THE SPRING RETURN OF MOORLAND BIRDS TO THE OCHIL HILLS OF CENTRAL SCOTLAND

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Upland moorlands such as those on the Ochil Hils, Central Region, characteristically have considerable breeding populations of waders and small passerines that are largely or entirely absent during winter. Thus in spring there is the notable and welcome return of these species to the uplands. Although these events are well known and the first recorded dates of return are regularly reported, there are few studies in which the whole sequence is followed up to the point where the full breeding population is established.

The lower western slopes of the Ochils support abundant populations of Curlew *(Numenius arquatu),* Skylark *(Alauda arvensis)* and Meadow Pipit *(Anthus pratensis),* as well as smaller numbers of other species, so I decided to try and study the spring return by making a series of transect counts throughout the spring. Two main questions were set up in advance—

(1)Are there species differences in the time pattern of arrival of the breeding populations?

(2) Does the return of any particular species involve a steady and fairly slow increase or can one or more mass influxes be detected?

STUDY AREA AND METHODS

The study area covered two of the major moorland types and a smaller area around a deserted farmstead. The first moorland area, hereafter called the 'low moor' (a 3.4km liner transect) is between 180 and 230m altitude with mixed patches of Heather *Calluna vulgaris* and rough grass; it is regularly burnt. The topography is irregular and includes several drainage ditches and boggy areas. The second moorland area, the 'high moor' (a 3.6 km transect), extends from 206 to 415m, mainly above 260m and with extensive steep slopes, and is almost totally covered in rough grass; there are a few rocky outcrops, small burns, boggy patches with rushes *Juncus sp* and some small areas of Bracken *Pteridium aquilinum.* The final area (a 1.6 km transect) lies between the low and high moors and is about half pasture and half an almost bare and heavily trampled field that had a root crop for sheep fodder, grown the previous year. This third section is crossed by two medium sized burns, one of which is in a deep gully with a dense growth of bushes and small trees. The whole area is heavily grazed by sheep and was chosen to provide a manageable transect that covered the major habitat types of the lower and medium altitude moors; it was not feasible to design a route that included the highest peat mosses or ridges.

The general plan was to make repeated transects (about weekly) in the early spring (March and early April) and the more at longer intervals until it seemed certain that the full breeding population had returned. Transect counts were made in the morning and only on days with good conditions for observation, i.e. with wind less than force four, no mist and no rain except possibly for brief showers. My method was to walk steadily over the area recording small birds up to about 100m *away* and larger species up to 200m. These distances correspond roughly to the distances at which it was easy to detect birds with the naked eye, no attempt was made to scan systemically with binoculars either at random or to sight singing but invisible individuals. Each record had to be of a bird positively identified and seen, irrespective of how it might have been detected initially, and with reasonable certainty that it was not an individual already noted. In the rare case where I was uncertain whether a record was either a new individual or within the standard distance then I noted it as a "half chance" and added a record for that species if an additional "half chance" occurred later. In fact the data would be similar if a different criterion had been used for borderline cases.

I followed the same transect line for each count, except for small variations due to the difficulties of precise route finding in irregular and featureless terrain or where detours had to be made to avoid disturbing flocks of sheep. For other practical reasons the start and end of the transect were interchanged during the study.

RESULTS

The number of Curlew, Skylarks and Meadow Pipit recorded over the whole area are shown in Figure 1 together with the combined total of large resident species (game birds, pigeons, Kestrel *Fdco tinnunculus* and Carrion Crow *Corvus corone)* that can act as a rough check for variations in conditions of observation. The numbers of the last group of resident species do not increase during the course of the study.

The data are further summarised in Table 1 which shows the dates of two stages of return for the whole area and separately for the low moor and the high moor. Two stages were considered-

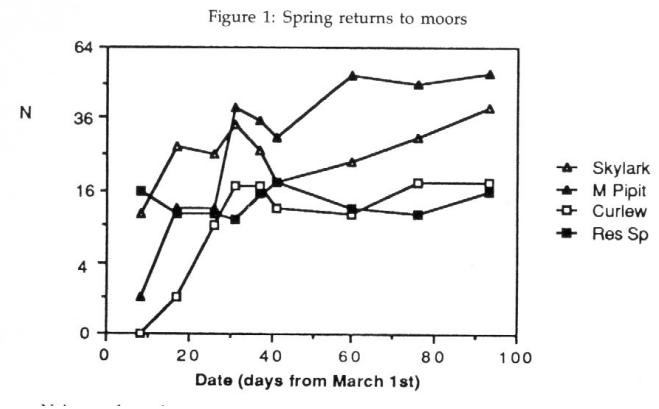
Primary arrival, when numbers first equalled 20% of final asymptote.

Major arrival, when numbers first equalled 60% of final asymptote.

Since occasional individuals can appear at almost any time, the date of the very first record is unreliable; however, Figure 1 shows that sometime after mid-March the recorded numbers start to fluctuate around a rough plateau representing the complete breeding population — hence an average figure for this asymptote can be calculated. Figure 1 also suggests that in several cases there is an initial distinct small arrival followed by a later rise to the asymptote and the figures of 20% and 60% were taken to represent these two, the primary and the major arrivals. I am aware that a 50% criterion has been used for Willow Warblers

(Phylloscopus trochilus) by Lawn (1980) but in that study the main interest was in comparing the best estimate for spring arrival betwen two sets of years. In addition Lawn's arrival curves were fairly smooth so that a single measure is quite adequate, this is not true of my data.

Figure 1: Spring returns to moors



N is number of records for the 8.6 km of transects (on a square root scale)

Skylarks were already present in numbers (primary arrival) on the first transect of March 8, though none were present on February 15 during a visit to the general area of the low moor when there was a complete snow cover. Numbers reached plateau level by March 17 so tht on these data Skylarks might either have returned in two major influxes or there could have been a fairly rapid but steady return over a week or so in early to mid-March. There was no dramatic difference in times of return to the low versus high moors except that the major arrival on the high moor was delayed by one visit (9 days).

Table 1 Dates in March 1986 of Primary and Major Arrivals

PA=Primary Arrival. MA = Major Arrival

	Whole area		Low moor		High moor	
	PA	MA	PA	MA	PA	MA
Skylark	8	17	8	17	8	26
Meadow Pipit	17	31	17	31	26	31
Curlew	26	26	26	26	26	31

NB: An actual influx must have occurred between the date specified and the date of the previous count; for Skylarks the primary arrival had already occurred at the time of the first count.

Meadow Pipits returned later than Skylarks and it is worth noting that the primary arrival of March 17 was largely composed of one small flock, the pipits were not generally dispersed until March 26. The data show at least one other influx between March 26 and 31 and possibly some birds coming in between April 10 and 29. However the number for the low moor on April 10 was exceptionally small and I suspect some artefact since the same effect was noted for Skylarks, although both species were in stable numbers on the high moor; possibly birds on the low moor were affected by some predator. The primary arrival of pipits was about nine days earlier to the low moor but the major arrival is the same date, March 31, on both low and high moors.

Wheaters *(Oenanthe oenanthe)* and Whinchats *(Saxicola rubetra),* the two trans-Saharan migrants, arrived later. Numbers are two small to use the quantitative criteria, however the first records were April 6 for Wheatear and May 16 for Whinchat.

The primary arrival of Curlew was on March 26 which was also the date of major arrival for the whole area, there is a suggestion that major arrival on the high moor was later but the figures are too small and variable to be relied on. Lapwings *(Vanellus vanellus)* were restriced to small numbers around the farmstead, after a single bird on March 17 the bulk of the population was present on March 26. A few Snipe *(Capella gallinago)* were noted on the low moor whilst a pair of Oystercatchers *(Haematopus ostmlegus)* appeared on the pasture only on May 16 although the species was on nearby lowland farmland for many weeks before this.

To give an idea of the final level of abundance Table 2 shows for the three commonest species the mean asymptotic number per kilometre of transect for the whole area and the low and high moors. Meadow Pipits are clearly more frequently recorded than Skylarks in the final breeding population ($p < 0.002$, 2 tailed t test) but for both there is little difference between low and high moors. Curlew seem to be more frequent on the low moor but the difference is not quite significant statistically (2 tailed t test on the last 6 transects).

	Whole Area	Low Moor	High Moor
Skylark	3.5	3.6	3.9
Meadow Pipit	5.4	6.9	5.5
Curlew	2.1	2.5	1.7

NB: Records of Curlew were taken up to 200m from observer, other species up to 100m.

DISCUSSION

The straigtforward interpretation, given above, of the basic data does depend on two main assumptions - that there is little through passage and that the counts are not often markedly affected by random effects on observability.

Through passage can in principle be detected either by direct observation of visible migration or by the occurrence of marked peak counts before the plateau period. Visible migration of larks and pipits is frequently seen in this area in autumn but I have never seen any indications in spring. Similarly, the total area counts in Figure 1 show no evidence of the temporary presence of passage birds although daily counts would ideally be needed to explore this possibility thoroughly. At least there is no reason to suppose that through passage is upsetting the main conclusions of the study.

The only marked erratic variation in counts applies to several counts of larks and pipits on the low moor in April, these are puzzling and not explicable by bad weather or observation conditions. However, since these occurred after the main arrival over the whole area they do not effect the conclusions.

It is course true that a mapping method can give more reliable results for a stable population and can be interpreted in terms of density per square kilometre. It would, however, be quite impractical to monitor a changing population by mapping over any area large enough to give representative results whilst, following Verner (1986), the questions posed here are logically answerable by a method using relative frequencies. The main problem would be if there were marked variations in detectability from one day to another. The restriction of transects to days when observation conditions were fairly good was intended to minimise variations due to weather. Since song frequency might vary through the course of the study I made notes on the frequency of song on a subjective scale (occasional, regular, sustained), no obvious relation was found between this and the recorded numbers of birds. The technique of noting birds only within a restricted distance would reduce any gross effect of song on detection, about only a third of the individuals seen were noted solely during song flights. In comparing species it is important to bear in mind their relative detectabilities. In Finnish woodlands for example, Hilden and Laine (1985) note that Willow Warblers *(Phylloscopus trochilus)* were over twice as conspicuous as Willow Tits *(Parus montanus).* They also note however, that these results accord well with general experience. Hence I judge that the relative frequencies of Skylarks and Meadow Pipits in the present study are fairly reliable, certainly there is no reason to doubt that the pipits are in fact the commoner species.

The fact that counts were not done daily does mean that I could have missed brief desertions of the moors due to severe weather. There are strong indications that this may happen since Meadow Pipits may appear

in flocks away from the breeding areas during cold spells in April, e.g. I saw 70 on the lawns of Stirling University on 8th April 1975 when there was snow on the hills. There was in fact wintry weather in mid April 1986 with the snow line at c300m on the 17th, unfortunately I was unable to make transects during this period.

The spring of 1986 was noticeably cold and late so it should not be assumed that the pattern of spring arrival detailed in this study applies in all years. I can, however, use temperature data from the Carim Lodge meteorological station operated by the Department of Environmental Science, University of Stirling, to say a little more about temperature and bird numbers. The station is at an altitude of c325m, GR NN 864049, and some 6.5 km NE of my study area. I have calculated the average of the daily mean temperatures for the periods between counts, or for five day periods before a count if the interval between counts was longer. In early March the average daily temperature was only 0.3°C but rose to nearly 4.0 before the primary influx of Meadow Pipits. There was then a spell of cold weather until April 20 with daily temperatures usually below 1.5°C but during the middle of this period there were major arrivals of Meadow Pipits and Curlews. In late April daily temperatures rose rapidly to reach a plateau of around 7°C through May. This suggests that, in the establishment of birds on the breeding moors, a major factor might be the absence of successive days with continuous frost rather than the achieving of temperatures typical of mid-April.

In conclusion I think that the spring arrival pattern is clearly more complex and interesting than is indicated by the simple date of first appearance and that spaced transects can start to give some insight into the problem. It would be particularly interesting if studies in the future could cover habitats with a greater range in altitude.

REFERENCES

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