

race, few, if any, Icelandic robusta being present. Three juvenile Redshanks ringed by the expedition have since been recovered fairly locally in January, February and March. This is of interest both in confirming that the birds stay to over-winter in this area of Morocco as well as being indicative of the intensity of hunting in the area. One of the aims of this year's UEA Expedition is to extend the work to the far south of Morocco to study the Knot and Sanderling which do not occur in reasonable numbers further north.

Although the counts, weight studies and race identification aspects form very obvious lines of enquiry, expeditions are frequently rewarded with some totally unexpected result. For us there were perhaps two of these, both arising from moult studies. The first was the preponderance of probably immature birds in some species already described. Although we expected to find a summering population, particularly of Knot, the early winter (and possibly even more complete) lack of adult birds was a considerable surprise. Secondly the moult of Ringed Plovers also caused considerable problems in analysis until it was realised that a very large proportion of the population had at some stage undergone suspended moult as well as those actually showing this when caught. Although suspended moult has commonly been recorded in Ringed Plover this has usually involved only a very small proportion of the population. The high frequency here raises questions as to the origin of the birds and whether they could be largely failed breeders or birds which started to moult while still raising young.

There is thus plenty of scope for further study in Morocco and elsewhere. Also our investment of ringed birds may hopefully soon be providing returns in more northern parts (including Britain). The two expeditions this year will be both continuing studies started in 1971 and extending the work further southward. Here there is particular cause for concern in that even since our visit, a causeway has been built across the Chebeika estuary (one of our main sites) apparently reducing tidal flow (J. Brock, pers. comm.). The same road is likely to make access to Puerto Consado for tourists and hunters considerably easier even if it does not have more direct effects. The UEA 1972 expedition aims to study this most important site for waders.

Biometric variations in the Curlew Sandpiper

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In many species of waders there is a difference in size between the sexes (the female usually being the larger) and between populations from different geographical areas. The Handbook (Witherby et al. 1940) gives similar size ranges for both male and female Curlew Sandpipers Calidris ferruginea and recognises no subspecies. Recently however Thomas and Dartnall (1970) showed a significant size difference between the sexes in 57 adult birds collected in Tasmania. Data on 344 juvenile and 26 adult Curlew Sandpipers caught for ringing in Britain and on 317 skins from the British Museum (Natural History) and the Norwich Castle Museum have therefore been examined for size differences associated with sex, age or geographical origin.

Bill length. The bill length of the juveniles caught in Britain - including 298 from the exceptional influx in autumn 1969 (Stanley and Minton, in press) - shows a bimodal distribution (Fig 1). The Percentage Cumulative Frequency (PCF) technique recommended by Griffiths (1968) gives means for the two components of the population, presumably males and females, of 36.8 and 40.2 mm with a standard error of $\pm .15$ mm for each. The 98% confidence limits (mean ± 2.3 x standard deviation) for the bill lengths of juveniles occurring in Britain are:

male	31.3 - 42.3mm
female	34.7 - 45.7mm

The sexual difference found by Thomas and Dartnall is therefore confirmed although it is rather smaller and the mean values are slightly higher in the British sample (Table 1). The difference is significant ($P < .002$) for males but not for females.

The bill lengths of museum specimens, analysed in groups according to the areas in which they were collected, showed a rather smaller, though still significant, difference between the sexes. Mean bill lengths were generally shorter than on the live samples. It is not clear whether these differences are caused by shrinkage, by the heterogeneous age categories or by incorrect sexing of some of the specimens. There does not however appear to be any geographical variation, in accord with the relatively restricted breeding range. There were more males than females in each of the museum samples, but in the large sample of juveniles from the 1969 influx into Britain the sexes appeared to be present in similar numbers. The bill lengths of 26 adults - 19 caught during an unusually large influx into Britain in early August 1971 - averaged $37.7 \pm 0.5\text{mm}$, below but not significantly different ($P < 0.1$) from the mean of the juveniles ($38.5 \pm 0.14\text{mm}$).

Wing length. Wing length measurements are subject to operator bias, even between measurers nominally using the same technique. To eliminate this variable only the measurements made by one person have been used in the calculations - 117 juveniles caught on the Wash, Lincs, between 23rd and 30th August 1969. The 'maximum length' method was employed (Spencer 1965).

Using the PCF method the mean wing lengths of the two components of the population were 129.4 and 132.5mm. with a standard error of $\pm 0.2\text{mm}$ on each (Fig. 2). Smaller samples measured by other operators also exhibited a bimodal distribution with a similar difference between means, but with these offset by 1-2mm. The difference of 3.1mm is similar to that found between the sexes by Thomas and Dartnall in Tasmania (3.3mm) but the means of their wing lengths were $126.5 \pm 0.7\text{mm}$ for males and $129.8 \pm 0.8\text{mm}$ for females. The significant ($P < .001$) differences in mean values between Tasmania and Britain probably result mainly from the measuring techniques employed since there is a correlation between wing and bill length in both samples and there was little difference between the bill lengths. The 98% confidence limits for juvenile birds occurring in Britain are

♂ 125.7 - 133.1 mm
♀ 128.8 - 136.2 mm

The mean wing length of 19 adult Curlew Sandpipers caught on the Wash in early August 1971 was $131.5 \pm 0.7\text{mm}$. This is only 0.5mm longer than the mean juvenile wing length at the same time of year but if allowance is made for probable wing shortening of 0.3mm/month (Pienkowski and Minton, in press) the newly grown adult wing feathers in say January must be 2-3mm longer than those of a juvenile in August assuming an equal proportion of both sexes in the adult sample. Thus the Curlew Sandpiper appears to have a shorter wing length in its first year, as do most other species of wader.

Moult. Curlew Sandpipers normally undertake the annual moult of their flight feathers on their wintering grounds (Stresemann and Stresemann 1966). This is supported by all but one of the 26 adults handled in autumn on the Wash - including two as late as the first week in September - showing a large amount of summer plumage and still having a full complement of old primaries. The exception was a bird in winter plumage on 9th August 1971 with active wing moult (3 old primaries, moult score 29). Its weight was 54gm, relatively lean compared with the high weight migrants caught at the same time (Stanley & Minton, loc.cit.) and it may have summered on the Wash.

Conclusions. Although there is a considerable overlap in bill length and wing length between the sexes of the Curlew Sandpiper the difference between the means found by Thomas and Dartnall is confirmed and is sufficient to enable the sex composition of samples measured in the field to be determined. There appears to be little geographical variation. The wing length of a juvenile is about 2% shorter than that of a newly moulted adult. Autumn migrants pass through Britain before commencing their annual wing moult.

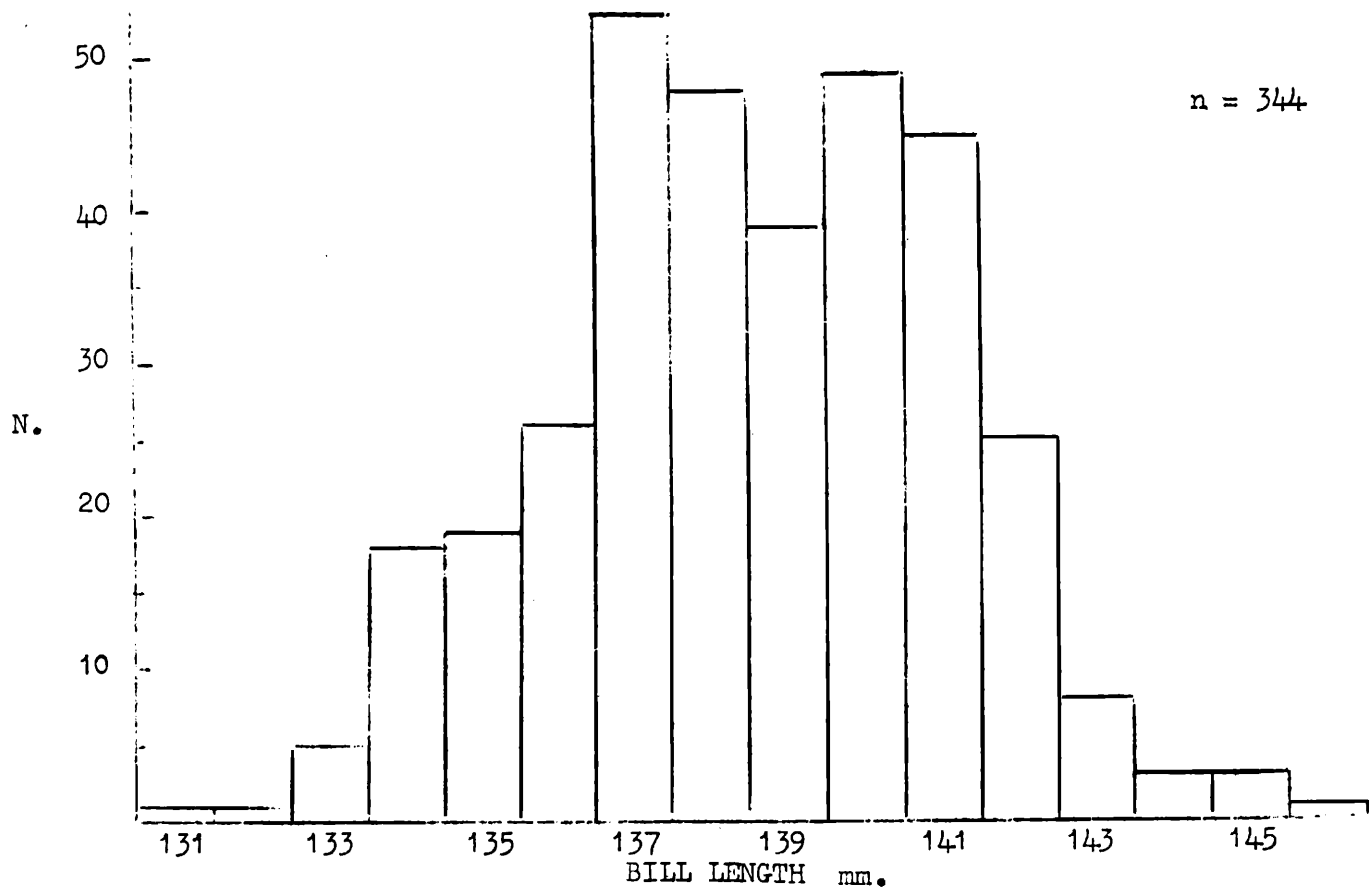


FIG 1. Bill length of juvenile Curlew Sandpipers caught in Britain

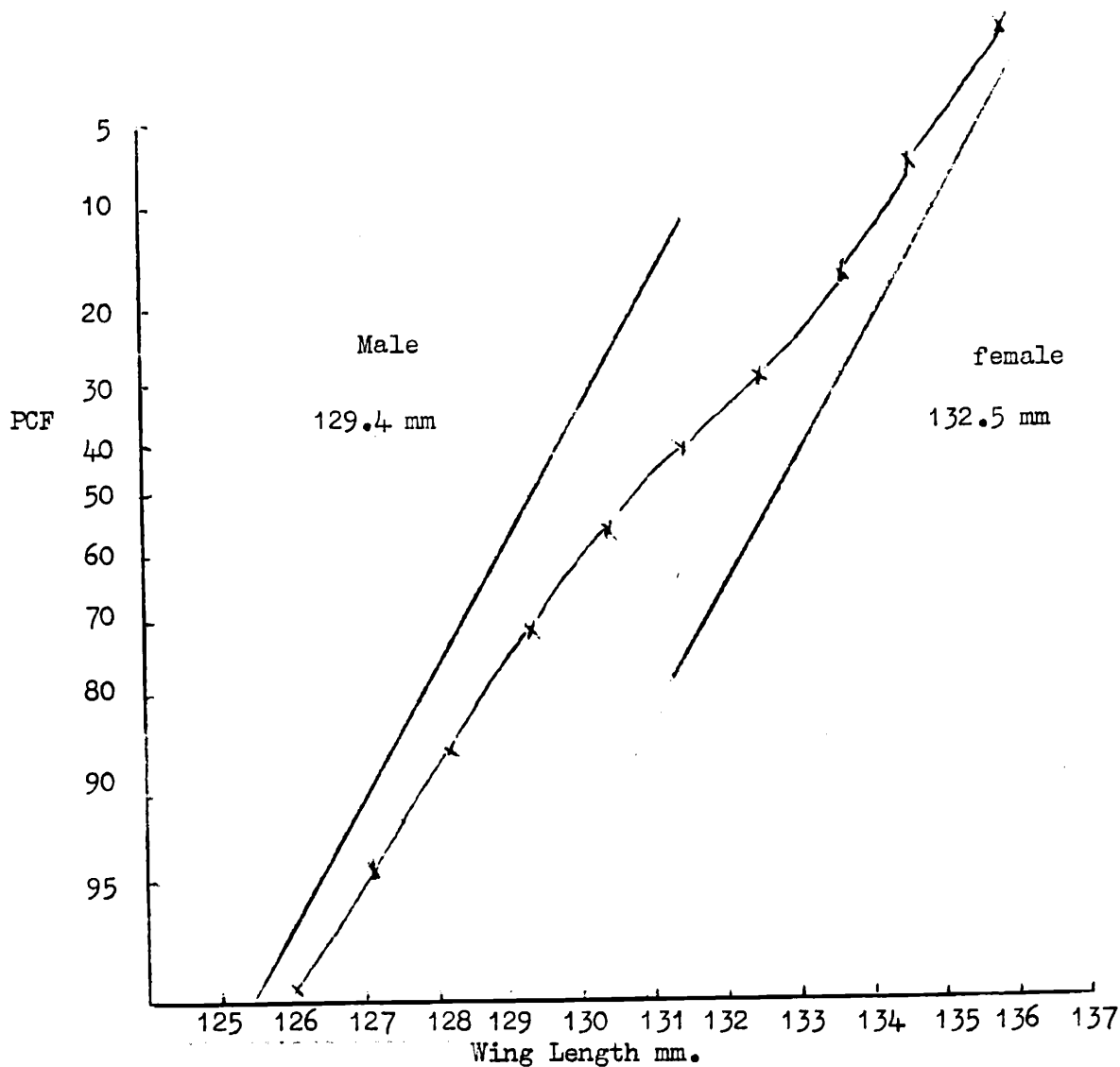


FIG 2. The PCF distribution of wing-lengths of juvenile Curlew Sandpipers Calidris ferruginea caught on the Wash 23-30 August 1969.

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Table I. The bill lengths of Curlew Sandpipers Calidris ferruginea in the British Museum (Natural History) and Norwich Castle Museum compared with a sample recently collected in Tasmania by Thomas and Dartnall (1970) and a large number of live juvenile birds measured in Britain.

Place	Age	Male			Female			Differences between means (♀-♂)mm
		Number	Mean mm	Range mm	Number	Mean mm	Range mm	
<u>Museum Specimens</u>								
British Isles	Adult	6	37.7	36-40	5	40.0	37-42	2.3
	Juv	26	35.4	32-41	25	38.1	34-44	2.7
Mediterranean		26	35.5	32-39	12	38.3	35-41	2.8
African and Middle East		55	36.0	31-40	25	38.8	34-43	2.8
Indian Ocean		62	36.4	33-42	49	38.8	34-44	2.4
Australasia and Far East		11	35.2	33-37	5	38.4	35-41	3.2
Siberia		6	36.0 ± 0.6	34-37	4	39.3 ± 1.3	36-42	3.2
<u>Recently collected</u>								
Tasmania		34	35.6 ± 0.7	31-40	23	39.5 ± 0.5	35-43	3.9
<u>Live Birds</u> * 98% confidence limits								
British Isles	Juv		36.8±0.15	31-42*		40.2±0.15	35-46*	3.4