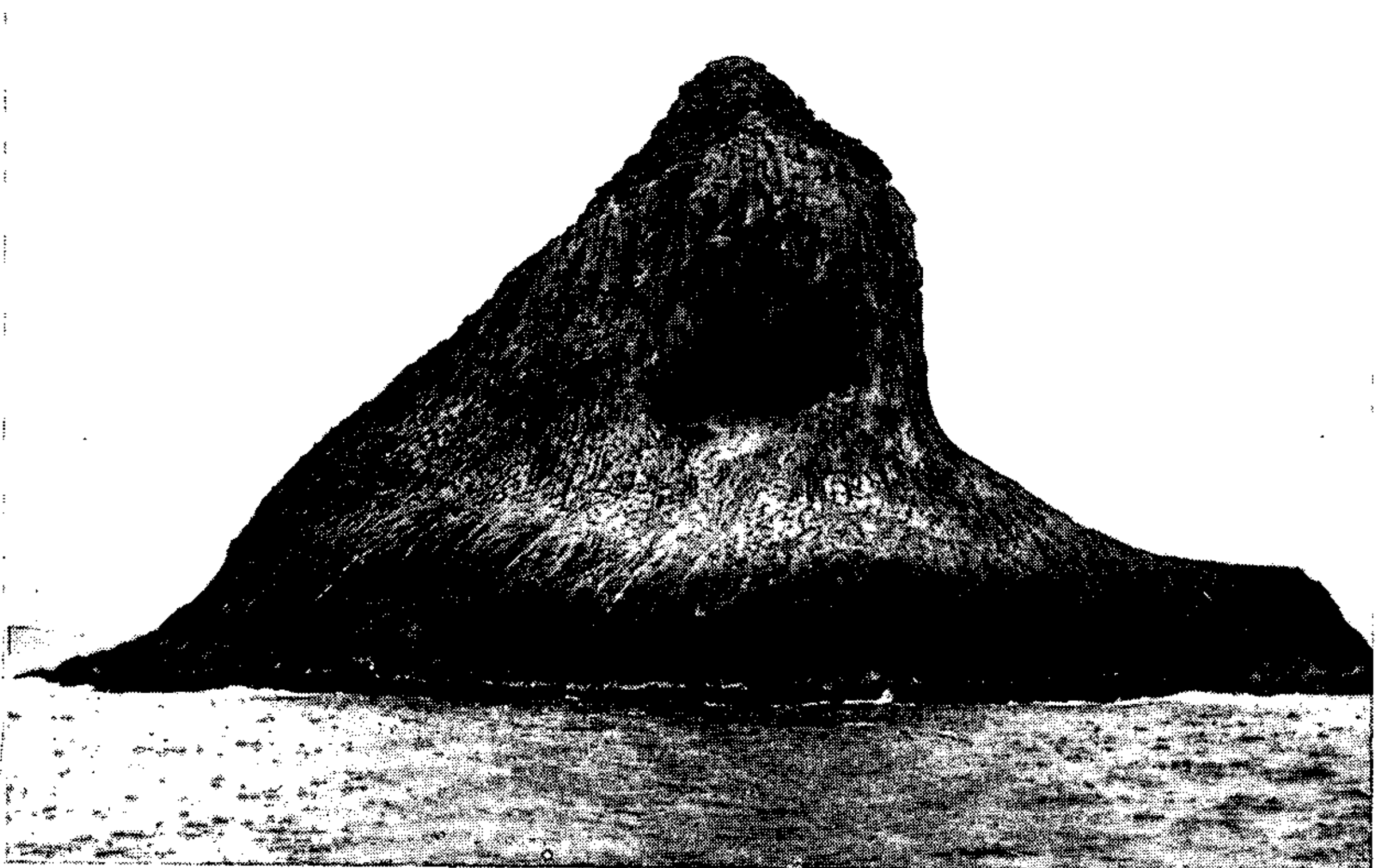


FIGURE 8 — The Pyramid from the south-east, 17 October 1964.
Photo: E. W. Dawson

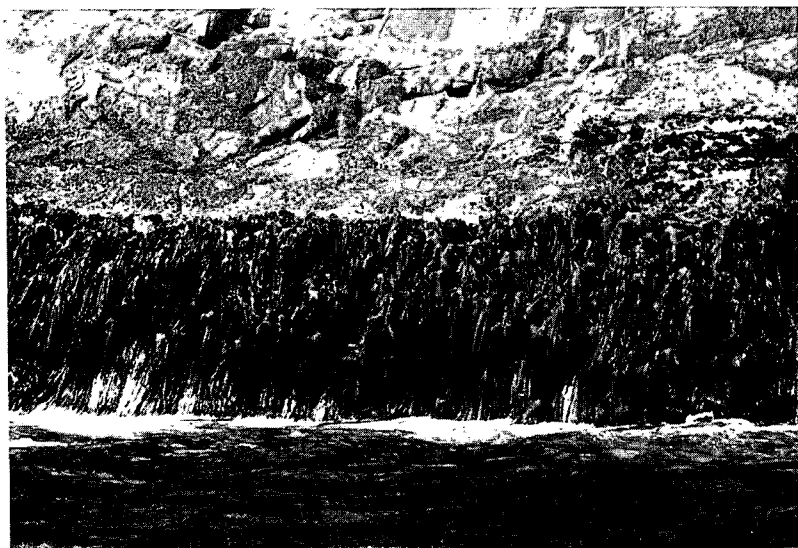


FIGURE 9 — The surge zone of c. 15 ft of kelp, *Durvillea antarctica*, with fur seals above, west side of the Pyramid, 17 October 1964.
Photo: E. W. Dawson



FIGURE 10 — Close up of south-west face of the Pyramid showing ledges with nesting Chatham Island Mollymawks, 17 October 1964.
Photo: E. W. Dawson

By considering the islet as a pyramid 500 feet high, dividing it into 50 foot strips on four sides, and estimating the number of nesting pairs per strip, based on actual counts at various levels, ten strips averaging 50 nests on four sides were calculated to give a breeding population of 2,000 pairs. As Fleming (1939: 393) has described, and as can be seen in Fig. 8 (also in Plate VI in Dawson's (1955) account), there is a flattish slope on the south-east side running round into a large overhang or cave in which a considerable number of mollymawks seemed to be nesting. Another 500 nests were estimated for the flat slope and below the overhang, although this figure may be too low since Fleming (1939: 394) said that the greatest concentration of nests "seemed to be in a gigantic cave on the south-west side of the island" in addition to a great many on the flat slope. This total of 2,500 pairs of Chatham Island Mollymawks is admittedly very crudely reached but it gives some figure for comparison with the only other estimates available, namely:

1. Murphy (1930: 6), based on Beck's visit of 3 March 1926 — "So far as we know, the entire population of the race comprises only a few hundred birds";
2. Fleming (1939: 395) — "The most conservative estimate from our observations would allow a population of several thousand adult birds rather than the 'few hundred' which Murphy suggests" (16 December 1937);
3. B. D. Bell (1961 unpubl.); Bell & Merton (1970 unpubl.) — "The probable population is possibly between two and three thousand pairs" (24 November 1961).

Through the kindness of Dr Dean Amadon, I have been able to see the relevant parts of the diary kept by Rollo Beck who visited the Chatham Islands in the schooner *France* in 1926 and who collected the mollymawks from the Pyramid later described by Murphy (1930: 4-6) as his new subspecies "*Thalassarche cauta eremita*." Beck's account shows how Murphy reached his number of "a few hundred birds" and it also reveals that Beck did not actually land on the Pyramid to collect his specimens which he refers to later in this narrative as "the *Cauta* albatrosses."

"March 3 [1926]. Pyramid Rock south of Pitt Island was seen at ten AM . . . and when near saw a few dozen albatrosses, three hundred or so all together. Although the wind and sea were not very favorable, I put out the boat and in an hour got what I wanted. One flock of forty or so were sitting on the water to the north and a number of others were seen scattered about and on the north side of the rock I saw many on the ground where there were small bushes. The sea was rough and there was no chance of getting ashore."

(Beck 1926: 129-30)

On a second visit, again on board the m.v. *Taranui*, to the vicinity of the Pyramid on 29 March 1969, no landing was attempted partly since time was short and, in any case, the rock appeared deserted of breeding birds or young. On 3 March 1926, Beck saw "many" birds still sitting on the rock although he said nothing about young birds, and the only specimens discussed later by Murphy (1930: 6) were "adults mostly with enlarged gonads." The type specimen was a "male adult, nesting" and, although Murphy stated that this material was part of "a series from the Pyramid Rock," it is clear from Beck's diary that he did not land and they were shot at sea around the island. During two hours ashore on 16 December 1937, Fleming (with E. G. Turbott) saw many downy nestlings at a stage illustrated in his plates 47 and 48.

The breeding season of the Chatham Island Mollymawk:

These observations, together with my notes of 13 October (1964), Fleming's of 16 December (1937) and Bell's of 24 November (1961) enable a tentative breeding cycle of the Chatham Island Mollymawk to be postulated:

ARRIVAL late August

LAYING late September/early October

HATCHING late November

DEPARTURE OF FLEDGLINGS late March

Comparing this with the information on other mollymawks given by Richdale (1952: 99, 101, tables 49-50), it seems that *D. cauta eremita* either has a shorter fledging period than the usual 4½ months or begins nesting several weeks earlier than the other subspecies of *D. cauta*.

DISCUSSION

Casual visits to the off-lying islands of the Chatham group, particularly since Fleming's work from 28 November 1937 to 24 January 1938, have produced information allowing not only an assessment of the numbers making up the breeding populations of the various species of albatrosses and mollymawks that nest there but also giving some basis for drawing up timetables of events in the breeding season of each of these species. Some fluctuations in numbers from year to year, particularly in the case of the biennially breeding Royal Albatrosses, may be expected judging by what is known for other species elsewhere and differences in estimates by various visitors need not indicate abnormal mortality rates or evidence of molesting by humans.

Current field work by the Wildlife Service of the Department of Internal Affairs should give material for a computation of the total breeding population and the range of egg-laying and hatching dates. Such information, with the earlier observations discussed above, may provide a criterion or control for conservation or management should it ever be decided to restore the traditional Maori rights of

"birding" on the Sisters and the Forty Fours, a practice which ceased in 1943 (*vide* L. C. Bell 1955: 65) although reports of poaching what has been called the "illegal tegel" (after the brand name of a commercially-produced chicken well known in New Zealand shops) are heard from time to time (Coster 1972). Some of these reports seem to me to be deliberate exaggeration to confuse official enquirers.

It is important, however, that a watch be kept on population changes both longterm and within breeding seasons, and stricter policing of fishing vessels near the end of the chicks' fledging times should bring better evidence of illegal activities if it exists. The Sisters and the Forty Fours have shown themselves ideally suited for population counts of Royal Albatrosses by aerial photography and with suitable oblique panoramas of the cliff edges Buller's Mollymawks could also be counted with good reliability. On the Forty Fours these mollymawks nest to a far greater extent on the flat tops on the less vegetated parts (*cf.* Pl. IX in Dawson 1955). It is to be hoped that further photographic coverage of these islands will be possible as circumstances permit, especially to meet the limitations of the occasional census as stressed by Tickell (1970: 91) as well as at critical times of the breeding cycle.

The breeding cycle timetables are probably fairly consistent both within a species and from one year to another. However, Buller's Mollymawk, with its remarkably long span of laying, has been recorded, in one case at least, breeding as late at the Chatham Islands as it habitually does in southern New Zealand, and one may speculate on the reasons for these apparent anomalies.

Departure dates for fledglings of *Diomedea cauta* have been given usually as about April, and the early date of March for the desertion of the Pyramid in 1969 may only indicate the fluctuation of one particular year. Further work is obviously needed to show how consistent events in the breeding season really are.

Further counts of the breeding population on the Pyramid are needed also since the estimate given here of c. 2,500 may well be out by as much as a factor of two if all the sloping ground and cave area is always as closely packed with nests as Fleming noted in 1937.

As stressed by Tickell (1968), the population dynamics of the Wandering and of the Royal Albatross are complicated by the biennial breeding cycle of these species. On the other hand estimates of the breeding population of annual breeders, such as the Chatham Island Mollymawk is assumed to be, are more soundly based and it can be considered that c. 2,500 pairs is the total breeding population on the Pyramid, the only known nesting ground of the species. Hence, the Chatham Island Mollymawk cannot be regarded as a common species in terms of the known populations of the other races of *Diomedea cauta*. Despite the natural protection given to the Pyramid by its very nature and setting, it is desirable that it should be given the same status as the nearby South East Island and Little Mangere and designated a Reserve for the Preservation of Flora and Fauna.

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LITERATURE CITED

- BECK, R. H. 1926. Trip to New Zealand. November 4, 1925 to March 24, 1926. Pp. 80-139 in: Whitney Expedition Journals. Beck's Letters and Journal, Dec. 1923-Feb. 1928, Vol. D. Unpubl. MSS in The American Museum of Natural History, New York.
- BELL, B. D. 1961. Birds of the Chatham Islands, Unpubl. MS.
- BELL, B. D. 1963. List of New Zealand off-shore islands and their wildlife status. 30 pp. (unnumb.). [Wellington]: Department of Internal Affairs.
- BELL, B. D.; MERTON, D. V. 1970. Endemic birds of the Chatham Islands. (Unpubl. MS).
- BELL, L. C. 1955. Notes on the birds of the Chatham Islands. *Notornis* 6 (3): 65-68.
- COSTER, G. E. 1972. Conservation of bird life urgently needed in Chatham Islands. *Forest and Bird* No. 185: 5-7, figs.
- DAWSON, E. W. 1955. The birds of the Chatham Islands 1954 Expedition. *Notornis* 6 (3): 78-82, pls VI-IX.
- DIEFFENBACH, E. 1841. An account of the Chatham Islands. *Journal of the Royal Geographical Society* 11: 195-215, 1 chart.
- FALLA, R. A. 1948. Birds of the Solanders. *New Zealand Bird Notes* 3 (2): 52-55, pls I-IV.
- FLEMING, C. A. 1939. Birds of the Chatham Islands. Part I. *Emu* 38: 380-413, pls 46-53, 2 maps.
- HAY, R. F.; MUTCH, A. R.; WATTERS, W. A. 1970. Geology of the Chatham Islands. N.Z. Geological Survey. *Bulletin*, n.s. 83: 1-86, frontis., figs 1-27, tables 1-5, 1 map.
- HORNING, D. S. JR; HORNING, Carol J. 1974. Bird records of the 1971-1973 Snares Islands, New Zealand, Expedition. *Notornis* 21: in press. (University of Canterbury Snares Islands Expedition Paper No. 17).
- KNOX, G. A. 1957. General account of the Chatham Islands 1954 Expedition. N.Z. Department of Scientific and Industrial Research. *Bulletin* 122: 1-37, frontis., figs 1-24.

- MURPHY, R. C. 1930. Birds collected during the Whitney South Sea Expedition. XI. American Museum Novitates No. 419: 1-15.
- PARRY, G. 1972. The Royals of Taiaroa Head. NAC Airline Review (Wellington) No. 61: 4-5, illus.
- RICHDALE, L. E. 1949a. The pre-egg stage in Buller's Mollymawk. Biological Monographs No. 2. Pp. 1-50, figs 1-16, 2 maps, tables 1-8. Dunedin: Otago Daily Times & Witness Newspapers Co. Ltd.
- RICHDALE, L. E. 1949b. Buller's Mollymawk: incubation data. Bird-Banding XX (3): 127-141, 2 figs, tables 1-9.
- RICHDALE, L. E. 1950. The pre-egg stage in the albatross family. Biological Monographs No. 3. Pp. 1-92, figs 1-13, tables 1-7. Dunedin: Otago Daily Times & Witness Newspapers Co. Ltd.
- RICHDALE, L. E. 1952. The post-egg stage in albatrosses. Biological Monographs No. 4. Pp. 1-166, figs 1-28, tables 1-65. (No. 1 Nuffield Publication). Dunedin: Otago Daily Times & Witness Newspapers Co. Ltd.
- RICHDALE, L. E. 1954. The starvation theory in albatrosses. Auk 71 (2): 239-252, figs 1-2, table 1.
- ROBERTSON, C. J. R. 1972. Royal Albatross colony at Taiaroa Head expanding and flourishing. Forest and Bird No. 184: 3-6, 3 figs [also in: The Royal Albatross at Taiaroa Head. Wildlife 1971 — a review (No. 3): 46-49, 1 fig.]
- ROBERTSON, C. J. R.; KINSKY, F. C. 1972. The dispersal movements of the Royal Albatross (*Diomedea epomophora*). Notornis 19 (4): 289-301, figs 1-5, tables 1-2.
- TICKELL, W. L. N. 1968. The biology of the great albatrosses, *Diomedea exulans* and *Diomedea epomophora*. Pp. 1-55, figs 1-46, tables 1-48 in: AUSTIN, O. L. Jr (ed.). Antarctic bird studies. Antarctic Research Series 12: x + 1-262, illus. Washington, D.C.: American Geophysical Union.
- TICKELL, W. L. N. 1970. The great albatrosses. Scientific American 223 (5): 84-93, illus.
- WARHAM, J. 1967. Snares Islands birds. Notornis 14 (3): 122-139, 1 map, pl. XXV.
- WILSON, G. J. 1973. Notes on the birds of the Solander Islands. Notornis 20 (4): in press.

E. W. Dawson,
N.Z. Oceanographic Institute,
DSIR,
Wellington