# Unbending moult data

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## Introduction

There is increasing evidence (e.g. Branson *et al.* 1979, Figure 3) that the rate of change of primary moult score in waders is not constant. There is a tendency for the rate to be fast at first but to slow down towards the end of the moult. This situation is due, in part at least, to the fact that we allot moult scores equal rating irrespective of feather length (Summers 1980). The amount of feather material involved between moult scores 48 and 49 is very much greater than between moult scores 2 and 3. This leads to the problem of trying to fit curves to scatter diagrams. It is perhaps easier to look at the problem from the other side – straighten the data so that straight lines can be fitted. This can be achieved to a certain extent by converting moult scores to feather mass. We use the Redshank *Tringa totanus* as our example.

## Methods

The state of moult was described in the usual fashion (Snow 1967), with old feathers given a value of 0, new 5, and growing feathers 1 to 4. Values for each feather were combined to give the moult score for the wing.

Six dead Redshanks, whose primaries were fresh, were found. The primaries were removed, dried in a convection oven at 60°C for two days, and mass recorded to the nearest $10^{-4}$ g. We were more interested in the relative rather than absolute mass of each primary, so the percentage mass that each primary contributed to the total mass of primaries was calculated. The percentage mass of each primary was then averaged for the six birds (Table 1).

Returning to the data on moult scores: the moult score for each primary was converted to percentage mass to determine the percentage mass for that wing.

For example, a wing whose moult score was 30 (5555541000) was:
$5.0 + 5.7 + 6.7 + 7.7 + 9.1 + 10.6 \times 0.2 = 45\%$ through its moult, in terms of mass.

**Table 1.** The mean percentage mass of primaries from six Redshanks.

| Primary number | Mean percentage mass | Standard deviation |
|---|---|---|
| 1 | 5.0 | 0.11 |
| 2 | 5.7 | 0.10 |
| 3 | 6.7 | 0.13 |
| 4 | 7.7 | 0.10 |
| 5 | 9.1 | 0.19 |
| 6 | 10.6 | 0.14 |
| 7 | 11.8 | 0.17 |
| 8 | 13.1 | 0.16 |
| 9 | 14.2 | 0.14 |
| 10 | 16.1 | 0.23 |
| | 100.0 | |

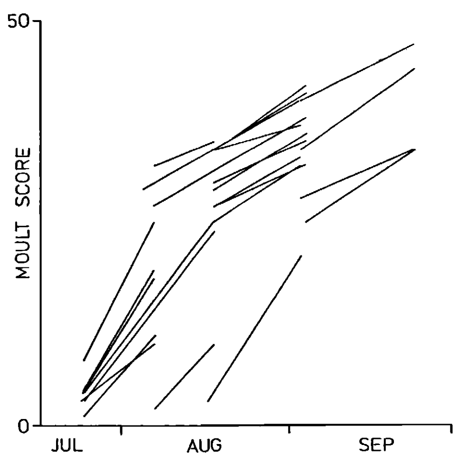


**Figure 1.** Lines joining moult scores of Redshanks ringed and retrapped within moult scores 1 to 25, and 25 to 49. Each bird is represented by a line.

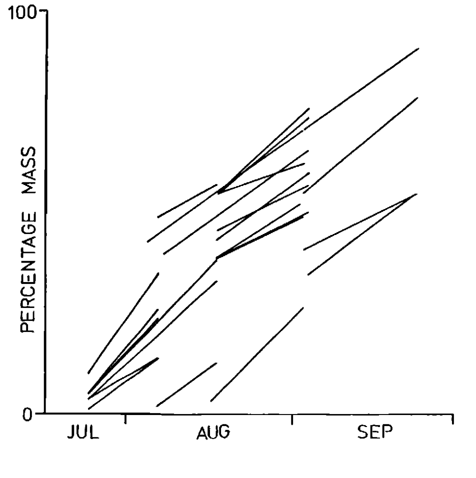


**Figure 2.** Lines joining the percentage mass of primary feathers grown by Redshanks ringed and retrapped within moult scores of 1 to 25 (lower group of lines), and 25 to 49 (upper group).

**Table 2.** Rates of change of moult score and percentage mass for Redshanks caught and retrapped whilst moulting within moult scores 1 to 25, and within 25 to 49.

| | Mean rate of change of moult score (units/day) | 95% C.L. |
|---|---|---|
| Caught and retrapped within scores 1 & 25 | 0.93 | 0.75 to 1.11 |
| Caught and retrapped within scores 25 & 49 | 0.36 | 0.32 to 0.40 |
| | **Mean rate of change of percentage mass (units/day)** | **95% C.L.** |
| Caught and retrapped within scores 1 & 25 | 1.30 | 1.05 to 1.55 |
| Caught and retrapped within scores 25 & 49 | 0.86 | 0.73 to 0.99 |

## Results and discussion

In 1978 the Highland Ringing Group made a series of Redshank catches and several retraps resulted. We selected those which were ringed and retrapped whilst moulting within moult scores 1 to 25, and those within 25 to 49 in order to look at the moult rates early and later in the moult. The changes in the moult scores of the retraps are shown in Figure 1. It is evident that the rate of change of moult scores is faster earlier in moult. The dog-legged appearance of the figure is due to the method of presentation and does not imply that the moult of an individual follows this pattern. The rate of change was calculated for each bird and averaged (Table 2). The two means differ by a factor of 2.6.

The moult scores of the birds were converted to percentage mass and the data presented in a similar way (Figure 2, Table 2). Clearly, Figure 2 does not have the dog-legged appearance of Figure 1, but the mean rate of change of percentage mass is still significantly greater early in moult ($t = 3.88$, $p < 0.001$). Also the 95% confidence limits of the difference (0.20 to 0.68) do not include negative values. However, the two means (Table 2) now differ by a factor of only 1.5 showing that we have straightened the data considerably, but not completely. Linear regression analysis is now less inappropriate.

The slowing in the rate of growth of the primaries in the latter half of their moult may be due to the influence of other feather tracts (e.g. secondaries) which are moulted after the start of the primary moult. The growth pattern of all feather tracts would be worth investigation.

## Acknowledgements

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## References

Branson, N.J.B.A., Ponting, E.D. & Minton, C.D.T. 1979. Turnstone populations on the Wash. *Bird Study* 26: 47–54.

Snow, D.W. 1967. *A guide to moult in British birds*. BTO Field Guide No. 11, Tring.

Summers, R.W. 1980. The rate of change of moult scores in waders. *Wader Study Group Bull.* 28: 24.

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# Estimates of the duration of the primary moult of the Redshank

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## Abstract of talk at WSG Meeting at Münster

Moult records collected from 1,647 Redshanks *Tringa totanus* caught in eastern Scotland were analysed by different methods to show the variations one can obtain for estimates of duration of primary moult. A line by eye through the mean moult scores for dates of capture, and linear regression analysis of moult scores against dates (moult score as the dependent variable) gave exaggerated values for moult duration (106 and 109 days respectively). The linear regression analysis gave earlier dates for the beginning and end of moult because the rate of change of moult score was less towards the end of moult. A line through the median moult scores for each date of capture gave a value of 90 days. This method relies on obtaining unbiased proportions of non-moulting and moulting birds. This is not always possible. Also the total moulting population must be present throughout the moulting season. This is unlikely since the moulting and migration seasons overlap. A line by eye through the mean dates for each moult score, and a linear regression analysis of dates against moult score (date as the dependent variable) gave values of 70 and 74 days respectively. An even amount of data is required throughout the moulting season in order to obtain an unbiased estimate. The data used in this study were not evenly distributed.