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YELLOW WAGTAILS Motacilla flava AT A NIGERIAN WINTER ROOST:

ANALYSIS OF RINGING DATA

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INTRODUCTION

Between 1960 and 1968, Mr. R.E. Sharland ringed over 11,000 Yellow Wagtails Motacilla flava at a winter roost in Kano, Nigeria. The results of this work have been published (Sharland, many notes) regularly in Bull. Niger. Orn. Soc. Interesting data have been obtained on the European origins of the birds, their migration routes and the speed of migration. In addition a large number of birds have been recaptured at the same site in subsequent seasons. The raw data presented by Sharland make it clear that a large proportion of the birds return regularly to the same wintering area. Moreau(1966) has quoted the Kano results as being among the few that indicate this previously unsuspected phenomenon. The purpose of the present note is to analyse the data further to see how much information can be extracted.

METHOD

Mr. Sharland has generously allowed me to use his data in a previously unpublished form, with ringing totals presented by season rather than by calendar year (Table 1.).

The analysis has been carried out using Jolly's stochastic method as described by Southwood (1966). This method is based on Lincoln's Index:

$$\text{Population} = \frac{\text{No. marked X No. recaptured}}{\text{No. in second sample}}$$

but allows for additions to, and losses from the population between sampling dates which Lincoln's index does not. The mathematical procedures are fully explained, with a worked sample, by Southwood.

The use of this method involves certain assumptions which cannot be fully justified in the present case, and the results are therefore not to be regarded as exact. The most important is that mortality is unrelated to age. The Kano birds are all at least three months old, and have survived their first Sahara crossing. Most of the disproportional juvenile mortality will thus have occured before their arrival. Death from senility is rare in wild birds and only affects a minute proportion of the population. The remaining mortality factors are probably largely unrelated to age, so age-related mortality is not likely to be very important in this case. We must also assume that a single population is included in each sample. The ringing period lasted for the entire duration of the roost, and birds on passage, new birds arriving late in the season, and birds dying or leaving during the winter are all included. However, the numbers of birds recaptured during the same season are enough to indicate that by and large a single population is involved. (The

data on this are insufficient for complete analysis),. Finally Jolly's formula fails to distinguish between birds which have died and those which have emigrated (ie. returned to winter quarters elsewhere), and also between birds added to the population by birth or immigration.

RESULTS

Table 1 shows the raw data obtained from Sharland's ringing and re-capture results.

Season	Total captured	Total recaptured by year ringed							
		1960-1	1961-2	1962-3	1963-4	1964-5	1965-6	1966-7	Total
1960-1	620								
-2	756	15							15
-3	709	7	13						20
-4	1796	2	24	21					47
-5	1732	1	6	9	74				90
-6	2506	0	3	6	13	35			57
-7	1853	0	2	0	9	23	63		97
-8	2304	1	0	1	7	15	54	71	149
Total	12276	26	48	37	103	73	117	71	475

Note that the first column shows the total number of birds captured, thus in 1963-4, 1796 birds were caught, and of these 47 were recaptures from previous years. Thus 1749 birds were ringed that season.

The results of the the analysis are shown in Table 2. Standard errors have not been included; they are quite large, but do not significantly alter the conclusions, and in view of the uncertainty of some of the original assumptions, their meaning is not clear.

Season	Estimated Population	Estimated survival rate to next season %	Estimated new birds added before next season
1960-1	-	30	-
-2	9,500	83	19,000.
-3	27,000	38	11,000
-4	21,000	47	11,000
-5	21,000	48	47,000
-6	57,000	57	9,100
-7	41,000	—	—
-8	—	—	—
Average	28,000	50	19,000

Table 2. For clarity numbers are shown to two significant figures only.

30% of birds wintering in Kano in 1960-61 returned in 1962, when the roost was relatively small, with around 9,000 birds. Of these however, 80% returned in 1963 along with 19,000 new birds, giving a total around 27,000

in 1962-3. Nearly 40% of these birds returned, with almost 11,000 new ones giving a fall of 21,000 in 1963-4. This situation was more or less repeated and the roost was again 21,000 in 1964-5. There was nearly 50% survival of these birds, and an enormous influx of nearly 47,000 new birds giving the maximum total of 57,000 in 1965-6. The return rate of 1965-6 birds was the second highest recorded, 57% but as only 9,000 new birds joined the roost, it declined in 1966-7 to around 41,000.

The average size of the roost indicated by the figures is nearly 28,000, the average return rate is 50% and the average number of new birds is over 19,000.

DISCUSSION

While the figures for individual years may be treated with some skepticism, they do not vary from year to year more than might be expected, and the population estimates do not differ wildly from those made subjectively by Sharland (pers.comm.). Thus while it might be unwise to draw significant conclusions from the differences between figures for different seasons, the averages are probably fairly reliable.

The most striking figure is that for "survival", averaging 50%. This gives a mortality of 50% per annum, including both real mortality and birds returning to winter quarters elsewhere. A true annual mortality rate around 50% is to be expected in passerine birds, and although it has never been calculated for Yellow Wagtails there is no reason to expect otherwise. Therefore the percentage returning to winter quarters other than Kano is very small, indicating that at least subsequent to the first migration, the winter homing instinct is very strong.

Recoveries of Kano birds in or close to the breeding season have come for example from Finland, Russia and Roumania. The breeding area from which Kano birds are drawn is thus certainly larger than that containing 28,000 birds. Thus the Kano roost does not represent a discreet population breeding and wintering together. More likely it is a selection of birds from a wide breeding area which "find" Kano on their first migration and subsequently return there regularly. The same probably applies to wintering populations of Yellow Wagtails throughout their range. The unavoidable implication is that on their first migration the birds are guided by a general directional impulse and become dispersed over a wide winter range. Subsequent migrations must be truly navigated, using past experience and the birds "home" accurately on their previous winter quarters.

Besides showing what may be achieved by applying a modern technique to ringing results, these conclusions emphasise the great importance of distinguishing between birds of different ages in migration studies.

REFERENCES

Moreau, R.E., (1966) The Bird Faunas of Africa and its Islands. Academic Press.

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