A simple "head and bill" ruler

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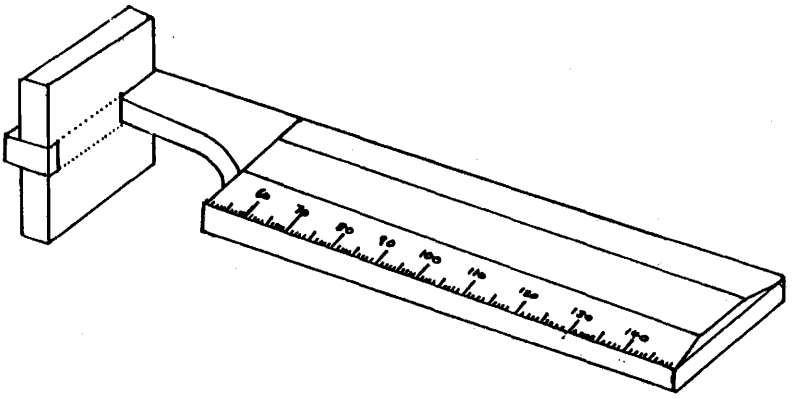
This is a stepped-ruler with a section cut away for the bird's head as shown in the diagram. The measurement is taken by resting the bill tip on the scale and this thus removes any risk of bending the bill. The original model was made from a length of scrap perspex of cross-section 4.5 × 0.5 cm. The cutaway was removed and a piece of plastic fitted in to form the stop. Then a white plastic ruler was glued into position, having carefully zeroed it. It was originally designed with a gap of 48 mm for use on Dunlin *Calidris alpina*, but during two years use it has also proved to be suitable for other species up to the size of Bar-tailed Godwit *Limosa lapponica*.



Correct measurement of the wing-length of waders

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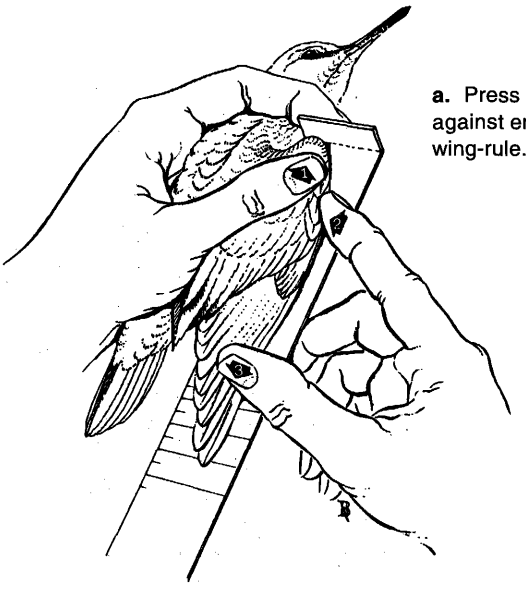
It has been drawn to my attention that there is some confusion as to the most reliable method of measuring the wing-length of waders, i.e. the method that minimizes differences in measurements obtained from the same bird by different workers on the same occasion, or by the same worker on different occasions (when the plumage of the bird is wetter or drier than usual; not, of course, when the wing is more or less abraded at the tip!) I considered various methods of measurement in a paper (Evans 1964) which may not be generally available to wader workers, and recommended the use of the flattened and straightened measure, in which both the camber along and across the wing *and* the natural curvature of the primaries are removed. This produces a maximum measurement and is the method recommended in the 3rd edition of the BTO *Ringer's Manual* (Spencer 1984), which may not be generally known to workers outside Britain. The description of the method in the *Manual* closely follows the text of my original description, and is as follows:

[The measurement is made] by sliding the wing forward along the rule until it meets the stop, straightening the bastard wing so that it falls into line (as far as possible) with the longest primary, and then straightening and extending the longest primary to its maximum length by stroking the thumb of the free hand along the shafts of the primaries, from the

Figure 1. The correct method of measuring wing-length in waders.



a. Press wing firmly against end-stop of wing-rule.

b. Straighten curve of wing.
c. Stroke along feathers to their end.

base to tip, pressing firmly against the rule all the while. It must be emphasised that no attempt must be made to pull the wing straight from the tip; a firm stroking action is required. Small differences in measurement may result from variation in the degree of straightness achieved, but the method reduces errors due to alteration of the lateral curvature during trapping and handling, or occasioned by dampness. It is, however, essential to keep the wing closed, and parallel to the long axis of the bird's body.

The measurement method is illustrated in Figure 1. In particular I would emphasize the need to keep the wing close against the body to minimize inter-observer differences in measurement of the same bird. Holding the wing away from the body, or partly opened, will greatly reduce the accuracy of the method.

References

Evans, P.R. 1964. Wader measurements and wader migration. *Bird Study* 11: 23–38.

Spencer, R. 1984. *The ringer's manual.* BTO, Tring.

Biometrics in waders

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In most ringing programmes it is now standard to measure waders that are trapped for ringing. This paper summarises an evaluation of which measurements are useful in distinguishing between different sexes and/or different population of a species. We conclude that as yet we are far from making precise statements for many species, and that the number and identity of the appropriate measures differ between species. For now we recommend measurements of at least bill-length and wing-length for all species, and where appropriate the extra measurements listed here for each species. A co-operative world-wide approach to the collation of measurement data collected from live breeding birds is proposed.

For many years wader measurements have been collected, to trace the breeding origins of birds and to differentiate between sexes. In most cases, maximum wing-length, bill-length and tarsus-length are measured, and much effort has been given to standardise measuring techniques (Evans 1964, 1986). When we started to analyse our results from large-scale trapping in the Dutch part of the Wadden Sea we faced the problem that it was not clear which populations and which groups could be distinguished from each other from external measurements.

In general, the problem was that although the measurements of two populations might be statistically discernible from each other, this does not mean that both populations can necessarily be identified outside their breeding areas. This is a particular difficulty when there may be more than just two populations or groups; and at times there could be up to ten more populations in the area. Unfortunately, along the East Atlantic flyway, and especially at a crossroads like the Wadden Sea, this is reality.

A second problem is that nearly all differences in measurements between populations or sexes (in dimorphic species, sexual and geographical differences can even out each other) are statistical differences, which can often involve a rather broad overlap. In such a case, many individual birds have a measurement which cannot help to distinguish its breeding origin. Therefore, if such overlap could be reduced by incorporating more measurements, we would then be able to collect more information from the same amount of data. So we looked for a multivariate approach, using wing-, culmen-, and tarsus-lengths, instead of a univariate approach (wing or culmen or tarsus). This approach would give us the tool we needed to predict the chance that an individual bird belongs to a certain group/population. This paper summarises our progress so far, and suggests some future directions.

We agreed rather quickly that a reference collection was required. As a bird present in the Wadden Sea could originate from a wide area from Arctic Canada in the west to Central Siberia in the east, measurements of many breeding populations need to be sampled. It was not possible to collect this information in the short term from live birds trapped on their nests, because few birds are trapped on the nests, and the data comes from scattered observations over enormous areas and collected by a few widely dispersed research-workers over a long time span. Therefore, there was no other choice than to use museum data of birds collected in several breeding areas. Many of these specimens were already measured by CSR, but this data file is still growing, thanks to the help of the Zoological Museums in Moscow, Tring, Bonn, Copenhagen, Leningrad, Reykjavik, Toronto, Leiden and Amsterdam.

The ideal situation is that we can distinguish all different populations and both sexes of a species with as little effort