January, but not noted in May. Silvereyes in small flocks; Pipits fairly numerous on dunes and sandflats, many of them noticeably dark-plumaged, compared with Bay of Plenty or Auckland birds.

Two additional species previously recorded are:—

AUSTRALIAN TREE MARTIN *(Hylochelidon nigricans)*
Two birds seen on 14/1/60 by A. Wright (*Notornis* VIII, 261).

WELCOME SWALLOW *(Hirundo neoxena)*
One bird seen by B. D. Heather on 25/11/55 (*Notornis* VI, 247).

## CONCLUSION

Farewell Spit Reserve is under the control of the Commissioner of Crown Lands, Nelson, to whom the Society is grateful for permission to carry out January and May surveys. A list of 79 species and sub-species from so small an area is in itself remarkable, and it is more than probable that considerable additions may be made to this list by future expeditions. The Spit, remote, undisturbed, and in a most auspicious geographical situation could prove to be not only a feeding ground for great congregations of waders but also a favourable landfall for stragglers and occasional visitors of many other species. The suggestion made in *Notornis* IX that the area of the lighthouse could be a very valuable site for a bird observatory is one which should be kept in mind.

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# TAXONOMIC STATUS OF THE NEW ZEALAND REDPOLL, CARDUELIS FLAMMEA: A REASSESSMENT

*By DAVID STENHOUSE*

*Zoology Department, University of Queensland, St. Lucia Brisbane, Australia*

## INTRODUCTION

Redpolls were first liberated in New Zealand in 1862, and after further introductions, became established in most parts of the country (Thomson, 1922). The species is now one of the more abundant components of the avifauna. The taxonomic status of the introduced populations was determined by Westerskov (1953), on the basis of 36 skins from the New Zealand region, at the sub-specific rank: *Carduelis flammea cabaret* P. L. S. Muller, the Lesser Redpoll. In the course of ecological work on this and other Fringillid spp. in Canterbury in 1958-9, evidence was obtained at variance with this conclusion; a preliminary report on this has already appeared (Stenhouse, 1960). A full investigation of individual variation in the N.Z. Redpoll populations had been initiated just prior to the author's departure from New Zealand. This would probably have led to a better understanding of the taxonomic problems; but it is felt that publication and discussion of results to date is desirable, if for no other reason than to focus attention on a most interesting situation.

## METHODS

Data were recorded from 234 birds trapped in the Lincoln area, Canterbury, and 34 taken at Alexandra, Otago. With a few exceptions,

these were all living at the time of examination. Wing-measurements of 12 skins taken in the Fiordland area were obtained from Mr. J. Kikkawa.

Data recorded included: sex; age class; wing length (chord of wing); length and depth of culmen; length of tarsus; weight; qualitative observations of plumage colour. Only the data on wing-length and on plumage colouration have been found significant to the question of sub-specific status: only these, therefore, will be dealt with here.

Measurements of wing-length were taken to the nearest millimetre, with the wing held in its natural curve against a finely-graduated ruler. Re-measurement on four repeat captures gave a 1 mm reduction in one case over an interval of two months. Since this was probably due to feather-wear, it is felt that "observer error" was negligible within the limits of accuracy employed. Re-measurement on 13 skins up to three years old showed no change in four specimens, an average decrease of 0.6 mm in the others. This appears to be due to shrinkage of tissues and/or loosening of the feather base. Measurements with the wing held flat against the ruler were found to be 1 mm greater than those taken with the wing in its natural curve (14 cases).

Observations on plumage colour were made in daylight, usually within 30 minutes (though in some cases up to 15 hours) of capture; And with the aid, for the latter two-thirds of the sample, of comparison with three captive birds representing a mean and the extremes of the *cabaret-flammea* range of colouration (see Table 1). The significance of deviations from the *cabaret*-type colouration was not initially realised, so no details of colouration were recorded for Redpolls Nos. 1-32.

TABLE I

Distinguishing Features of the sub-species *C. f. flammea* and *C. f. cabaret*.

(After Westerskov, 1953, following Salomonsen, 1928, and Witherby *et al.*, 1938)

| | Wing length (mm.) | | Bill length (mm.) | | General plumage colour | Wing-bar | Body-size |
|---|---|---|---|---|---|---|---|
| | M | F | M | F | | | |
| *flammea* | 71-79 | 69-76 | 8-10 | 7.7–9.1 | Paler | Conspicuous whitish | Slightly larger |
| *cabaret* | 67-73 | 63-69 | 8-10 | 8 – 9.5 | Darker | Inconspicuous buff | Slightly smaller |

Sexing was by presence or absence of pink on the breast, cheeks, and rump. Birds with no pink on the breast were classed as females, those with a small amount of pink as first year males. Juvenile birds were recognised by their distinctive plumage (Witherby *et al.*, p. 71-2), and were not sexed.

Sexing was checked by dissection in 13 cases, by behaviour (paired with birds of obvious sex) in two. Two birds classed on plumage as first year males were found by dissection to be females; in other cases sexing was confirmed.

*Individual Variation*

Considerable variation in distribution and shade of the red or pink plumage of both males and females was observed, and a start had been made, shortly before the termination of the study, to record details of this individual variation. Too little has been done to enable definite conclusions to be drawn, but it may be mentioned that the "red" colouration ranged from orange (with even a few definitely yellow feathers visible) through a fairly pure red to a blue-red which in a few cases was almost purple. The relative importance of genetic and of environmental factors in this variation is unknown: environmental effects may be considerable, since captive birds eventually lose all trace of red. This colour variation has apparently escaped mention in the European literature, so perhaps may not occur there, or may occur to a lesser extent. If so, the considerable N.Z. range of variation deserves careful study. It might be due to environmental factors novel to the species (new foods are certainly taken in N.Z., e.g. seeds of *Nothofagus* spp. (Riney *et al.*, 1959, p. 66) :or to the "secondary intergradation" between the subspp. (cf. Stenhouse, 1962). There may also be a tendency towards true geographical variation, since approximately half of the Canterbury sample showed the "yellowish" type of colouration, whereas all the Fiordland skins were "bluish" — but of course the Fiordland sample was extremely small.

A subjective impression is that the individual variation of several characteristics is at present discordant (Wilson and Brown, 1935). This is supported by the fact that a certain degree of discordance has been shown to exist between the variations in wing-length and those in plumage colour, e.g. *flammea*-type colour characteristics being found below the lower limit of wing-length for that subsp. Theoretically an eventual stabilisation of the ranges of variation within the N.Z. populations would be expected. Interesting possibilities become apparent. Has stability already been attained — after only 100 years? This seems unlikely. Is there a trend to concordance of the variation of separate characteristics, either in N.Z. as a whole or in the different regions; or will the situation finally settle to a stable discordant variation? There is obviously an opportunity here for N.Z. ornithology to make signficant contributions, over the ensuing years, to our knowledge of such phenomena.

## IMPLICATIONS OF SEXING AND MEASURING TECHNIQUES

Since *cabaret* is the subspecies of least wing-length, for present purposes it was felt that errors should tend if anything towards reduction in apparent wing-length, in the interests of conservatism. Sexing technique, accordingly, since female wing-length averages less than male, allowed some females to be classed as males (this is known to have occurred in two cases — see above), but no *vice versa*. It is likely then that the individuals below the lower limit of the male range were in fact females, and that there was some depression of the mean of the male wing-lengths. (This sexing technique gave a ratio of 128M/122F in the sample. If 18 of these "males" were in fact females, the resulting

TABLE II

*Carduelis flammea* males: frequency-distribution of wing lengths, with occurrence of *C. f. flammea* plumage characteristics.

| Wing length (mm.) | No. of individuals | No. with *C. f. flammea* plumage | | | |
|---|---|---|---|---|---|
| | | Pale upper plumage (a) | Whitish wing-bar (b) | Both (a) and (b) | |
| 65 | 1 | | | | |
| 66 | 7 | 1 | 1 | | |
| 67 | 14 | | 1 | | |
| 68 | 21 | | 3 | | |
| 69 | 35 | | 3 | | *C. f. cabaret* range |
| 70 | 31 | | 4 | | |
| 71 | 8 | | 1 | 1 | |
| 72 | 3 | | 1 | | |
| 73 | 6 | | 1 | 1 | *C. f. flammea* range |
| 74 | 1 | 1 | | | |
| 75 | 1 | 1 | | | |

TABLE III

*Carduelis flammea* females: frequency distribution of wing lengths, with occurrence of *C. f. flammea* plumage characteristics.

| Wing length (mm.) | No. of individuals | No. with *C. f. flammea* plumage | | | |
|---|---|---|---|---|---|
| | | Pale upper plumage (a) | Whitish wing-bar (b) | Both (a) and (b) | |
| 64 | 5 | | | | |
| 65 | 7 | | 1 | 1 | |
| 66 | 25 | 2 | 1 | | |
| 67 | 27 | 1 | 1 | | *C. f. cabaret* range |
| 68 | 20 | | 2 | | |
| 69 | 23 | | 1 | | |
| 70 | 11 | | | 1 | |
| 71 | 2 | | 1 | | *C. f. flammea* range |
| 72 | 1 | | | | |

sex-ratio, 110M/140F, still appears not unreasonable.) It seems likely that long-winged females might have more chance of being classed as males, since the long-winged subspecies *flammea* has a stronger tendency to red colouration; hence any resulting change in the frequency-distribution of female wing-lengths should tend to support the conclusions of the present study.

The "Handbook" wing-lengths (Witherby *et al., op. cit.:* xxxiv) are "flat" measurements, whereas those of the present study are "curved." As indicated above, it appears that c. 1mm should be added to "curved" measurements to make them comparable with "flat." The "Handbook" measurements, however, are assumed to be measurements of skins; and such measurements have been shown, above, to be on average 0.6 mm less than "live" measurements. It appears, therefore, that on average 0.4 mm should be added to the "live," "curved" wing-lengths of the present study to make them comparable with the "Handbook" measurements. This would tend to result in a further upward shift in the mean wing-lengths of the sample, and would further emphasise the disparity between the New Zealand and pure *cabaret* populations.

## POSSIBLE EXPLANATIONS OF THE OBSERVED DATA

1. Neither the "Handbook" nor Salomonsen (1928) gives the size of the samples from which the wing-length ranges of the various subspecies were determined. It is assumed that the samples were sufficiently large for the ranges to be authoritative. The possibility that the data of the present study merely extend the wing-length range of *cabaret* is therefore excluded (v. also below).

2. It is possible that, in c. 100 years isolation in a new environment, evolutionary changes might have been rapid, and that the wing-length range of a pure *cabaret* population might have increased. Against this, however, are:—

(a) In a period of rapid expansion of population, selection pressures should be low, hence both short-winged and long-winged individuals should occur. In fact, there has been a general *increase* in wing-length.

(b) While wing-length is the only characteristic used in this study which is both significant and quantified, conclusions based on this are supported by the data on plumage colouration (c.f. Mayr 1955). No known-pure specimens of *cabaret* or *flammea* were available for comparison, but the colour of upper parts varied from a warm almost chestnut brown to a pale and definitely greyish brown; and, more noticeably, the wing-bars in several specimens were an almost pure white. It appears implausible that two characteristics of another subspecies (longer wings and paler plumage, characteristic of *flammea*) should have evolved in a pure *cabaret* population in a relatively short time; especially since these characteristics are the opposite of those to be expected, if Bergmann's and Gloger's rules were applicable, in an environment generally warmer and probably little less humid than that of the parent populations.

3. The only other explanation is that the New Zealand populations contain a proportion of one of the subspp. longer-winged than *cabaret*. It seems that this is most likely to be *flammea*. Apparently against this conclusion is the fact that no individuals have been obtained from the

upper parts of the *flammea* wing-length ranges. It is suggested, however, that the two subspp. have been interbreeding and that the several wing-length ranges are coalescing about common means (male and female). This supposition would explain the absence of individuals of shortest wing-length from the *cabaret* female range; and is further supported by the presence of *flammea*-type plumage colour in individuals of *cabaret* wing-length range (v. Tables II and III).

## ORIGIN OF FLAMMEA COMPONENT

There are alternative explanations of the presence of *C. f. flammea* in the predominantly *cabaret* New Zealand populations:

Either (a) Some *flammea* individuals were included in the original shipments;

or (b) There have been subsequent importations of *flammea* by bird fanciers, and some of these individuals have escaped and mingled with the wild populations.

While the second possibility must remain open — evidence on private importations is obviously difficult to obtain — there is circumstantial evidence in favour of the first. The birds for the original importations were probably obtained from trappers in Britain (or other parts of Europe), who would work mainly on the winter flocks. Since the first liberation in New Zealand was made in 1862, the birds must have been caught in the European winter of 1861-2. Witherby *et al.* (1943: p. 67) record "great numbers" of *flammea* arriving in Britain in 1861. It seems likely that some of these were included in the shipments to New Zealand. The early incorporation of a *flammea* component in New Zealand populations may be supported by the degree of mixing of sub-specific characteristics which apparently has occurred. The possibility of other subspecies besides *cabaret* and *flammea* having been incorporated in the New Zealand populations cannot be ruled out. Redpoll No. 8 of the present study was recorded as a female with wing-length 78 mm. At the time 23/9/58 its possible significance was not realised, and it was released. If measurements and sexing were correct, and since there were apparently no obvious colour differences from *cabaret*, this might have been assignable to the subspecies *islandica* (Hantzsch) 1904 or *rostrata* (Coues) 1861 (Salomonsen, 1928; Witherby *et al.*, 1938). It is felt, however, that no significance should at present be attached to this single and rather doubtful record.

## RESULTS

Results are given in the form of frequency-distribution tables of wing-lengths, for males in Table II, females in Table III. The occurrence of pale plumage colouration and whitish wing-bars, at various wing-lengths, is also shown in these Tables.

As will be seen from comparison of Table II and Table III severally with Table I, the wing-lengths of the New Zealand specimens fall (with one exception — see below) within the ranges for the subspecies *C. f. flammea* and *C. f. cabaret*. Several points may be noted:—

(a) The occurrence of individuals of both sexes above the wing-length ranges for *C. f. cabaret*.

(b) A strong shift of the female mean above the theoretical mean for *cabaret*.

(c) The occurrence of individuals below the lower limit of the range for male birds.

## CONCLUSION

*Recommended Change in Nomenclature*

In view of the findings and conclusions outlined above, it is suggested that the use of the subspecific rank be dropped, at least until the situation has been further clarified. It may in the future be possible to define the limits of variability of the New Zealand populations and to distinguish these as a (or as several) new sub-species, on the definition of the subspecies proposed by Mayr *et al.* (1953). It is suggested, however, that for the present it would be preferable to follow the proposal of Wilson and Brown (1953) and avoid the use of the formal subspecific rank, using instead only the specific name with "the simple vernacular locality citation or a brief statement of the [geographical] range involved." The New Zealand Redpoll could then be referred to as: "*Carduelis flammea* L., New Zealand"; further specification of locality within New Zealand being added as warranted.

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# OBSERVATIONS ON A TATTLER AT WAIKANAE ESTUARY

*By IAN G. ANDREW*

The Grey-tailed Tattler or Grey-rumped Sandpiper, *Heteroscelus incanus brevipes* (Vieillot), breeds throughout northeast Siberia and winters in the west Pacific. Its winter range includes the Malay Archipelago, Celebes, New Guinea, Australia, Micronesia, Bismark Archipelago, and Solomon Islands (Bull 1948, Mayr 1945, Neufeldt et al. 1961, Stickney 1943). In Australia it winters around most of the