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# PRELIMINARY ANALYSIS OF RECORDS OF "STORM-KILLED" SEA BIRDS FROM NEW ZEALAND, 1939-59

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## I ABSTRACT

Published and unpublished records held by the Ornithological Society of New Zealand give the identity and the date and place of collection of 6,960 specimens of oceanic birds that have been found dead on New Zealand beaches during the period 1939 to 1959. Of the 50 species represented, 38 belong to the order Procellariiformes. Prions (*Pachyptila* spp.) constitute 64 per cent. of the total records and Shearwaters (*Puffinus* spp.) 20 per cent. The records of most of the species, but particularly of the prions, are characterised by occasional periods of very heavy mortality ("wrecks") which sometimes involve a single species, sometimes several species. Records of the Fairy Prion (*Pachyptila turtur*) are presented in some detail to show distribution and seasonal movements; comparable data for other species are given in summary. Many of the species breed in the South Indian Ocean, and banding of birds at breeding stations there and elsewhere in the Subantarctic can be expected to yield many interesting recoveries from New Zealand.

## II INTRODUCTION

The recording of sea birds found dead on New Zealand beaches has been one of the New Zealand Ornithological Society's activities almost from its inception. Several such records appear in the Society's first Annual Report (1939-40), and many others are included in the "Summarised Classified Notes" sections of subsequent publications. These records provide a useful source of information for anyone studying the distribution and seasonal movements of birds living off the New Zealand coast. A defect of the records, however, is that, although people usually report the finding of rare species, they sometimes neglect to record the commoner ones, and consequently the records may not give a true picture of the relative abundance of the different species. Further, most of the records give no indication of how much beach was examined, and, without this information, the finding of many birds could mean either that many were present or that the observer covered an unusually long stretch of coastline.

To correct these defects in the records, a special Beach Patrol Scheme was initiated in October 1951 (Notornis 4: 142), and members were asked to record on special cards *all* the sea birds they found, together with details of the date, locality, length of beach patrolled, freshness of specimens and weather conditions during preceding days. The Scheme flourished for a few years and then gradually lapsed. A considerable number of cards were sent in by members, but no summaries were published. The continued inclusion of records of dead sea birds in the Summarised Classified Notes caused some confusion in that

records were sometimes published in the notes, sometimes merely entered on the patrol cards and sometimes preserved both on the cards and in the notes.

The Beach Patrol Scheme was revived in 1960 (Notornis 8: 268) and has met with a good response from members. It was recently decided to discontinue the publication in the "Classified Notes" of records of dead sea birds, and instead to publish an annual summary of the cards sent in; it is hoped that the first of these summaries, that for the year 1960, will appear shortly.

The present compilation deals only with records made prior to 1960. It attempts to describe the nature of the material so far collected, to point out some of the defects in it, and to illustrate some of the ways in which the data can be used to obtain information on species that are rarely seen except at breeding colonies or from ships at sea where specific identification is often impossible.

## III THE RECORDS EXAMINED

### *A. Beach Patrol Cards*

The total number of cards held, for patrols made prior to 1960, is 344, but this number may be increased because several observers have promised to make out cards for patrols at present recorded in private field notebooks. Although 32 observers contributed to the above total, only nine provided more than ten cards each and only three sent in more than 40 cards each.

The monthly and yearly distribution of patrols, irrespective of locality, is shown in Table 1 below.

**Table 1: Number of Beach Patrols each Month, 1951-59**

| | —1951 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan. | 4 | – | 6 | 3 | 4 | 2 | 1 | – | – | 2 | 22 |
| Feb. | 4 | – | 4 | 6 | 7 | – | 1 | – | 1 | 2 | 25 |
| Mar. | – | – | 6 | 11 | 9 | – | – | – | 1 | 2 | 29 |
| Apr. | 1 | – | 7 | 21 | 8 | 1 | 1 | 1 | 1 | 6 | 47 |
| May | – | 6 | 5 | 14 | 1 | 1 | – | 2 | 5 | 6 | 40 |
| June | – | – | 6 | 5 | 3 | – | – | 2 | 3 | 8 | 27 |
| July | – | – | 4 | 11 | 9 | 2 | – | – | 5 | 8 | 39 |
| Aug. | 1 | 2 | 7 | 7 | 2 | 1 | – | – | 2 | 6 | 28 |
| Sept. | – | 1 | 2 | – | 2 | – | – | 3 | 5 | 5 | 18 |
| Oct. | – | 5 | 6 | 6 | 2 | 1 | – | 3 | 2 | 1 | 26 |
| Nov. | 1 | 7 | 4 | 8 | – | – | 1 | 1 | 4 | 4 | 30 |
| Dec. | 1 | 5 | – | 2 | 1 | – | – | 2 | 2 | – | 13 |
| Total | 12 | 26 | 57 | 94 | 48 | 8 | 4 | 14 | 31 | 50 | 344 |

The number of cards sent in has varied markedly from year to year. Following the initiation of the Beach Patrol Scheme in 1951, the number of patrols increased progressively to reach a peak of 94 in 1953, and then declined to the ignominious figure of four in 1956. In subsequent years the figures rose again to a modest peak of 50 in 1959, but this latter increase was largely due to the contributions of a very few observers working in the Wellington district. Twelve cards record details of patrols made before the scheme was started; these cards, presumably made from entries in field notebooks, cover the years 1943 to 1949. The cards are representative of all seasons of the year;

the combined patrols, over the whole period, exceed 20 for every month except September (18) and December (13); one or more patrols were made in nearly every month of the years 1952, 1953, 1954, 1958 and 1959.

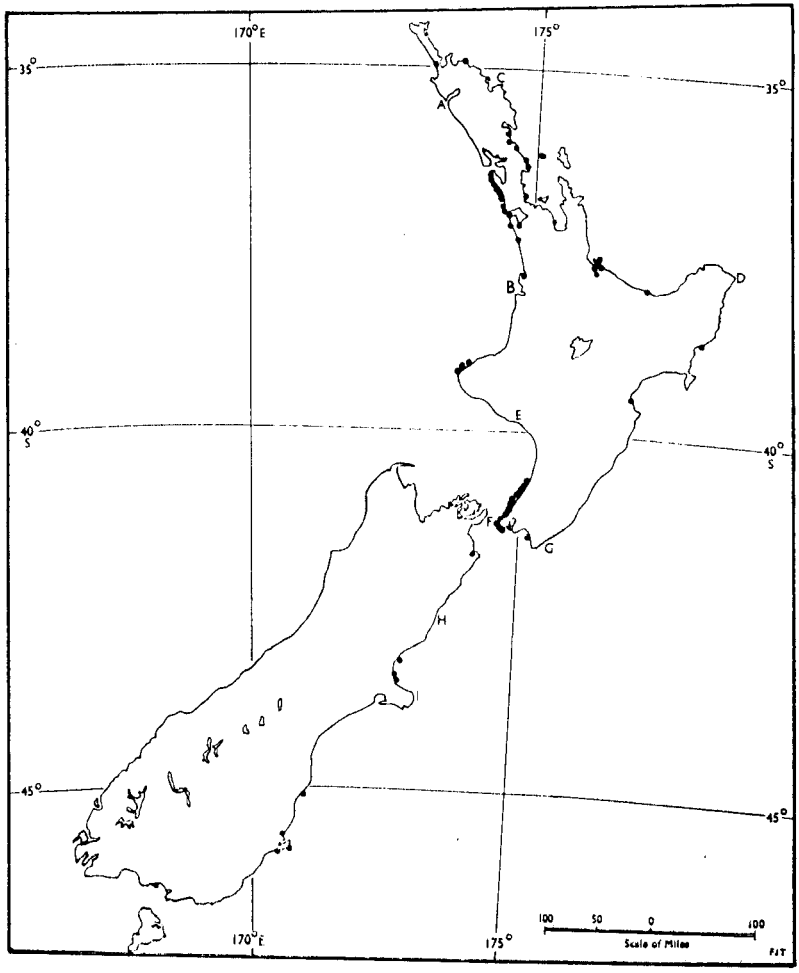


**Fig. 1** — Distribution of Beach Patrols. Each dot indicates a locality in which one or more patrols have been made. For purposes of analysis the localities have been grouped in zones; these are indicated as follows:

A-B Auckland West Coast, Hokianga to Kawhia
C-D Auckland East Coast, Bay of Islands to East Cape
E-F Wellington West Coast, Wanganui to Cape Terawhiti
F-G Wellington South Coast, Cape Terawhiti to Cape Palliser
H-I North Canterbury, Motunau to Banks Peninsula

The geographic distribution of the patrols (Fig. 1) is very uneven. Over 90 per cent. of the patrols relate to beaches in the vicinity of Auckland or Wellington, and there are no patrols at all from several long stretches of coastline; for example, there are none from the whole length of the west coast of the South Island (Dr. R. A. Falla advises that dead birds are rare on beaches near Hokitika and Okarito). For purposes of analysis, the Auckland patrols have been divided into Western and Eastern zones, and the Wellington ones into Western and Southern zones (Fig. 1). A few patrols from the Christchurch-Motunau Island area have been placed in a fifth zone and all others grouped together as "miscellaneous." In most of these zones several patrols were made each year from 1951 to 1954, but only in the Wellington West Coast Zone, which has the largest number of patrols, is there any approach to an unbroken record for the full period 1951 to 1959 (Table 2).

**Table 2: Number of Beach Patrols on Various Coastlines, 1951-59**

| | —1951 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Auck. East | – | 7 | 14 | 32 | 10 | – | – | – | 1 | 1 | 65 |
| Auck. West | – | 7 | 23 | 14 | 13 | – | – | – | – | – | 57 |
| Wgtn. West | 7 | 1 | 6 | 28 | 14 | 5 | 3 | 13 | 29 | 35 | 141 |
| Wgtn. Sth. | 5 | 2 | 3 | 13 | 7 | 3 | 1 | 1 | 1 | 14 | 50 |
| Nth. Canty. | – | 4 | 5 | 2 | – | – | – | – | – | – | 11 |
| Miscell. | – | 5 | 6 | 5 | 4 | – | – | – | – | – | 20 |
| Total | 12 | 26 | 57 | 94 | 48 | 8 | 4 | 14 | 31 | 50 | 344 |

The length of beach patrolled is indicated on only 266 of the cards, and the total distance covered by these patrols is 647 miles. The contribution made by each zone to this total is shown in Table 3, together with the average number of petrels found per mile in each zone.

**Table 3: Patrols for which Mileage was Recorded**

| Zone | No. Patrols | Total No. Miles Covered | Total No. Petrels Found | Birds Per Mile |
|---|---|---|---|---|
| Auck. East | 33 | 94 | 132 | 1.4 |
| Auck. West | 48 | 195 | 1195 | 6.1 |
| Wgtn. West | 121 | 230 | 644 | 2.8 |
| Wgtn. Sth. | 44 | 63 | 69 | 1.1 |
| Nth. Canty. | 10 | 44 | 52 | 1.2 |
| Miscell. | 10 | 21 | 12 | 0.6 |
| Total | 266 | 647 | 2104 | 3.3 |

The number of birds found per mile in the Auckland West Coast Zone is more than twice that of any other zone. This may indicate that more birds are washed up in this zone than in others, or, less likely, that, in this zone, a higher proportion of the patrols took place after strong gales than elsewhere.

The identification of some of the petrels is a matter of considerable difficulty, and the specimen record cards vary with regard

to evidence of correct identification. Some cards have detailed measurements or reference to a preserved skin or skeleton, while others have been signed by an experienced ornithologist who has examined the original specimens. Some cards, however, provide no indication of the grounds on which the identification was made. In view of these considerations, anyone using the Society's records will need to inspect the cards and published records himself. Since the present work is intended as a compilation rather than a critical study, all the records have been accepted at face value; subspecific determinations, however, have been omitted.

### *B. Records from "Notornis"*

For the present purpose, "Notornis" is taken to include also the Society's earlier publication, "N.Z. Bird Notes." The material covers a period of 20 years (1939-59) and also includes a few records from earlier years. The published notes thus provide some indication of sea bird mortality during the 12 years immediately preceding the introduction of the Beach Patrol Scheme, and, even in later years, they include many birds not recorded on beach patrol cards. For the present purpose, all the published records of each species were listed. The list for each species was then compared with the beach patrol cards and any obvious duplications were deleted from the list of published records, together with records of birds found dead at breeding colonies or of healthy birds caught for banding. In this way the two sets of material were made reasonably comparable and duplication was reduced to a minimum.

The published records usually give no indication of how much beach was examined, nor of the basis on which the specimens were identified. In some instances it is even difficult to decide whether a record refers to a living bird or to a dead one.

## IV PRELIMINARY ANALYSES

### *A. Records of Pachyptila turtur*

Records of Fairy Prion *(P. turtur),* a common and fairly easily recognised species, are presented below in some detail as an example of the kind of data that are available for many other species.

In Table 4 all the Society's records of *P. turtur* have been grouped according to the month and year in which the birds were collected. Nearly all the records of birds found prior to 1951 are from "Notornis" whereas most of the later records are from beach patrol cards. An entry of "0" in the table signifies that no *P. turtur* was found even though some beach was examined that month as indicated by a beach patrol card or a published record concerning the finding of other petrels; in the absence of such indication the space is left blank. The table gives some measure of observer effort during the 20-year period and may be useful in helping to decide whether the lack of records of other species is to be interpreted as a true scarcity of birds or merely an absence of observers.

It is apparent that the observations provide a much better coverage of the second half of the 20-year period than of the first half. Observations are lacking for 48 per cent. of the months in the first ten years but for only seven per cent. of those in the next decade.

**Table 4: Records of Pachyptila turtur**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1940 | | | | | | | 12 | | | | | | 12 |
| 1940 | 0 | 1 | | 1 | 1 | | | 0 | | | | | 3 |
| 1941 | 0 | | | 1 | 2 | | | | 2 | | | | 5 |
| 1942 | | 0 | | | 0 | 0 | 0 | | | 0 | | 0 | – |
| 1943 | 35 | 15 | 4 | | 0 | | 1 | | | 3 | | | 58 |
| 1944 | | | | | 0 | | 0 | | 0 | | | | – |
| 1945 | | 0 | | | 0 | | 0 | | | | 0 | | – |
| 1946 | 0 | 0 | 0 | 0 | | | 1 | 49 | 4 | 0 | | 0 | 54 |
| 1947 | | 2 | | 0 | 0 | 0 | | | 0 | | | 0 | 2 |
| 1948 | 4 | 0 | | 0 | 4 | 4 | 4 | 2 | 3 | 1 | 9 | 6 | 37 |
| 1949 | 2 | 2 | | | 4 | 0 | 17 | | 2 | | 35 | 4 | 66 |
| 1950 | | 0 | 1 | 0 | 0 | 0 | 2 | 146 | 0 | | 0 | 0 | 149 |
| 1951 | 8 | 0 | 0 | 1 | 9 | 0 | 0 | 5 | 2 | 52 | 26 | 9 | 112 |
| 1952 | 0 | 0 | 3 | 1 | 1 | 2 | 0 | 0 | 1 | 8 | 5 | 1 | 22 |
| 1953 | 95 | 11 | 32 | 7 | 3 | 6 | 31 | 8 | 0 | 12 | 26 | 3 | 234 |
| 1954 | 1 | 3 | 1 | 5 | 0 | 12 | 128 | 15 | 62 | 3 | 4 | 5 | 239 |
| 1955 | 6 | 11 | 1 | 0 | 1 | 0 | 13 | 4 | 18 | 3 | | 2 | 59 |
| 1956 | 9 | 41 | | 0 | 1 | | 14 | 3 | 2 | 0 | 0 | 0 | 70 |
| 1957 | | 0 | 0 | 0 | 0 | 2 | | | 4 | 3 | 2 | 3 | 14 |
| 1958 | 0 | 0 | 0 | 1 | 3 | 6 | 4 | 12 | 13 | 2 | 44 | 0 | 85 |
| 1959 | 0 | 0 | 2 | 0 | 2 | 3 | 1 | 2 | 17 | 0 | 6 | 0 | 33 |
| Total | 160 | 86 | 44 | 17 | 31 | 35 | 228 | 246 | 130 | 87 | 157 | 33 | 1254 |

It is also likely that patrols were fewer or shorter in the first decade than in the second because the percentage of months in which no *P. turtur* was found (even though some beach was examined) was 50 per cent. during the period 1940-49, but only 32 per cent. during 1950-59. The same conclusion may be drawn from the fact that the average number of *P. turtur* found per month (excluding months with no observations) rose from 3.6 in 1940-49 to 9.1 in 1950-59.

The most striking feature of Table 4 is that the number of birds reported varies greatly from month to month and from year to year. For instance, of the 160 birds found in January (left hand column), 95 (59%) were recorded in January 1953, and a further 35 (22%) in January 1943; birds found in January of the remaining 18 years totalled only 30 (19% of the 20-year total). The occasional periods of heavy mortality may occur at different times of the year. For

instance more than 30 *P. turtur* were found in January (1943 and 1953), February (1956), March (1953), July (1953 and 1954), August (1946 and 1950), September (1954), October (1951) and November (1949 and 1958).

It is assumed above that these high figures indicate unusually severe mortality, but it could be argued that they are perhaps due merely to increased activity of observers. This possibility can be checked by reference to beach patrol cards that show the length of beach examined in the combined Auckland and Wellington West Coast Zones (Tables 5 and 6). Table 5 shows the average number of *P. turtur* found per mile of beach in each year from 1951 to 1959. Excluding the years 1955 and 1956 when only a few miles of beach were examined, the values vary from 2.5 birds per mile in 1951 to 0.2 birds per mile in 1952. At least some beach was examined in every month of these two years (Table 4) so it is unlikely that the low value for 1952 could be explained by inadequate patrolling; indeed, on the basis of miles covered, 1952 was a year of rather high patrolling activity (Table 5). The number of birds found per mile on certain

**Table 5: Mean Number of P. turtur Found per Mile in Different Years**

(Auckland and Wellington West Coasts combined)

| | — 1951 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. Miles Patrolled | 4 | 24 | 90 | 104 | 49 | 6 | 2 | 16 | 72 | 58 | 425 |
| No. P. turtur found | 9 | 60 | 16 | 195 | 56 | 4 | 41 | 10 | 72 | 30 | 493 |
| Birds per Mile | 2.3 | 2.5 | 0.2 | 1.9 | 1.1 | (0.7) | (20.5) | 0.6 | 1.0 | 0.5 | 1.2 |

occasions was sometimes much higher than the average values given in Tables 5 and 6. For instance, 31 *P. turtur* were found during a patrol of one mile on the Auckland West Coast in October 1951, and 38 were found over a distance of two miles on the Wellington West Coast in February 1956. It is apparent therefore that there are certain occasions when mortality is particularly severe; such occasions are sometimes referred to as "wrecks." Although this term is convenient for describing periods of unusually severe mortality, there is no evidence to suggest that wrecks differ, except in degree, from the more frequent occasions when the birds occur in only moderate numbers.

The variation in the monthly averages (Table 6) is even more marked than in the yearly ones and ranges from 0.2 birds per mile in April to 6.3 in January.

**Table 6: Mean Number of P. turtur Found per Mile in Different Months**

(Auckland and Wellington West Coasts combined)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. Miles Patrolled | 16 | 14 | 50 | 56 | 35 | 51 | 62 | 20 | 35 | 25 | 43 | 19 | 425 |
| No. P. turtur found | 100 | 50 | 37 | 10 | 13 | 17 | 51 | 13 | 36 | 53 | 103 | 10 | 493 |
| Birds per Mile | 6.3 | 3.7 | 0.7 | 0.2 | 0.4 | 0.3 | 0.8 | 0.7 | 1.0 | 2.1 | 2.4 | 0.5 | 1.2 |

The three lowest values (all under 0.5 birds per mile) occurr in April, May and June. Further, during the whole period 1940 to 1959, the highest number of *P. turtur* found in any of the above three months was only 12 (June, 1954); except for December (only nine birds) the other months all have a maximum figure of at least 30 birds (Table 4). These results may indicate that the mortality of *P. turtur* tends to be lower in April, May and June than during the rest of the year or that the species is scarce in offshore waters at that season. Any such conclusion, however, must be regarded as provisional because the figures would be completely changed if a wreck should occur in the April-June period, and there are as yet too few records of wrecks to give any assurance that they are really rarer at this season than at others.

Although the species *P. turtur* is present off the New Zealand coast throughout the year, a detailed study of the measurements of specimens found at different seasons might show that there is in fact considerable seasonal movement — the disappearance of birds of one race being balanced by the arrival of those of another.

The geographic distribution of records of *P. turtur* is almost the same as that of beach patrols (Fig. 1). Of the 1,254 birds listed in Table 4, 52 per cent. are from the Auckland West Coast, 36 per cent. from the Wellington West Coast, five per cent. from North Canterbury, 4 per cent. from the Auckland East Coast-Bay of Plenty zone and only 3 per cent. from other areas. The species has been found along almost the whole length of the West Coast of the North Island; on the East Coast specimens have been reported from North Auckland, Firth of Thames, Bay of Plenty and Gisborne. In the South Island *P. turtur* has been found at Cape Farewell, New Brighton (Christchurch), Lake Ellesmere and Dunedin. Probably the species is to be found on all New Zealand coasts where tide, currents and shoreline conditions are such that birds can be washed ashore. Fairy Prions seem to be washed up in greater numbers on West Coast Beaches than on Eastern or Southern ones, but the number of patrols from the latter beaches is still too small to prove this. The highest mortalities recorded for other than West Coast beaches are 0.4 birds per mile in the Bay of Plenty in July, 1953, 1.0 per mile on the Wellington South Coast in April, 1953, and 1.3 per mile in Canterbury in October, 1951. The published records include a few birds from as far inland as Taihape and Queenstown.

*B. Records of Other Species*

Most of the records refer to species in the Order Procellariiformes (albatrosses, petrels and shearwaters, storm petrels and diving petrels) and these are listed in Table 7. In addition, there are 182 records of penguins; *Eudyptula minor* (150 records) is by far the most numerous species, but there are also a few records of *Megadyptes antipodes*, *Eudyptula albosignata* and *Eudyptes sclateri*. Other groups represented total only 14 specimens and comprise the following species: *Phaethon rubricauda* (1), *Sula leucogaster* (1), *Fregata ariel* (2), *Stercorarius skua* (5), *S. pomarinus* (1), *S. parasiticus* (2), *Sterna bergii* (1), and *S. fuscata* (1). Records of common New Zealand species of shags, gannets, gulls and terns, together with a few records of land birds, have been excluded from this compilation because in these species better information is usually available from the study of living birds. The paragraphs that follow deal only with the petrels and their allies.

**Table 7: Summary of Records of Petrels and Their Allies**

| SPECIES | Total No. Records | % from "Notornis" | No. Records from each of zones | | | | |
|---|---|---|---|---|---|---|---|
| | | | CD | AB | EF | FG | HI |
| *Diomedea exulans* | 42 | 90 | 1 | 19 | 1 | 8 | 5 |
| *D. epomophora* | 19 | 95 | – | 10 | 2 | 6 | 1 |
| *D. melanophris* | 16 | 81 | 2 | 12 | – | – | 2 |
| *D. chrysostoma* | 130 | 61 | – | 104 | 23 | 3 | – |
| *D. bulleri* | 11 | 73 | 1 | 5 | 1 | 4 | – |
| *D. cauta* | 122 | 78 | 2 | 33 | 15 | 63 | 7 |
| *Phoebetria palpebrata* | 15 | 73 | 2 | 9 | 1 | 1 | 1 |
| *Macronectes giganteus* | 78 | 62 | 2 | 54 | 8 | 2 | 3 |
| *Daption capensis* | 66 | 68 | 5 | 31 | 18 | 7 | 3 |
| *Fulmarus glacialoides* | 7 | (86) | – | 3 | 2 | – | 1 |
| *Halobaena caerulea* | 58 | 84 | 1 | 51 | 5 | – | – |
| *Pachyptila vittata* | 1026 | 81 | 51 | 596 | 211 | 2 | 107 |
| *P. salvini* | 1720 | 68 | 6 | 1611 | 101 | 1 | – |
| *P. desolata* | 163 | 64 | 15 | 116 | 16 | 2 | 14 |
| *P. belcheri* | 146 | 62 | 3 | 116 | 26 | – | – |
| *P. turtur* | 1254 | 52 | 54 | 650 | 457 | 18 | 56 |
| *Puffinus carneipes* | 60 | 63 | 23 | 32 | 2 | 1 | – |
| *P. bulleri* | 140 | 71 | 24 | 57 | 19 | 31 | 6 |
| *P. griseus* | 806 | 64 | 40 | 610 | 77 | 28 | 33 |
| *P. tenuirostris* | 102 | 84 | 20 | 61 | 17 | 2 | 1 |
| *P. gavia* | 234 | 53 | 41 | 115 | 49 | 6 | 17 |
| *P. assimilis* | 20 | 80 | 5 | 9 | 5 | – | – |
| *Procellaria cinerea* | 4 | (75) | – | 3 | 1 | – | – |
| *P. parkinsoni* | 5 | (100) | 2 | – | – | 1 | – |
| *P. westlandica* | 2 | (100) | – | 1 | 1 | – | – |
| *P. aequinoctialis* | 12 | 58 | 1 | 9 | 2 | – | – |
| *Pterodroma macroptera* | 52 | 60 | 23 | 13 | – | 11 | 2 |
| *P. lessoni* | 154 | 71 | 2 | 126 | 18 | 2 | 2 |
| *P. inexpectata* | 33 | 67 | 2 | 24 | 5 | 1 | 1 |
| *P. brevirostris* | 22 | 73 | 1 | 12 | 8 | – | 1 |
| *P. pycrofti* | 6 | (100) | 6 | – | – | – | – |
| *P. leucoptera* | 1 | (100) | – | 1 | – | – | – |
| *P. cooki* | 17 | 65 | 9 | 7 | 1 | – | – |
| *P. nigripennis* | 1 | (100) | – | – | 1 | – | – |
| *Oceanites oceanicus* | 1 | (0) | 1 | – | – | – | – |
| *Garrodia nereis* | 6 | (100) | – | – | 1 | – | 2 |
| *Pelagodroma marina* | 22 | 64 | 14 | 4 | 1 | 1 | 2 |
| *Pelecanoides urinatrix* | 191 | 49 | 95 | 45 | 35 | 6 | 7 |
| *TOTALS* | 6764 | 66 | 454 | 4549 | 1130 | 207 | 274 |

Brackets indicate percentages based on less than 10 records

**Zones:** CD — Auckland East Cost-Bay of Plenty (see Fig. 1)
AB — Auckland West Coast FG — Wellington South Coast
EF — Wellington West Coast HI — North Canterbury Coast

The prions *(Genus Pachyptila)* are by far the most numerous group and comprise 64 per cent. of the total records. Of the other groups, the shearwaters make up 20 per cent., other petrels seven per cent., albatrosses five per cent., diving petrels three per cent. and storm petrels less than one per cent. The Lesser Broad-billed Prion *(P. salvini)* is the most abundant species with 1,720 specimens. There are 1,254 records of the Fairy Prion *(P. turtur)*, 1,026 of the Broad-billed Prion *(P. vittata)* and 806 of the Sooty Shearwater *(P. griseus)*; except for the Fluttering Shearwater *(P. gavia)* (234 records), the other species are each represented by less than 200 records.

Although there are more records of *P. salvini* than of any other species, 83 per cent. of the specimens were found during June and July of 1954. The number of records of *P. turtur*, the next most abundant species, is considerably below that of *P. salvini*, but the records are more evenly distributed (Table 4) and the greatest number of specimens recorded in any period of two consecutive months constitutes only 12 per cent. of the total records. It is apparent therefore that *P. turtur* is more often found than *P. salvini*, even though the total number of specimens is greater for *P. salvini*. A comparable, but less obvious difference, may occur between some of the shearwaters. Taking the maximum number of birds found in any period of two consecutive months as a percentage of the total records, it was found that the highest value for *P. griseus* was 26 per cent., but for *P. gavia* only 16 per cent. The data concerning the diving petrel *P. urinatrix*, though not analysed in detail, appear to resemble those for *P. turtur* and *P. gavia* in consisting of many records of small numbers of specimens rather than of a few "wrecks" involving many birds.

People visiting beaches at times when there has been no recent heavy mortality may find the above three species more often than other species and thus tend to regard them as common and the record not worthy of publication. This possibility is examined in Table 7. The total number of records for each species is shown in the first column of figures; some of these records were from "Notornis" and the rest from beach patrol cards. The percentage of the records that came from "Notornis" (second column of figures) is much lower for *P. turtur* (52 per cent.), *P. gavia* (53 per cent.) and *P. urinatrix* (49 per cent.) than for any of the other species with comparable numbers of records (60 per cent to 84 per cent. for all species with more than 50 records). The fact that the beach patrol scheme rather than "Notornis" yielded so high a proportion of the total records for these three species is best explained on the hypothesis that people have not bothered to publish the finding of small numbers of these relatively common species. It is probable that "wrecks" of these species do occur (see Table 4 for *P. turtur*), but the constant occurrence of small numbers of dead birds between the "wrecks" means that the latter come to constitute a smaller proportion of the total records. *P. turtur, P. gavia* and *P. urinatrix* are present off the New Zealand coast throughout the year and they all breed in large numbers on islands in the vicinity of Auckland and Wellington so it is not surprising that they figure frequently in the beach patrols, most of which are from beaches near these centres (Table 3).

The wrecks of petrels sometimes involve mainly a single species and at other times several species. For instance, a wreck, consisting almost entirely of *P. vittata*, occurred in August, 1946. In July, 1954,

on the other hand, the records include 1,135 *P. salvini,* 128 *P. turtur* and over one hundred *P. vittata.* A southerly gale in February, 1947, resulted in the stranding in Palliser Bay over 40 Salvin's Mollymawks *(Diomedea cauta salvini)* and unusually large numbers of Buller's Shearwaters *(P. bulleri)* and Grey-faced Petrels, *(P. macroptera).* These wrecks are recorded in "Notornis" together with information on the weather conditions that preceded them (see Turbott and Sibson, 1946; Wodzicki, 1947; Cunningham, 1948; and Davenport and Sibson, 1955). Earlier wrecks, involving mostly of *P. salvini,* occurred in 1918 and 1932 (Falla, 1940).

Dr. R. A. Falla has pointed out that one might separate winter wrecks (in which food shortage is sometimes suspected as an underlying cause) from wrecks of young birds caught by strong winds within a few days of leaving their burrows. These very young birds can be distinguished by the nature of the bill and plumage; the dates on which they occur are sometimes useful in indicating the time at which young birds leave inaccessible nesting colonies (R. A. Falla, personal communication).

The present data are of limited value for showing the geographic distribution of the different petrels because most of the observations refer to beaches in the vicinity of Auckland and Wellington and there are few if any records from several long stretches of coastline (Fig. 1). A glance at the five right hand columns of Table 7 shows that, in general, the species present are substantially the same in all zones in which regular observations have been made. A notable exception is the Grey-faced Petrel *(P. macroptera)* which has not been found on the Wellington West Coast despite intensive patrolling in this area; the eleven specimens of *P. macroptera* from the Wellington South Coast were all found together after the gale of February, 1947 (Cunningham, 1947). Despite the similarity of the species lists, there are considerable differences between some of the zones with regard to the relative abundance of certain birds. For instance, prions constitute 68 per cent. of the total records from the Auckland West Coast, but only 28 per cent. of those from the East Coast. Conversely, Diving Petrels *(P. urinatrix)* are more abundant on the Auckland East Coast (21 per cent. of all records) than in any other zone (less than four per cent. of total records). Except for *P. macroptera,* the records for the Auckland and Wellington West Coasts are very similar, both with regard to the species present and to their numerical importance.

There are marked differences between the species with regard to the months in which most of the specimens are recorded. This is illustrated in Table 8 for a few species in each of several groups of petrels. Some species are found in good numbers during all months of the year (e.g. *P. gavia* and *P. turtur*), others are rare or absent in mid winter (Flesh-footed and Buller's Shearwaters, *P. carneipes* and *P. bulleri*) and others again occur mainly during the winter months (*P. salvini* and the Blue Petrel, *H. caerulea*). These differences of course are related to the seasonal movements of the species and would be clearer still were it not that many of the records provide no indication of how long the specimen had been lying on the beach before it was found. The occurrence of "wrecks" also increases the difficulty of interpreting Table 8, since the high average for some months is due to the single occurrence of large numbers of birds; as more records accumulate, wrecks may be found in other months and perhaps modify the seasonal patterns shown in the table.

**Table 8: Seasonal Distribution of Records**

| Species | Number Specimens Recorded in Each Month | | | | | | | | | | | | Total Records |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D | |
| *Diomedea chrysostoma* | 3 | 1 | 6 | 3 | 5 | 8 | 66 | 12 | 17 | 3 | 3 | 3 | 130 |
| *D. cauta* .... .... | 7 | 57 | 8 | 8 | 10 | 6 | 11 | 6 | 2 | 2 | 4 | 1 | 122 |
| *Macronectes giganteus* | 7 | 1 | – | 3 | 3 | 8 | 20 | 17 | 10 | 5 | 2 | 2 | 78 |
| *Daption capensis* .... | 2 | 1 | – | – | 2 | 4 | 17 | 21 | 6 | 6 | 6 | 1 | 66 |
| *Halobaena caerulea* .... | – | – | – | – | 1 | 14 | 18 | 9 | 9 | 7 | – | – | 58 |
| *Pachyptila vittata* .... | 151 | 1 | 2 | 5 | 16 | 76 | 290 | 410 | 31 | 11 | 30 | 3 | 1026 |
| *P. salvini* .... .... | – | – | 1 | – | 22 | 358 | 1291 | 24 | 10 | – | 12 | 2 | 1720 |
| *P. belcheri* .... .... | – | – | 1 | – | 3 | 18 | 83 | 22 | 11 | 2 | 6 | – | 146 |
| *P. turtur* .... .... | 160 | 86 | 44 | 17 | 31 | 35 | 228 | 246 | 130 | 87 | 157 | 33 | 1254 |
| *Puffinus carneipes* .... | 17 | 11 | 10 | 6 | 7 | 2 | – | – | – | – | 1 | 6 | 60 |
| *P. bulleri* .... .... | 7 | 33 | 4 | 12 | 29 | 7 | 5 | – | – | 5 | 22 | 16 | 140 |
| *P. griseus* .... .... | 43 | 27 | 21 | 28 | 125 | 23 | 13 | 4 | 1 | 11 | 364 | 146 | 806 |
| *P. gavia* .... .... | 10 | 14 | 24 | 33 | 14 | 8 | 21 | 48 | 14 | 18 | 22 | 8 | 234 |
| *Pterodroma macroptera* | 6 | 11 | 3 | 1 | 8 | 6 | 2 | 2 | 3 | – | 4 | 6 | 52 |
| *P. lessoni* .... .... | 7 | 2 | 7 | 8 | 11 | 15 | 32 | 34 | 9 | 14 | 7 | 8 | 154 |
| *Pelecanoides urinatrix* | 35 | 5 | 4 | 6 | 5 | 2 | 14 | 38 | 11 | 7 | 21 | 43 | 191 |

For some species, such as *P. salvini,* the nearest known breeding places are on islands in the south Indian Ocean. In view of the many specimens washed up on New Zealand beaches, a banding programme on these and other subantarctic islands should provide some interesting recoveries from New Zealand. The species found in largest numbers on New Zealand beaches, and therefore most likely to yield recoveries, are indicated in Table 7.

## V DISCUSSION

The collection, preservation, analysis and publication of the data listed in Table 7 have cost many people a great deal of time and also a considerable amount of money. The main purpose of this compilation is to summarise what has been collected so far and thus provide a basis for considering any changes that may be required in the Scheme.

It is tempting to advocate measures that would ensure a better coverage of beaches in all parts of the country, but the consequent increases in clerical work would be more than the Society could hope to handle on the present voluntary basis. Before considering alternative methods of improving the Scheme it may be useful to summarise its main objectives. In the opinion of the compilers, these objectives are:

(1) To add to the list of species recorded from New Zealand waters and to ensure that specimens of particular scientific interest are sent to Museums.

(2) To collect information on the distribution and seasonal movements of birds living off the New Zealand coast.

(3) To record the extent and frequency of wrecks, and the conditions that accompany them, so as to provide a better understanding of their cause.

(4) To increase the chances of recovery of banded birds which would give unequivocal information as to the places of origin of New Zealand off-shore birds.

(5) To provide data which will allow the linking of sea bird distribution with the results of current studies on the distribution of plankton, the surface-living animals on which the birds feed.

It can be argued, and with justification, that the number of dead birds on the beach at a given time is not a valid indication of the abundance of birds offshore. If the records cover a long enough period, however, it may be possible to detect certain well marked trends that can be interpreted in terms of distribution and movements. For instance if a species such as *P. macroptera* is found regularly in the northern part of the country, but rarely if at all in the south, it seems reasonable to conclude that the normal range of this species is in the more northern waters. With the Cape Pigeon, records from the more northerly part of the country mostly occur in winter, and this can be interpreted as indicating a northerly extension of the range in winter provided records from further south show that mortality does in fact occur during summer. Again, if *P. turtur* is recorded throughout the year, but *P. salvini* only in winter, it seems safe to conclude that the latter species is absent from New Zealand waters during the summer.

In years of heavy *P. griseus* mortality, records of the distribution of dead birds, together with a record of weather conditions, provide some indication of routes followed by the birds while migrating along the coast. In all these instances, however, reliable conclusions can be drawn only if the same pattern emerges year after year. The value of the records is thus proportional to the length of the period they cover and to their continuity throughout this period.

In view of the above and the limits inherent in any purely voluntary scheme, it is considered that the objectives of the Beach Patrol Scheme can best be attained by giving first priority to the maintenance of regular patrols on the Auckland and Wellington West Coast beaches. Birds are washed up in large numbers on these beaches, the existing records already cover a period of 20 years, the beaches are close to large cities where there are a number of observers who can co-operate to ensure continuity of patrols, and finally the results to date are sufficiently similar in the two areas to justify the use of data from one area to cover a temporary break in the continuity of records from the other. In due course it may be possible to link the records from these areas with observations made from ships passing along the coast, and thus obtain a further check on the limitations of the beach patrol data.

The collection of records on distribution in New Zealand as a whole could be achieved by having emergency observers in as many districts as possible. These observers would agree to inspect their local beaches when advised that heavy mortality was occurring in the study areas, or when local weather conditions indicated the likelihood of seabird mortality. Species new to the New Zealand list, and specimens of rare species, can occur anywhere in New Zealand, but are to be expected particularly in the far north and in the far south, and it is important to find observers to cover these areas. The above suggestions for the more efficient use of available resources are in no way intended to discourage those who prefer to do casual patrols outside the Scheme's main programme; the results of such patrols will always be welcome.

In conclusion, it must be emphasised that the success of the whole scheme depends on the correct identification of the birds found. People taking part should remember that, until detected, a single faulty identification may obscure the significance of several accurate records made by other people. It should also be stressed that negative records (no birds found) are valuable and that all cards should include information concerning the number of miles patrolled, the freshness of all specimens found and weather conditions that may have contributed to the presence or absence of dead birds.

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★

# SHORT NOTES

## SOUTH ISLAND ROBIN EATING VENISON

The tameness of the Robins *(P. australis)* in the Eglinton Valley is proverbial, but I have never found them so tame as in May 1961. All eleven birds which I contacted at various parts of the valley (five of them in an area of about ten acres) readily accepted small pieces of bread and though they did not actually feed from my hand, most of them would quite happily take bread fragments dropped on the ground just by my foot. They were not at all interested in bits of biscuit. The pieces of bread were usually carried in the bill to a perch on branch or stump, and most birds returned for more — one bird had twelve pieces. Two birds on the roadside were particularly tame; both were I think cocks, one rather aggressive and the other rather cowed. The aggressive bird took its food to a perch, but the other preferred to hop under the car and eat its portions. After feeding these birds for a little time I left them and went into the bush for about half an hour; when I returned they were still there, the first bird on a perch, the second bird on the ground by the front wheel of the car, body held semi-erect but slightly crouched, wings slightly drooped and tail spread, with the tips of the feathers touching the ground; its whole attitude was expressive of supplication and expectancy.

Robins were watched taking insects and worms from the forest floor, and one bird was seen "marking time" and later collecting an insect from the moss where it had been treading. A deer had recently been killed, skinned and some of the flesh removed. In the process of cutting the meat some small fragments of flesh had been scattered on the ground around the dead beast. As I first came upon the dead deer I saw a Robin take and eat one of the meat fragments, and on my return half an hour later I watched the bird again hop up to the carcase and take another piece. I do not know if this carnivorous behaviour has been previously recorded.

— A. T. EDGAR