

Selection for size in the Ringed Plover in relation to migration and climate

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Investigations carried out into selection for size in birds have tended to concentrate upon one or a few selective factors, and to have over-simplified the complex interrelationships between the birds, their environment and their inherited characteristics. In any migratory species there are three problems which need to be considered. Firstly, what is "size"; secondly, where do the different breeding populations winter; and thirdly, what group of potential selective factors are amenable to study? This paper discusses a method of analysis rather than specific results.

Wing-length and weight have traditionally been used as indicators of size in birds, but the temporal variation in these characters reduces their reliability. A multi-variate factor called the discriminant function is generated by simultaneously assessing variation in several characters. The first discriminant function in the Ringed Plover Charadrius hiaticula is probably a better indicator of overall "size" differences than any single character (Taylor 1978).

Ringed recoveries can be used to determine the winter quarters of several breeding populations. For those populations where no ringing recoveries exist but from which measurable specimens are available, the "allocation" sub-routine of the linear discriminant analysis has been used to generate hypothetical recoveries. A comparison of hypothetical with ringing recoveries indicates that this form of analysis is sufficiently accurate in its predictions to make it a worthwhile tool for use in regions where few ringing data are available (Taylor in press).

The selective significance of a series of climatic factors was investigated using multiple regression techniques. "Size" (the first discriminant score), bill length and tarsus length were separately compared with temperature and precipitation variables from the breeding and winter quarters. "Size" in both sexes shows a significant negative correlation with the winter mean precipitation. In the females there is a greater degree of correlation between "size" and the summer climatic variables than in the males. Bill length in both sexes is positively correlated with temperatures in the breeding season, and varies independently of body size. Tarsus length varies independently of body size and is very significantly correlated with mean precipitation. In both sexes, birds with long tarsi tend to breed in wet regions and winter in dry ones.

The conclusions to be drawn are that climatic factors in both winter and summer environments contribute towards selection for overall body size and bill and tarsus length in the Ringed Plover.

Taylor, R.C. 1978. Geographical variation in the Ringed Plover Charadrius hiaticula and related species. Liverpool Polytechnic, Ph.D. Thesis.

Taylor, R.C. In press. Migration of the Ringed Plover Charadrius hiaticula L. Ornis Scandinavica.

AN INLAND FLOCK OF CURLEWS *Numenius arquata* IN MID-CESHIRE, ENGLAND

by Dennis Elphick

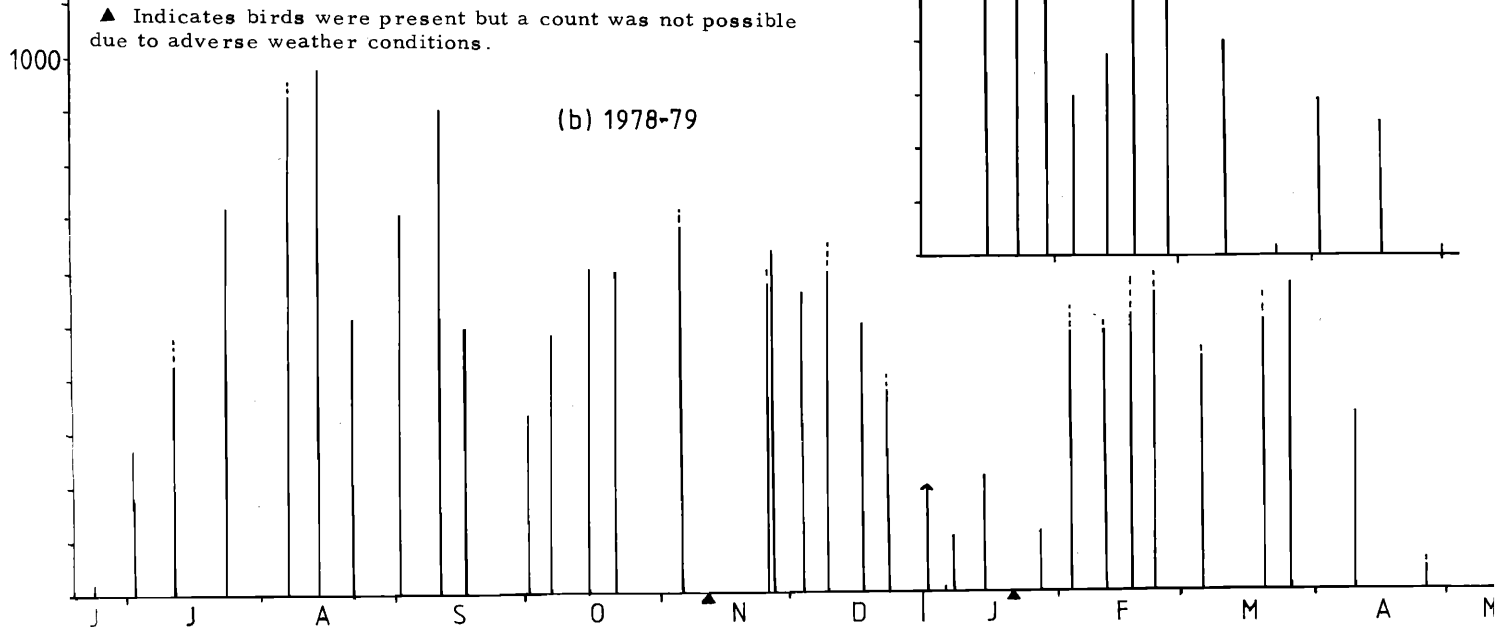
Introduction

When I moved to Cheshire in 1976, I was interested to find that during the winter up to 170 Curlew Numenius arquata were feeding regularly at a group of several fields, about 25km inland of the Mersey Estuary. I could not find reference to such a flock in the county avifaunas but there were a few records in recent Cheshire Bird Reports (CBR). Local bird-watchers suggested the flock was probably a regular feature, but unrecorded because the area was not regularly watched. Regular observations made over a period of several years at two other sites (one 6km to the south-east of my own site and one 12km to the north) showed that up to 100 and 60 birds respectively used these sites in March and April. Since then discussions with local farmers have revealed that feeding flocks have regularly used this part of the Cheshire Plain for at least 25 years and probably for 50 or more! Some reported a big drop in numbers during the severe weather conditions of the 1962/63 winter and said that numbers had increased since but not to their previous level. Farmers' comments also indicated that birds were seen at various sites from late summer, through the winter and in spring.

During the period July to October 1977 I found many more regular feeding sites. There were indications of other sites and some were found when looking for birds dyed yellow in December 1978 (see below). There are seasonal preferences for certain sites; some are only used in spring, others only in late summer/autumn and others only in winter. However, some of the last are used throughout and there is probably some overlap between the last two categories. Farming activities probably determine which areas are most favourable at a particular time. Some sites used in winter are still under silage during the autumn and others are being cultivated in the spring. Newly sown pasture or short permanent pasture, especially adjacent to brooks and streams or in wet, marshy areas appear to be preferred.

Records in the 1975 CBR indicated that birds were regularly seen flying NW at dusk away from the area of my 1976/77 winter observations. On following up these flight lines during September 1977 I located the roost on a lime-bed complex some 20km inland. The roost was not visible from adjacent public roads but permits were quickly obtained to visit the site on a regular basis. During the first few visits in October it was obvious that several hundred Curlews were using the roost, coming from feeding sites in an arc spanning from the NE through E to the south.

Fig 1. Number of Curlew counted at Mid-Cheshire roost (a) from Jan. to April 1978 and (b) from June 1978 to May 1979. All counts are of birds entering the roost at dusk unless marked 'M' to indicate a morning count. The count at the end of March 1978 is almost certainly incomplete as at least 200 birds were feeding in the area the following day.



The documented record was obviously far from complete for Cheshire! I wonder how many more such inland feeding/roosting flocks lie undetected elsewhere in Britain? I know of one other at Walcot, Wellington, Salop where, Chris Whittles tells me, birds feed in water meadows and roost on filter beds at a sugar-beet factory. Chris found that birds are present throughout the autumn and winter with numbers varying from a few hundred to over 1000. Since 1962 over 1000 Curlews have been ringed at this site although birds can be caught during the autumn only until the factory comes into operation and the filter beds are flooded. The birds apparently roost on the water meadows thereafter. Chris suggests there may be other sites along the Shropshire/Montgomeryshire borders. Tony Prater has also indicated (pers. comm.) that during the winter quite large numbers (possibly 5000+) apparently feed inland in east Scotland.

Counting methods

During the period October 1977 to January 1978 counts were made at the roost on an exploratory basis using different vantage points and both at dawn and at dusk. In the mornings one or more observers were positioned at different points around the lime-bed complex to cover the wide front of dispersal from the roost. These counts are now thought to be over-estimates due to duplication, although some allowance was made for this at the time. At evening counts observers were positioned at the apex of the arc from which the birds generally enter the roost. These counts are much more accurate (especially in good visibility) as birds can be seen, strung out in a line, well before they enter the roost, thus allowing several counts of each party. Since February 1978 only evening counts have been made.

We usually left our regular vantage point when it became too dark to count any late-comers accurately. We were then out of sight of the birds' 'arc of entry' into the roost for up to 10 minutes. The significance of late-comers was not fully appreciated until 6 August 1978 when parties totalling c220 flew immediately overhead into the roost just as we were leaving the lime-bed complex. With the help of additional observers, positioned so that they could see and estimate the number of birds flying immediately overhead into the roost after dark, we were able to show that late-comers often entered the roost undetected - during the autumn at least. Consequently we know that our evening counts are minima. Because parties of late-comers were seen on occasions when both high and low counts were recorded it suggests that the two peaks during the autumn (see Fig 1b) really did occur and that over 1000 birds may well have been present.

Roost visits and counts

Regular visits to the roost during the 1977/78 winter showed that between 500 and 800 birds were present, but some of these counts may have been over-estimates (see above). In early February 1978 (a time when Curlew are beginning to take up territories on the hills of the Peak District some 25km to the east) numbers at the roost dropped to 300 (Fig 1a). This was followed by an increase to c650 in mid-February and then a steady decline during March and April. The peak in mid-February was particularly interesting. It followed a period of 10 days hard frost in the immediate area, whilst much of the country was under snow. Flocks coming into roost that evening were much smaller than usual. Only three were greater than 30 birds and most were less than 10. This suggested that the birds were probably feeding in small parties along the network of streams and brooks in the area. These were probably the only places soft enough for feeding.

Only three visits were made to the roost during May and June 1978. Three Curlews were present on 21 May and none on 5 June. However, by 23 June 23 were present and plans were made to visit the site weekly. By 23 July there had been a rapid increase to c725 and this continued to a peak of c975 on 13 August. By 25 August numbers had declined to c510, increasing again to 900+ on 10 September. By early October numbers again declined to c500 but built up to a 'stable' winter population (mid-October to mid-December) of between 550-650 birds. However, with colder conditions, numbers decreased to c375 in late December.

On 1 January 1979 c200 were counted before heavily falling snow made further counting impossible. This was the first time that substantial snow cover had occurred in the area since my observations began and I was particularly interested to see what effect it would have on the Curlews. On 5 January, when there was still complete snow cover, only 10 birds were seen at the roost. Two days later, after a quick thaw on 6 January the snow cover had partially cleared and 105+ were counted. During the rest of January, the coldest for 16 years, no more than 225 were counted. At the beginning of February some 500+ birds had 'returned' and during February and March counts of between 480-570 were made. There was some indication of a drop in numbers in early March followed by a build up to c570 in mid-March. However, this did not match the drop in numbers noted in mid-February 1978 (see above) and there was no steady decline during March 1979 as noted in 1978. I suspect that the continuing cold conditions experienced during February and March were the reason for such high numbers remaining in the area, with both wintering and passage birds waiting for milder weather before moving on. As expected, numbers declined steadily during April 1979 with the warmer weather. None were present on 17 May 1979.

During the spring period only, birds also enter the roost from an arc between NE through N to NW. This ties in with sightings of birds feeding at sites to the north and north-west of the roost which are regularly used only during the spring.

#### Roost site and the catch

To learn more about the movements of the roosting birds it was decided to attempt to catch a sample, using cannon-nets, and to dye the rump and under-tail coverts of trapped birds yellow, using picric acid. This was to make them easily visible when studying the feeding flocks subsequently. This is known to have been the only such colour-marking scheme in Britain, but it is not known whether any such schemes have been carried out on the continent - it is thought not.

The roost site consists of a series of settling beds associated with a chemical works. Most of the beds contain a lime-like deposit which has been settled from chemical plant effluent but which retains quicksand-like characteristics. However, the Curlews regularly roost on one or other of two 'safe' beds no longer in use. One consists of compacted cinders and is safe to walk on. Having a hard surface and a considerable fringe of rough grass it is a very suitable cannon-netting site, especially as the birds regularly use one particular section of the bed. The second bed, on the opposite side of the complex, is not suitable for netting.

In 1977/78 the cinder bed was used regularly until the spring when the second bed was generally preferred. During the autumn of 1978 birds used the cinder bed regularly, but the 'stable' winter flock favoured the second bed. An experimental 'scaring' session, the week before the catch was planned, successfully diverted the birds to the cinder bed. Thus, we felt confident that we could direct the birds to the right place and at a specific time - our observations having shown that the birds regularly arrived during the period 20-30 minutes before and after sunset.

Until mid-November 1978 the cinder bed was dry and a catch of up to 200 was possible under such conditions. However, there was a lot of rain during the next three to four weeks and by 9 December, when cannon-netting was attempted, the site was wet and a little muddy. Consequently the nets were set further back into the grassy fringe than was desirable for a large catch. The birds were successfully diverted to the right place at the right time..... and bang! - 65 Curlews were caught.

The catch represented about 10% of the total number of birds present. Each bird caught was ringed, weighed and the bill and wing lengths were measured. The rump, under-tail coverts and belly of each were dyed yellow by applying picric acid solution with a 1 inch paint brush.

#### Results

Measurements. Female Curlews are larger than males and a bimodal distribution was apparent in bill lengths. Using the probability graph paper method described by Griffiths (1968 Bird Study 15:29-32), the proportion of males in the catch of 65 was estimated as at least 75%. The mean bill lengths (tip to feathers) estimated by this method were 109mm for males and 131mm for females, each with a standard deviation of about 8mm. Wing lengths were not markedly bimodal, the overall mean being 307mm (S.D. 10.4mm), and weights ranged from 705 to 1060g, mean 865g (S.D. 68.9g). Bill lengths from nares to tip were also recorded and all measurements are deposited in WSG files.

From plumage characteristics, only four birds were aged as first-year. This suggests that the wintering flock present in 1978-79 consisted largely of adult males - a major surprise. Whether this was the case and, if so, whether it is an annual feature or not only a long-term study with regular large catches will show. One farmer did comment that most of the birds in the flock of c250 which regularly feed on his land appeared to be smaller than usual this winter.

Because of the small sample size some reservations must be placed on the bill length estimates, particularly that of the females. However, lengths were considerably shorter than means at the Wash on the east coast of England: males 121 mm  $\pm$  S.D. 8 mm, females 151 mm  $\pm$  S.D. 7 mm and where 95% of males measure < 136mm and 95% of females > 138 mm (I.P. Bainbridge & C.D.T. Minton in prep). This may indicate either that the two sets are drawn from different populations of Curlews or that shorter-billed Curlews are more common at inland sites.

Local Observations of Yellow-dyed Curlews. Observations resulting from colour-dyeing the birds have been of great value and the whole exercise was fortuitously timed as the most severe winter for 16 years was just about to set in. Following the catch a special effort was made to count yellow birds, both in the feeding flocks and in parties entering the roost. Yellow birds were subsequently seen at all previously known feeding sites and at additional ones found since the catch. The proportion of yellow birds in feeding flocks of up to 140 birds was generally between 8% - 10%. Larger feeding flocks consisted of 200-250 birds and it was not easy to count accurately either the number of yellow birds or the total flock size. However, in the few large flocks seen the proportion of yellow birds appeared to be lower (5% - 8%). On the few occasions when the weather allowed us to see birds sufficiently well as they entered the roost there were about 10% yellow birds in most parties. Although, with large flocks we had the same problems of counting them accurately as had been experienced with large feeding flocks.

In early February 1979, when c500 birds 'returned' to the area, at least 40% of the birds which had been dyed yellow were also present. From mid-February there were fewer (25% - 30%), although the total number of Curlews at the roost remained fairly constant. This may be an indication that some wintering birds had begun to return to their breeding grounds, the roost being augmented by passage birds moving north. However, during the spring period there is evidence that 'field roosts' may be a regular occurrence. On 17 February 1977 25 birds were seen to stay and roost at a feeding site and on 29 March 1979 86 birds, including three yellow ones, stayed to roost at a feeding site regularly used only in spring. This indicates that counts at the main roost during spring are minima and the latter observation shows that the number of yellow birds still present in 1979 was higher than counts at the main roost suggest. An interesting feature at the main roost in spring is that both 'safe' beds are often used on the same night and that the grassy fringes of two other intermediate beds are also used.

On 26 April 1979 one yellow bird, showing no signs of the partial moult expected, was seen at the main roost. This suggests that the dyed feathers are not replaced until the full, post-breeding moult and that there is a chance that yellow birds may be seen on breeding grounds.

Non-local Observations of Yellow-dyed Curlews (Fig.2). Since the catch in December 1978 there have been nine reports of up to four yellow birds from three sites on the Mersey Estuary, the nearest coastal site where Curlews are regularly seen. Due to various disturbances at the roost the night after the catch and when visited the two subsequent week-ends up to 250 birds were seen to fly off high towards the Mersey Estuary. Consequently the sighting of a bird there on 17 December was no real surprise. Nor were the eight other sightings between 31 December and 11 February 1979 when the severe weather conditions were experienced.

There were also two records of a yellow bird near Southport, Lancashire, one in mid-February and another on 12 March, and it seems very likely that these relate to the same individual. Of more interest is the record of a yellow bird seen on 22 February near Abersoch on the Llyn Peninsula in North Wales. This is a possible indication that some wintering birds moved on into Ireland during the severe weather at the turn of the year.

Of greatest interest however, is the report of "a Curlew with bright yellow underparts" seen on 10 March in Friesland in the Netherlands. The observer states that: "The bird sat together with a group of migrating Curlews which had been grounded because of the bad weather." Assuming that no similar colour-dyeing schemes were carried out on the continent, this bird was probably returning to its breeding grounds.

#### Other Waders

One spin off from visiting the Curlew roost regularly has been the sightings of other wader species during spring and autumn passage. It now seems to be quite an important inland water site for Cheshire, although the autumn of 1978 was possibly an exception. The following are the maximum counts recorded during the period July to September 1978: 1 Oystercatcher Haematopus ostralegus; 5 Little Ringed Plovers Charadrius dubius; 7 Ringed Plovers C. hiaticula; 8 Little Stints C. minuta; 16 Curlew sandpipers C. ferruginea; 25+ Dunlins C. alpina; 12+ Ruffs Philomachus pugnax; 10 Redshanks Tringa totanus; 1 Greenshank T. nebularia; 1 Wood Sandpiper T. glareola; 2 Common Sandpipers Actitis hypoleucos and 1 Turnstone Arenaria interpres.

Several thousand Lapwings Vanellus vanellus and over 100 Snipe Gallinago gallinago were present throughout the 1977/78 winter although the weather conditions were too severe for these species for most of the 1978/79 winter. Redshank, Ruff and Dunlin are seen in small numbers during the winter. Up to 200 Golden Plovers Pluvialis apricaria were recorded during the autumn and early part of the 1978/79 winter, although none were recorded in 1977/78. A Grey Plover P. squatarola was present in December 1978.

#### Other Species

Highlights have included a Short-eared Owl Asio flammeus in November 1978 and Snow Bunting Plectrophenax nivalis - a first-year male in February 1978 and a female in January 1979. The site is also a roost for thousands of gulls in autumn and winter, especially Lesser Black-backed Larus fuscus and Black-headed L. ridibundus. Because the site is raised above the adjacent ground level there is a spectacular view across the Cheshire Plain. In early November tens of thousands of Wood Pigeons Columba livia were seen emanating from a roost, somewhere to the NW, and flying in long lines to the south and east, and in early March 1979 a flock of c50 Bewick's Swans Cygnus columbianus were seen migrating due east towards the Peak District and the east coast of England. The site is also a regular feeding site for migrant Wheatear Oenanthe oenanthe, one being seen as late as the 23 October 1977. In all over 80 species have been seen at this very inhospitable-looking site.

Requests for Information

If anyone has records of yellow-dyed Curlews I shall be very grateful for the details giving the place, date, number of dyed birds, total number of Curlew in flock, whether feeding or not and, if so, in what type of habitat and any other information which may be of use. With the possibility of yellow birds being seen on breeding grounds the fullest details possible for such sightings will be of considerable interest.

Secondly, I shall be grateful for details of any other inland feeding/roosting sites such as this one in mid-Cheshire.

Acknowledgements

I am deeply indebted to I.C.I. Monde Division for the assistance they have given, in particular regular access to the roost site and to their land where several feeding sites have been located; to the many farmers and land-owners who have also allowed me free access to their land to look for and check on feeding sites; to Graham Appleton, Kate Lessells, Ian Bainbridge and their cannon-netting teams for providing the necessary equipment and expertise to catch the Curlews; to those members of the South Manchester Ringing Group who helped with the ringing exercise and to Tony Prater for his continued interest, especially during the first six months of the study. In particular I am most grateful to those colleagues - G.R.Parkinson, T.E.Helvin and Dr.E.A.Lock - who have regularly trudged round the roost site making it possible for such a complete series of counts and observations to be carried out over a period of nearly two years. Last but by no means least I must thank my wife for her continued encouragement - and for staying at home to look after the children!

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P.S. On the evening of 24 June 1979, 45 Curlews had returned to the roost and one of these birds still carried yellow dye - therefore there is a chance of further sightings in late summer before the moult.

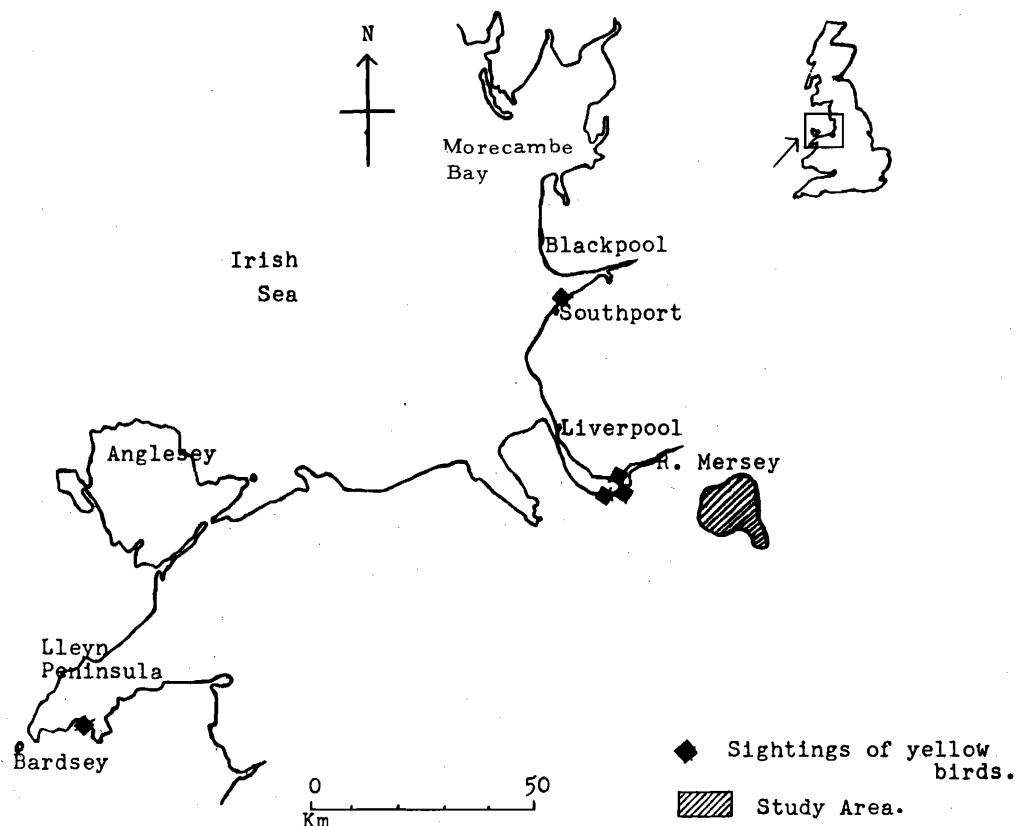


Figure 2. The Study Area and its Location