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SHORT NOTE

Age-dependent changes in the shape of the secondary remiges of individual adult Corncrakes *Crex crex*

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A comparison of Corncrakes *Crex crex* of known age showed that the tips of the secondary remiges were, on average, more pointed for birds with remiges grown in the hatching year (HY) than for older adults with remiges grown after the hatching year (AHY; Green *et al* 2001). It might be that this difference is due to an age-related change in the shape of secondaries grown by the same bird. The magnitude of the change would suggest that an alternative explanation of the age difference, that juveniles with less pointed secondaries are more likely to survive to become adults, seems less plausible. However, because few Corncrakes are recaptured in years after ringing (Green 2004), there were too few repeated measurements of the shape of secondary tips of the same bird in successive years to exclude this possibility. In this note, I report changes in the shape of the secondaries of wild adult Corncrakes over periods within which I knew or inferred that a full remex moult had occurred.

Adult Corncrakes were caught and ringed on the Isle of Coll, Argyll (56°40' N 6°35'W) during 1999-2003, and the shape of the tips of secondary remiges 3, 4, 5 and 6 (numbering ascendantly) was measured as described previously (Green *et al* 2001; Green 2004). The angles at the tips of these four feathers were summed to provide a measure of the shape of the secondaries. Repeat measurements were made on five individuals before and after an intervening full remex moult. Three of these birds were captured and recaptured as adults in two successive springs (May) and another was captured in August with old remiges, not yet having begun to moult, and was recovered freshly dead in June of the following year. Adult Corncrakes undergo a full annual moult in which all remiges are shed simultaneously in August-September, so I assume that these birds had renewed their secondaries between measurements. A further adult was first caught in May and recaptured in moult in August of the same year with half-grown new feathers.

None of the five birds had been ringed as a chick or juvenile, so their ages at first capture were not known. However, four birds had secondary angle sums within the previously established 95% range for one year old adults with HY secondaries and outside the 95% range for older adults with AHY secondaries (Figure 1). The remaining bird had a secondary angle sum within the 95% range for AHY secondaries and outside the 95% range for HY secondaries. The secondaries of all of the first four adults, which are likely to have been one year old at first capture, became significantly less pointed after their next remex moult (mean increase in secondary angle sum = 39°, standard error = 10°; range 13° to 59°; matched pairs *t* test, $t_3 = 3.77$, $P = 0.03$). This average change is similar to the 49° difference between the mean secondary angle sums for HY and AHY secondaries (Fig 1, Green 2004). The secondary angle sums after the

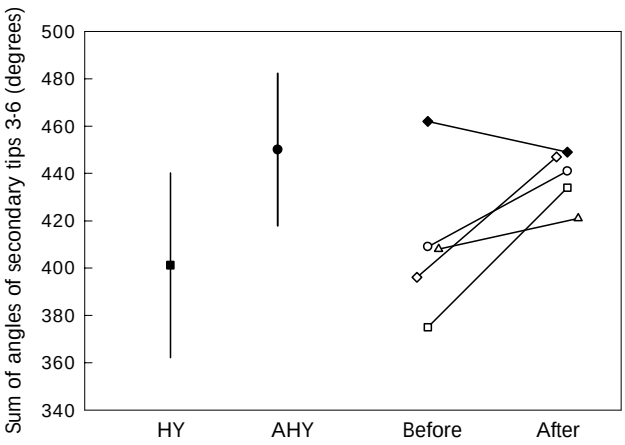

Figure 1. Sums of angles (degrees) at the tips of secondaries 3-6 of Corncrakes in relation to age. The left hand part of the diagram shows the mean (symbols) and 95% range (± 1.96 times the standard deviation) of secondary angle sums for feathers known to be grown in the year of hatching (HY) and after the year of hatching (AHY). Estimates are from Green (2004). The right hand part of the diagram shows changes in secondary angle sum for five individual adult Corncrakes (symbols joined by lines) measured before and after an intervening full remex moult. Open symbols denote four probable one year old birds with secondary angle sums at first capture within the 95% range for HY feathers. Filled symbols denote a bird that was likely to be two years old or more at first capture.

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intervening moult were within the 95% range for AHY secondaries for all four birds. The other adult that was likely to have been more than one year old at first capture showed a decline in secondary angle sum of 13° between successive measurements, with both lying within the 95% range for AHY secondaries.

These observations indicate that the difference in the average shape of HY and AHY secondaries is due to individual birds growing markedly less pointed feathers as adults than they did as chicks. A small decline in secondary angle sum after a subsequent moult occurred for the one adult believed to be two years old or more at first capture. This change is consistent with measurements of secondaries grown one to five years after hatching by captive Corncrakes of known age (Green *et al* 2001) which showed no consistent tendency for the shape of secondaries to increase or decrease with age, after the first post-juvenile remex moult. The change was not due to the second measurement being of an older feather which had become more pointed because of abrasion.. The first measurement was in May, when the remiges were about nine months old, whereas the second measurement was of freshly grown feathers in August. In any case, abrasion of the secondary tips was minimal on all the birds examined and the mean angle sum of fresh HY secondaries measured on juveniles was previously found to be similar to that of 9-11 month old HY secondaries measured on one year old adults (Green *et al* 2001). The application of this ageing method to the estimation of adult survival (Green 2004) is likely to be more reliable if individual birds grow secondaries of different shape as adults and chicks, as these results indicate. If the age difference was instead caused by differential mortality of juveniles with respect to feather shape, the survival estimates would be affected by the strength of this selection.

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