

# On the rate of change of moult scores in waders

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**Table 1.** The mass of individual primaries of a Turnstone *Arenaria interpres*.

Primary number	Dry mass (mg)
1	18
2	19
3	25
4	30
5	37
6	44
7	50
8	58
9	66
10	76

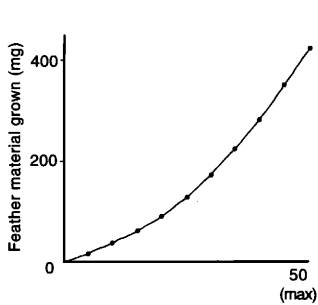
**Table 2.** Molt scores of primaries of Turnstones during moult.

Total moult score	Primary number									
	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0
5	2	2	1	0	0	0	0	0	0	0
10	5	4	1	0	0	0	0	0	0	0
15	5	5	4	1	0	0	0	0	0	0
20	5	5	5	4	1	0	0	0	0	0
25	5	5	5	5	3	2	0	0	0	0
30	5	5	5	5	5	4	1	0	0	0
35	5	5	5	5	5	5	3	2	0	0
40	5	5	5	5	5	5	5	4	1	0
45	5	5	5	5	5	5	5	5	4	1
50	5	5	5	5	5	5	5	5	5	5

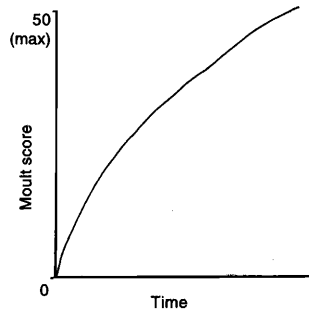
In most studies of the moult of birds the moult of the primary feathers is usually quantified by allotting a score of 0 to 5 to each feather; 0 for an old feather, 5 for a new feather, and 1 to 4 depending on the feather's stage of growth. The values for each feather are then added to give the moult score of the wing. Molt scores for samples of birds caught through the moult season are then plotted against date in the form of a scatter diagram. Then comes the major problem of drawing a line through the points to represent the moult for the "average" bird, and to establish its dates of commencement and completion, and consequently its duration. The following article describes what this line may look like assuming a constant rate of deposition of feather material into the growing primaries.

The primary feathers of a Turnstone *Arenaria interpres* were plucked from a wing, dried for 24 hours in an oven at 100°C and the mass of each feather recorded (Table 1). Known examples of Turnstone with moult scores ranging from 5 to 45, and at intervals of 5, were examined to determine the moult scores for individual feathers (Table 2). From this table, and knowing the mass of complete feathers (Table 1), the mass of partially grown primaries could be estimated; for example, the total amount of feather grown by the bird with moult score 5 was estimated by adding  $0.4 \times 18$ ,  $0.4 \times 19$  and  $0.2 \times 25$  mg. The mass of new feather material grown was plotted against the moult score (Figure 1). It is evident that the relationship is not a linear one. The data are also presented in the form of moult score against time to show the rate of change of moult score assuming that feather material is being grown at a constant rate (Figure 2). Initially the rate of change of moult score is large but it slows down as moult nears completion. This pattern would be similar for most waders and other birds whose outer primaries are much longer than the inner ones. The pattern would be further complicated if it were shown that the rate of deposition of feather material varied during the growth of individual feathers and/or during the overall progress of moult. However, should the rate of deposition become faster towards the end of moult, then the moult score might be close to linearly related to time. This seems unlikely. Such details on feather growth could best be studied with captive birds.

One of the implications of Figure 2 is that regression analysis on dates against moult scores (an analysis now in popular usage) will not fit the best line for the observed data. Our present system of recording moult in the form of an index may not be the best one, and perhaps a hard look should be taken at our present methods if we are to carry out detailed analyses of moult data in the future.



**Figure 1.** The relationship between moult score and amount of feather material grown for the Turnstone.



**Figure 2.** The relationship between moult score and time assuming a constant rate of deposition of feather material.

