

SHORT COMMUNICATIONS

ESTIMATION OF THE DURATION OF BIRD MOLT

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In estimating the duration of bird molt, it is common to sample the molting population at intervals and assign a score which represents the degree to which a bird has molted (Pimm, *Condor* 75:386-391, 1973). This process is one of a large set where some estimate of duration is of interest, and the problems described below may be general ones. The purpose of this paper is to draw attention to a potential pitfall in the estimation of the duration of molt from regression analyses using molt score data.

In regression analyses one seeks to predict one variable (the dependent variable, 'Y') from another variable (the independent variable, 'X') on which the first variable usually depends. Though it would seem that molt depends on date and not vice versa, one faces the paradox that treating time as the dependent variable and molt score as the independent variable is the more reasonable procedure. The reason is simple but does not appear to have been appreciated or explicitly stated in the literature. This interchange of variables can drastically alter the estimates of duration and the biological interpretation of one's results. If only one bird were followed through time, then regression using score as the dependent variable is appropriate. Usually a whole population is measured, with individuals starting and finishing molt at different times. The resultant scatter of points is usually shaped like a parallelogram (fig. 1). Regressions using *score* as the dependent variable produce lines from one corner of the scatter to the other; this does not indicate the molt duration of the individual bird, but rather some function of this and the time over which birds commence molt. If *time* is used as the dependent variable the regression line correctly estimates the duration of molt, and the variance about this line is a measure of the variability of starting (and finishing) dates.

As an example, I shall consider the recent paper by Green and Summers (*Bird Study* 22:9-17, 1975). Two populations were considered, the first from Scoresbyland, the second from work by Stresemann and Stresemann (*Beitrag zur Vogelkunde* 16:386-

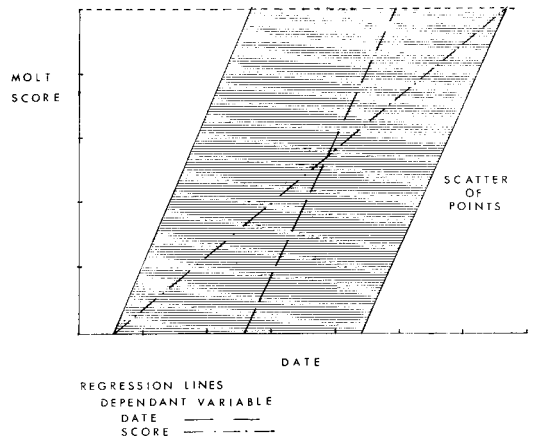


FIGURE 1. Estimation of duration of molt from molt score data; note that the axes should be reversed for a correct estimation of the duration of molt.

392, 1971). Using time as the dependent variable, one obtains estimates of 28 and 45 days respectively; using molt score as the dependent variable one obtains estimates of 38 and 67 days. The differences are obvious and marked. With score as the dependent variable one would expect longer "durations" of molt from more heterogeneous samples since these would be expected to be more variable in starting dates. Care should be taken in comparing rates of molt since most authors are not specific about how they obtained these estimates.

The rate of molt may not be linear. Fitting curvilinear models with time as the dependent variable is easy; a serious problem even with linear models is that the scatter may not be parallelogram-shaped because of late starting birds molting faster, or because birds might leave the population with incomplete molt (Pimm 1973). In these circumstances regression techniques are inapplicable though duration of molt of those birds which remain in the population might be obtained from retrap data. *Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409.* Accepted for publication 16 July 1976.

MORE ON CHICKEN-TURKEY-PHEASANT RESEMBLANCES

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In a recent paper, Nolan et al. (1975) discussed a supposed contrast between results of studies at the protein level and evidence at the organismal level regarding the degree of resemblance among three

species—the Domestic Chicken (*Gallus gallus*), the Domestic Turkey (*Meleagris gallopavo*), and the Ring-necked Pheasant (*Phasianus colchicus*). While the authors indicated that studies in the last 20 years make it less certain that the turkey is as distant from the chicken as once thought, they stated that "There seems to be unanimous agreement among ornithologists that the turkey shows less overall resemblance (at the supramolecular or organismal level) to the chicken than the pheasant does." While a number of classifications maintain the turkey in the family Meleagrididae or the subfamily Meleagridinae (of