

Estimation of unmeasurable wing-lengths

HUMPHREY P. SITTERS

Limosa, Old Ebford Lane, Ebford, Exeter, EX3 0QR, UK, e-mail: hsitters@aol.com

Wing-length, from the carpal joint to the end of the longest primary, measured using the "maximum chord method" (Clark & Redfern 2001), is often used by wader researchers in controlling for structural body size in studies of mass variation (Piersma & Davidson 1991). It may also be a valuable parameter in determination of race or sex. However, the accuracy of this measurement is greatly reduced if the longest primary is badly abraded. Moreover, it is of no value at all if that primary is in the process of being moulted.

As a lack of wing-length data, especially in the season when many birds are moulting their outer primaries, can be a major hindrance in studies of mass variation, I have investigated whether wing-length can be adequately estimated by measuring the length of a shorter primary (from the carpal joint) and calibrating the difference by a regression equation relating actual wing length to the length of the shorter primary.

This study was carried out on samples of 74 Red Knots *Calidris canutus rufa* and 101 Ruddy Turnstones *Arenaria interpres* caught by cannon net during May 2002 in Delaware Bay, New Jersey, USA. These birds would have moulted their outer primaries about four months earlier, so they were in fresh condition, without significant abrasion. For each bird, I measured wing-length using the maximum chord method and also the length of the 8th primary (numbered from the inside) in the same way (both to the nearest whole millimetre). The 8th primary was chosen because it is a long primary that does not usually suffer so much abrasion as the 9th and 10th, but there appears to be no reason in principle why the 6th or 7th should not be used. For both species, the length of the 8th primary is a highly significant linear predictor of wing-length (Fig. 1).

In order to evaluate the power of the method to predict wing-length, for each bird, wing-length was estimated using the measured length of its 8th primary in the regression equation

of wing-length against 8th primary length for all the other birds in the sample. This shows, for both species, a highly significant correlation between measured wing-length and the values so estimated, with slopes not significantly different from 1 (for Red Knot, $t = 1.59$, d.f. = 73; for Ruddy Turnstone, $t = 0.5$, d.f. = 100) and intercepts not significantly different from 0 (for Red Knot, $p = 0.95$; for Ruddy Turnstone, $p = 0.89$) (Fig. 2).

An alternative means of assessing the accuracy of the method is to look at the difference between measured and estimated wing-lengths. This shows, co-incidentally, that for both species 87% of estimated wing-lengths are within ± 2 mm of measured wing-lengths (Fig. 3). In light of the fact that measurements were made only to the nearest whole millimetre and in light of the well-known difficulty of achieving consistency in measuring wing-lengths, it is considered that this result allows us to be confident that the method allows wing-lengths to be estimated with reasonable accuracy.

Finally, it is pertinent to consider how well estimated wing-length predicts mass compared with measured wing-length. Unfortunately this is not possible for the current Red Knot data because their weights varied so widely that even measured wing-length is not a significant predictor. No doubt the reason is that the birds were caught at a migration stop-over site, so their masses would depend more on how long they had been there than on size variation. For Ruddy Turnstone, however, both measured and estimated wing-length are significant predictors, though measured is a better predictor than estimated (Equations 1 & 2). Therefore it is probable that, although measurements will usually be the better predictor, estimates may be used where measurement is impossible. In most cases, this will be a better option than either omitting data for birds with unmeasurable wings or failing to control for structural size.

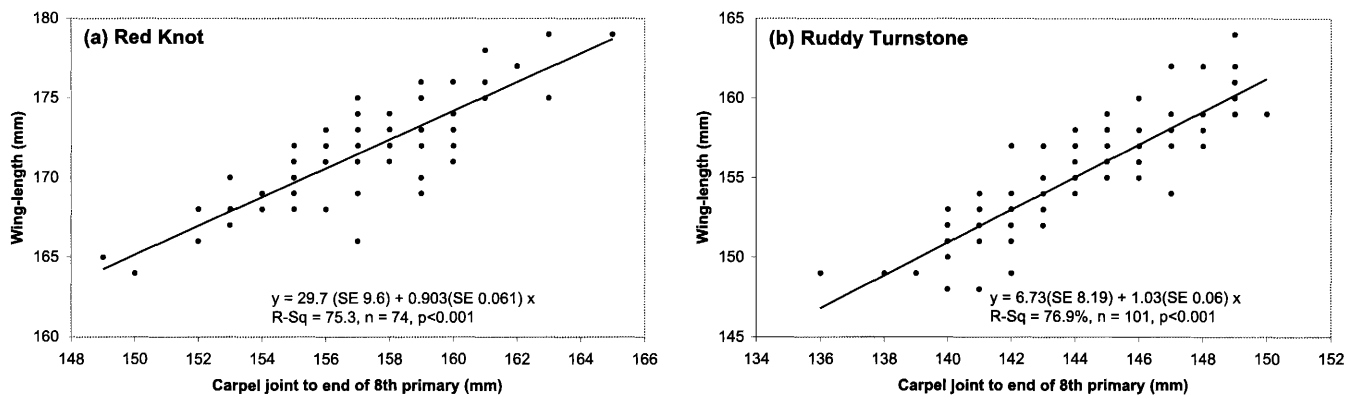


Fig. 1. Wing-length (measured from the carpal joint to the end of the longest primary using the "maximum chord" method) plotted against the length of the 8th primary (measured from the carpal joint in the same way) for samples of (a) Red Knots and (b) Ruddy Turnstones caught in May 2002 in New Jersey, USA.

