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Estimating age of Ural Owl nestlings from body part measurements

Dag Eriksson, Arne Lundberg & Björn Westman

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We present data on measurements of Ural Owl nestlings which can be used to estimate their age from one nest visit. This is useful for sparsely distributed species when one wants to minimize the number of nest visits. We found wing length and sheath length to be the best predictors of age (the mean age estimate error was one day). They seem to increase in a way mainly determined by age and less by hatching order or nutrition. Tarsus length and weight were less useful for assessing age.

Dag Eriksson, Arne Lundberg & Björn Westman, Department of Zoology, Uppsala University, Box 561, S-751 22 Uppsala, Sweden.

1. Introduction

In studies on bird breeding biology it is important to know basic parameters such as clutch size and reproductive success; however these variables are often dependent on the date of egg-laying. In sparsely distributed species, such as the Ural Owl *Strix uralensis*, finding nests is often both difficult and laborious. Some nests may be found during incubation but most can be found after hatching when prey delivery to nestlings and adult vocal communication is at its peak (see Lundberg 1980).

Incubating Ural Owl females sit tightly on the eggs and nestlings are brooded up to the age of two weeks. During this period it is almost impossible to inspect the nest without lifting the female out of the nest. This may cause disturbance or broken eggs and is also not without risk of injury to the investigator. Therefore it would be useful to minimize the number of nest visits and from one nest visit be able to estimate accurately laying and hatching date from measurements of the young. In this paper we present data on measurements of Ural Owl nestlings which can be used to estimate their age.

2. Methods

The study was carried out in the province of Uppland, central Sweden. Details of the study area and the distribution of the species are given by Lundberg (1976). The breeding population is well known (e.g. Lundberg 1981) and many pairs breed in nest boxes. In 1980, 1981 and 1983 we carefully checked breeding pairs, 5, 9 and 4, respectively, in order to establish the day of hatching. Nestlings from the two first years were used for calculations of growth rates and nestlings from the last year to double-check the accuracy of our regression lines. The eyes begin to open on day three and feathers emerge on the fifth day (Scherzinger 1974, 1980, 1981). Thus, in cases when we missed the actual hatching by a few days, we could estimate time of hatching, probably to an accuracy of less than one day. Some time later the nest was revisited and we measured the sheath length of the fourth primary feather (i.e. the distance from the skin to the vane; in 1980 and 1981), wing length (maximum method) from carpal joint (bend of the wing) to the tip of the longest primary feather (1981 and 1983), tarsus length from between toe 3 and 4 to the bending point of the intertarsal joint (1981 and 1983) and nestling weight (all years). Wing length was measured to the nearest mm and sheath and tarsus length to the nearest 0.1 mm (with a dial caliper). Weights were recorded with a spring balance to the nearest g for nestlings under 300 g and to the nearest 5 g for nestlings heavier than 300 g. For the three body part measurements we calculated the linear regression line for each measurement versus age.

3. Results

Weight increase in Ural Owl nestlings is highly variable, especially after 10-14 days of age and weight is not an accurate predictor of age (Fig. 1). Curves of tarsal growth, wing growth and sheath growth are all very close to linear (Figs. 2, 3 and 4, respectively). However, for wing and sheath length the linear growth does not start until after the fifth day when the

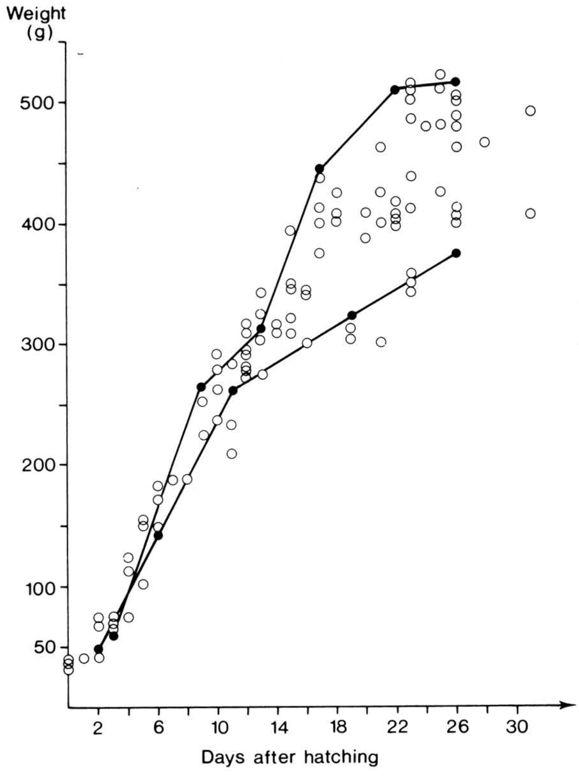

Fig. 1. Weights of 26 Ural owl nestlings in 1980, 1981, and 1983 in relation to age. Solid lines show measurements of the nestling with the fastest and slowest weight increase.

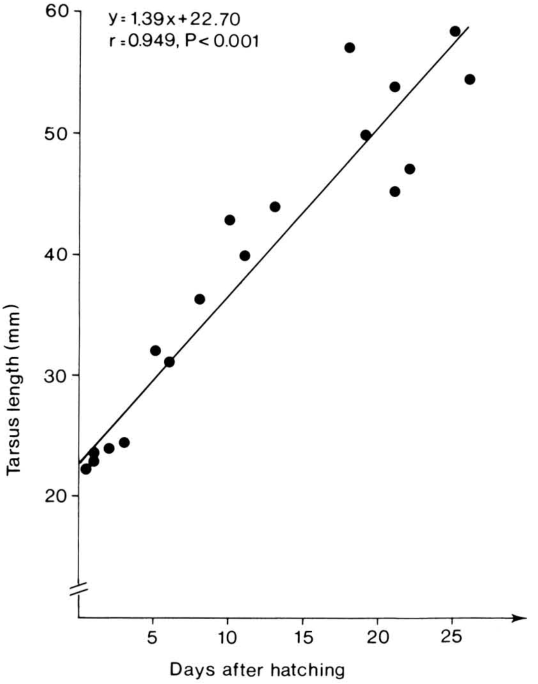

Fig. 2. Relationship between tarsus length and nestling age. Data from 1981 only.

feathers emerge.

Similarly to body weight tarsus length becomes more variable with nestling age (Fig. 2). The mean age error of our tarsus measurements (mean deviation from the regression line when the measurement is the independent variable) is 2.1 days ($SE = 0.45$). The mean age error for the nine control nestlings in 1983 was 3.7 days ($SE = 0.47$). Wing length and sheath length growth was found to be less variable than tarsus growth and can be quite accurately used to assign the age of nestlings (Figs. 3 and 4). The age estimate error was, on average, one day for both characters (sheath length (when independent variable) $\bar{x} = 0.9$, $SE = 0.18$; wing length (when independent variable) $\bar{x} = 1.2$, $SE = 0.16$; wing length (nestlings from 1983) $\bar{x} = 1.1$, $SE = 0.35$) with a maximum deviation of three days.

The range of brood sizes in our sample is 1-4 young, that is the range within which 95 % of all clutches fall (Lundberg 1981). We have not separated the growth curves for different brood sizes, partly because the sample sizes were too small and partly because we looked for an easy ageing method applicable to all brood sizes.

4. Discussion

Ural Owl nestling weight was a poor predictor of age although they increased in weight quickly and regularly until about two weeks of age, after which weight increase started to level off (Fig. 1). This is the same pattern of weight increase as is shown for Tawny Owls *S. aluco* (Southern 1970). In this latter species first and second chicks, in broods of more than two, fluctuated far less in weight than the third and fourth chick. This may also be the case in the Ural Owls, although, in our smaller sample, the lightest young was the first hatched in a brood of two (the heaviest was a single chick) and in one brood of four all weighed over 400 g at 26 days of age (see Fig. 1). Also, countrary to Tawny Owls, Ural Owl nestlings seldom die from starvation in the nest (Southern 1970, Lundberg 1981).

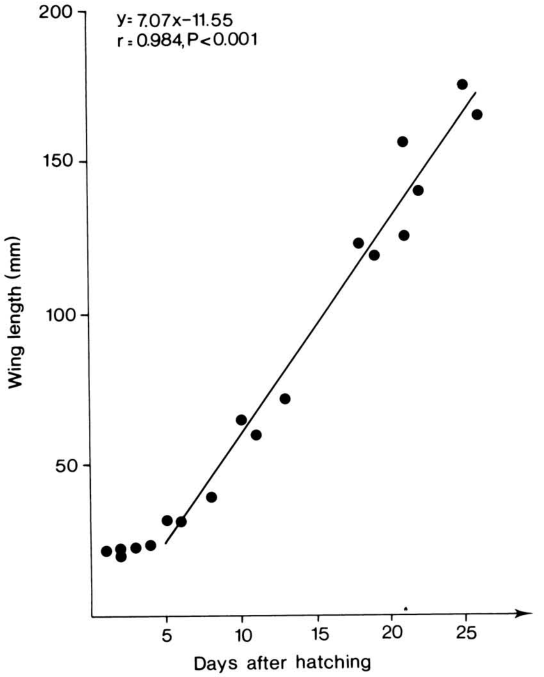

Fig. 3. Relationship between wing length and nestling age. Feathers emerge on day five and measurements before that have not been included in the linear regression equation. Data from 1981 only.

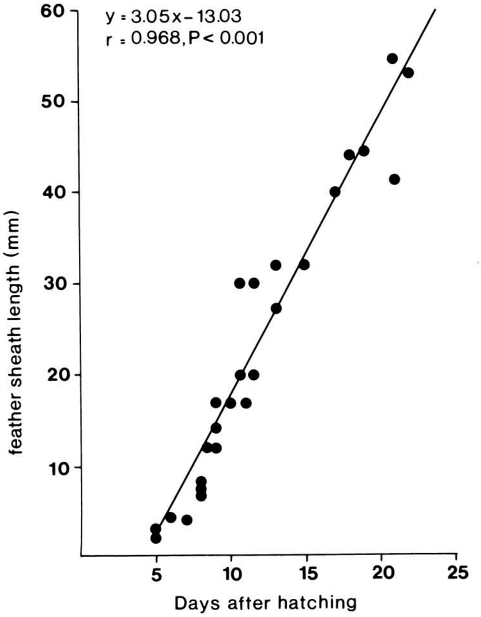

Fig. 4. Relationship between feather sheath length (from skin to the vane of the fourth primary) and nestling age. Data from 1980 and 1981.

Tarsus length growth (Fig. 2) was much more linear than weight increase, but was not particularly useful when used to assess age, especially after the age of two weeks. The relatively large age error when using tarsus length is probably caused by varying individual growth rates which, in turn, may be influenced by factors such as sex, hatching order and nutritional status. Nestling tarsus length may be retarded depending on the nutritional status of the chick. For example, in the Pied Flycatcher *Ficedula hypoleuca*, offspring from unaided females (secondary females of polygynous males) have significantly shorter tarsi than offspring of monogamous pairs where both parents feed the chicks (Alatalo & Lundberg unpubl.). However, in the Herring Gull *Larus argentatus* tarsus length was the single best predictor of chick age (Elowe & Payne 1979).

We found wing length and sheath length to increase in a way which seems to be mainly determined by age and less by hatching order or nutrition. One confounding variable which we could not control for was sex; females are clearly larger than males, but according to Scherzinger (1980) this size dimorphism is not visible until the end of the nestling phase. In general, feather growth seems to be almost unaffected by the nutritional status of the bird. For example, Blackcap *Sylvia atricapilla* and Blackbird *Turdus merula* nestlings raised on nutrient-poor berries or on a nutritious animal diet did not differ in wing length growth (Berthold 1976, 1977). Thus, feather growth seems to be the most reliable character for assigning age and, in this case, the average error using wing or sheath length was one day. Scherzinger (1980) has given a good description of the plumage of Ural Owl nestlings of different ages which may also be useful for assessing age. We think our method is sufficiently accurate for the estimation of age of Ural Owl nestlings.

Females start incubating on the first or second egg and the average incubation length is 35 days (see Scherzinger 1980). Thus, by adding 35 days to the assigned age of the nestlings we can estimate laying dates of the eggs. In the Ural Owl the onset of breeding can range over two months and an average error of a few days would not distort any comparisions.

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