CONTENTS

We should like to thank all those who have helped us in many ways and particularly Dr J Smart and Dr S M Walters representing the National Trust. The Warden, Lt Col C E Mitchell has constantly assisted and advised us in many ways.

Editor: C J Bibby
Cover design by Dr E A R Ennion
Line drawings by R J Prytherch and M J Allen

Wicken Fen Group Report No. 2 1970

INTRODUCTION

During 1970 the Group has consolidated on the work of its first year, and has proved more consistent in the coverage obtained throughout the breeding season. On most weekends members of the Group were at work in the Reed Bed area, and on three weekends resources were stretched to near breaking-point to allow the two 'ends' of the Fen to be worked simultaneously. This development has produced some thought provoking data, and we hope that in 1971 a similar effort will enable us to fill in more of the patterns of activity and population density for certain species, which are already being suggested in the notes elsewhere in this report.

If the totals of birds ringed are taken as an index of success then the year has undoubtedly been successful, but it is sad to report that no additional member of the Group has attained a permit, and that on many occasions trainee members were unable for the most part to take advantage of large catches to improve their ringing techniques. The work of the late summer and autumn however found new trainee members ready to help and the enthusiasm of some of our newest recruits augurs well for the future.

The sales of our first report: ONE 1969 have been steady and the interest it has aroused since its appearance at the Ringers' Conference at Nottingham in January 1970, and even during the IOC at the Hague in October, has been most encouraging. Perhaps the most immediate way of informing the public about our work is through the direct display in the panels kindly made available to us by the Trust outside the William Thorpe building at the entrance to the Fen: the Group is very grateful to Peter Bircham for undertaking to look after this important aspect of its work.

In considering the Group's future there are many encouraging signs; new members are appearing to replace original stalwarts like David Steventon, a founder member, who left this year at the end of his University course. The Ringing and Migration section of the BTO continues to lend us the benefit of its experience and expertise: we were delighted to entertain Jim Flegg and Chris Mead on a visit to the Fen this year, and the encouragement of the Head of the Section, Bob Spencer, is much appreciated. Finally we must put on record our continuing debt to Dr Eric Ennion whose immense generosity in giving the Group his entire stock of remaining nets, some of them quite unused, as well as a Fair Isle apparatus for collecting ectoparasites from live birds, is much appreciated. We hope to put all this equipment to excellent use in the future.

In this our second report, we have continued the policy of including short contributions on work in progress, and are pleased that this again demonstrates something of the range of interests of our members. To those who are diffident about producing what they consider to be no more than an interim report, we stress than any contribution, however brief can be of value in stimulating other members of the Group to look more critically at their techniques in the field and the data which they are helping to collect. We hope that even more members will be encouraged to contribute next year, however inconclusive their initial result may appear to be.

REVIEW OF THE YEAR

The Group's first visit to the Fen coincided with the appearance of the first Swallow of the year there on 27th March; a phylloscopus warbler was feeding on the edge of the carr on the opposite side of the Lode on the same day.

By 11th April the winter flocks of Fieldfares had dwindled, but the large gatherings of Snipe on the flooded areas around the Mere had been joined by at least two Jack Snipe and a Curlew, and Redshank were also present. The first Chiffchaff was caught and ringed on the same day. By the following weekend, Chiffchaffs, Willow Warblers and Sedge Warblers were in song, a Cuckoo was calling, and about twenty Swallows and forty Sand Martins were seen heading north at dusk on 18th. Two more unusual summer visitors were caught the following day: the first, a Tree Pipit, appears to constitute the first record for that species on the Fen, while the second, a male Redstart, was a month earlier than the Group's first record for the species in the previous year. The Whitethroat caught the same day was the first record for the year: the date exactly coinciding with last year's first observation of the species.

Grasshopper Warblers were present by 25th April, when two House Martins were also seen, and several single Garganey were noted on the Mere, while a pair was also observed in flight. A Whimbrel was seen heading south-east on the same day.

By 9th May at least two pairs of Garganey had been seen, while the first Reed Warbler had been caught and ringed on 8th, and no less than 17 new birds and 19 'retraps' handled on 9th. The first Blackcap and Lesser Whitethroat of the year were ringed, while two Yellow Wagtails were the first ever handled by the Group.

A second Redstart for the year, this time a female, was caught on 10th May in the same site as its predecessor of two weeks earlier, while ten Swifts, counted overhead, may have been associated with a much larger movement at a higher altitude. Turtle Doves had arrived by the following week, and the Group ringed its first Collared Doves on 16th May when two pulli were found in a nest near Sedge Fen Drove.

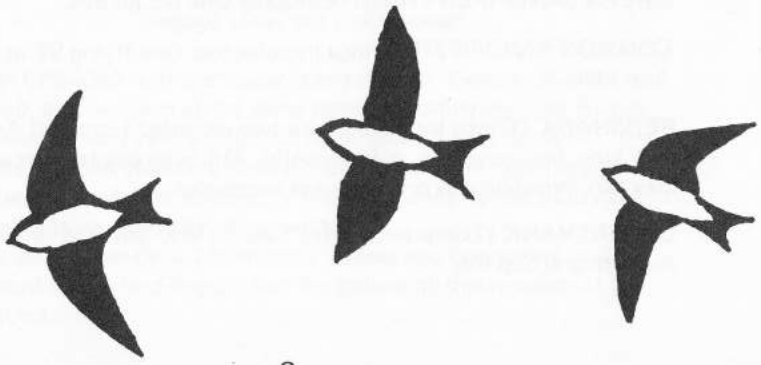
Two species were notably scarce during the spring of this year: by mid-June only 33 Willow Warblers had been handled by the Group compared with 91 in the same period in 1969, while the first Spotted Flycatcher was not seen until 6th June when it was caught and ringed near Harrison's Drove.

The first return movements of the year probably began with the appearance of a Green Sandpiper at the Reed Bed on 5th July, but the conditions were not attractive enough to hold passage waders and a single Curlew on 10th July and five more moving north-west on 18th July, single Greenshanks on 8th August and 6th September and a Common Sandpiper on 11th August, were the only other non-resident wader records for the autumn.

Early roosts of hirundines began with small parties of Sand Martins from 17th July, joined by a few Swallows from 26th July onwards, and by the end of the month some five hundred Sand Martins were roosting in the vicinity of the Mere, while at the same time a roughly similar-sized roost of Starlings was forming on its eastern end. By 8th August the Sand Martin roost numbered about 2,000 birds, and a week later similar numbers of Swallows were moving north-east, but the largest roost probably numbered no more than 1,000 birds, on 16th September, and the last recorded roost was noted on 3rd October. The last House Martins seen, were 10 on 26th September, on which day a single Sand Martin was also present over Monk's Lode.

A notable feature of high summer on the Fen in 1970 was the number of birds of prey, from single Kestrels seen on most visits, and two to three Tawny Owls heard on most, to a male Sparrowhawk and one Long-eared Owl on St. Edmund's Fen. A female Marsh Harrier seen near Spinney Bank on 16th August preceded a series of sightings on 18th, 19th and 20th.

Highlights of the late summer included a juvenile Red-backed Shrike on 1st August and two further Redstarts on 12th and 16th September; but before the last visit was made to the Reed Bed on 4th October, when two Reed Warblers and a Chiffchaff were ringed, a great deal of energy had been devoted to the ringing of some 315 Tree Sparrows, for most of which moult cards were completed. Results of this work are used elsewhere in this report.



SOME NOTES ON SELECTED SPECIES

Although the Group maintains a comprehensive record of casual observations made during ringing visits, only a few are reproduced here, if they differ from or add to the *Birds of Wicken Fen* (G M S Easy and C A E Kirtland), and the notes in the Wicken Fen Group's previous Report.

In view of the foundation of the Charles Raven Marshland Reserve, adjoining the Mere, all records of waders are included as this area might be expected to suit these species, and their status may change in the near future. The area was wet in the spring, but dried out steadily during the summer, so that by July and August, it was totally dry, and indeed a crop of hay was cut from it. The water level did not greatly increase again until mid November. Several species of waders were nevertheless recorded, and the area has considerable potential for development which could lead to its becoming an important resting and feeding place for passage waders. All records below refer to the area of the Charles Raven Marshland Reserve, and the main bird catching area on the nearby Reed Bed, unless stated otherwise.

SPARROWHAWK (Accipiter nisus) One on St. Edmund's Fen on Aug 12th.

MARSH HARRIER (Circus aeruginosus)A female seen on Aug 16th and 18th - 20th.

SNIPE (Gallinago gallinago) Numbers present are related to the amount of water standing on the CRMR. The species was numerous in the early months of the year, but numbers declined during the summer, and very few were seen in the autumn and early winter.

JACK SNIPE (Lymnocryptes minimus) Two on Apr 11th.

CURLEW (Numenius arquata) Singles on Apr 11th and Jul 10th and five flying NW on Jul 18th.

WHIMBREL (Numenius phaeopus) One on Apr 25th.

GREEN SANDPIPER (Tringa ochropus) One on Jul 5th.

COMMON SANDPIPER (Tringa hypoleucos) One flying SE at dusk on Aug 11th.

REDSHANK (Tringa totanus) Up to two recorded from mid April to mid June, but none seen subsequently. Although display was seen on May 8th, breeding was probably not successful.

GREENSHANK (Tringa nebularia) Two on May 9th, and singles on Aug 8th and Sep 6th.

COMMON/ARCTIC TERN (Sterna hirundo/paradisea) One on May 9th.

LONG-EARED OWL (Asio otus) One on St. Edmund's Fen on Aug 12th is the only record of the year.

KINGFISHER (Alcedo atthis) Seven caught during the summer represents a healthy increase on last year's two. There were no sight records!

REDSTART (Phoenicurus phoenicurus) Singles on Apr 19th (m), May 3rd (m), May 10th (f), Sep 12th (m), and Sep 16th (m). Both the September birds were young of the year. This represents a considerable number of records for a species which is a very uncommon species in the county.

TREE PIPIT (Anthus trivialis) One on Apr 19th.

RED-BACKED SHRIKE (Lanius collurio) A juvenile on Aug lst.

RECOVERIES NOTIFIED SINCE THE LAST REPORT

There follows a list of all recoveries and controls of over five miles, notified by the Ringing Office since the last Report. Distances are given in miles together with the approximate direction of movement.

Key to symbols and terms

pull	–	nestling
1 Y	–	bird in its first year
FG	–	full grown, age otherwise unknown
PJ	–	post juvenile
Ad	–	adult at least one year old
Juv	–	juvenile
m	–	male
f	–	female
v	–	controlled (caught alive and released)
x	–	found dead
()	–	trapped alive, but not released

Song Thrush CP64063 is of particular interest since it was at Wicken in summer 1969, and in Spain at the same time the following year. British Song Thrushes are very rarely reported from Spain in the summer.

Two controls of Reed Warblers, bred at nearby sites and returning to a different place in their first summer of life add slowly to the national collection of data on this interesting matter.

Redpoll HS 89289 was ringed in Norfolk as was one controlled in 1969 and mentioned in the first Report but the nature of this movement is not understood.

MUTE SWAN			
Z 15092	1Y	11. 7.65	Cambridge
	v	2. 5.70	W.F. (9 miles NE)
Z 14893	FG	29.11.64	Cambridge
	v	25. 4.70	W.F. (9 miles NE)
SONG THRUSH			
CP 64063	PJ	31. 5.69	W.F.
	x	10. 6.70	Alonsotegui, Baracaldo, Spain.
REED WARBLER			
HS 14146	pull	27. 6.69	Over (Cambs)
	v	31. 5.70	W.F. (10 miles E)
HX 10634	pull	28. 6.69	Rye Meads, Hoddesdon,(Herts)
	v	10. 7.70	W.F. (38 miles NNE)
GREENFINCH			
BH 54530	1y m	26. 4.69	W.F.
	x	3. 5.70	Cambridge (9 miles SW)
BH 54503	Ad m	1. 2.69	W.F.
	x	7. 1.70	Wilburton, Nr. Ely, (Cambs) (5 miles NW)
REDPOLL			
HS 89289	Ad f	21. 9.69	Leziate, King's Lynn, (Norfolk)
	v	3. 7.70	W.F. (30 miles SSW)
BULLFINCH			
HV 23480	Juv m	14. 9.69	W.F.
	()	15.12.69	Cottenham (Cambs) (7 miles W)

Species ringed in 1970

	Site A & B	Site F	1970 total	Grand 1968-1970
Mallard	-	2	2	3
Red-legged Partridge	-	2	2	3
Moorhen	-	-	-	1
Snipe	1	6	7	12
Jack Snipe	-	-	-	1
Woodcock	1	-	1	1
Cuckoo	-	2	2	4
Tawny Owl	1	-	1	5
Kingfisher	2	5	7	9
Woodpigeon	1	1	2	2
Collared Dove	3	-	3	3
Skylark	-	3	3	4

Swallow	15	70	85	135
House Martin	-	-	-	1
Sand Martin	-	-	-	1
Jay	1	-	1	2
Great Tit	16	36	52	91
Blue Tit	66	64	130	256
Willow Tit	12	26	38	87
Long-tailed Tit	7	13	20	100
Tree Creeper	2	5	7	18
Wren	40	64	104	236
Mistle Trush	-	-	-	1
Fieldfare	-	-	-	6
Redwing	-	-	-	22
Blackbird	37	86	123	359
Redstart	-	4	4	5
Robin	45	54	99	210
Nightingale	2	-	2	5
Song Thrush	47	83	130	341
Reed Warbler	90	325	415	671
Sedge Warbler	121	287	408	710
Grasshopper Warbler	7	16	23	36
Blackcap	29	42	71	141
Garden Warbler	5	15	20	31
Lesser Whitethroat	9	20	29	48
Whitethroat	20	21	41	75
Willow Warbler	55	114	169	348
Chiffchaff	26	36	62	98
Goldcrest	-	-	-	2
Spotted Flycatcher	6	10	16	28
Dunnock	76	85	161	396
Pied Wagtail	-	2	2	7
Yellow Wagtail	-	2	2	2
Tree Pipit	-	1	1	1
Meadow Pipit	-	1	1	1
Red-backed Shrike	-	1	1	1
Starling	-	-	-	11
Redpoll	49	57	106	164
Linnet	2	14	16	55
Goldfinch	14	41	55	89
Chaffinch	23	19	42	85
Brambling	-	-	-	1
Greenfinch	14	44	58	108
Bullfinch	35	88	123	351
Yellowhammer	10	2	12	33
Reed Bunting	45	147	192	328
Corn Bunting	-	-	-	4
House Sparrow	-	-	-	1
Tree Sparrow	370	10	380	583
TOTALS	1305	1926	3231	6333

Note: The Group no longer rings Sand Martins, Starlings or House Sparrows, as recommended by the Ringing and Migration Committee of the BTO.

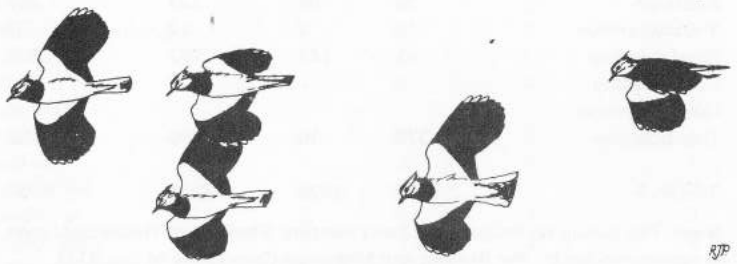
MOULT

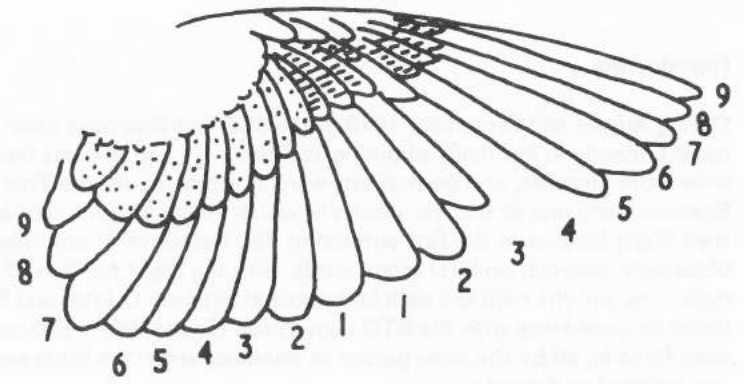
The handling of birds enables the ringer to observe moult in detail. For all birds caught in wing moult, details are described on BTO moult cards, with the state of growth of the tail and flight feathers being numbered between 0 (old) and 5 (new), as shown in the illustration. For further information on all aspects of moult and the BTO Moult Scheme, readers should consult *A Guide to Moult in British Birds* by D W Snow (BTO Field Guide no 11). A paper on the moult of the Tree Sparrow, using the data collected by the Group in the autumn of 1970, follows. For most species, the individual ringer or group can only collect a few cards each year, but these are added to the BTO's collection so that enough are ultimately collected to permit analysis and publication. The juvenile Tree Sparrow is however gregarious at the time of its moult, and the Group was able to collect enough cards for a preliminary analysis.

The following moult cards were collected in 1970

Mallard	1	Whitethroat	3
Collared Dove	1	Willow Warbler	5
Kingfisher	1	Chiffchaff	1
Jay	1	Spotted Flycatcher	2
Great Tit	2	Dunnock	10
Blue Tit	15	Greenfinch	4
Willow Tit	7	Goldfinch	3
Long-tailed Tit	9	Redpoll	4
Tree Creeper	3	Linnet	1
Wren	1	Bullfinch	3
Song Thrush	16	Chaffinch	2
Blackbird	38	Yellowhammer	3
Nightingale	1	Reed Bunting	19
Robin	4	Tree Sparrow	290
Blackcap	2		

TOTAL 452





Right wing of a moulting Tree Sparrow showing primaries and secondaries conventionally numbered. The dotted area is the greater coverts, and the primary coverts are hatched.

SPECIES: Tree Sparrow | AGE SEX: 3J | RING No: JK 32357 | DATE: 12:8:70
LOCALITY: Wicken Fen | COUNTY: Cambs. | COUNTRY: U.K. | OFFICIAL
OBSERVER GROUP | Indicate if Retrap | IF RETRAP ORIGINAL RINGING DETAILS: DATE, AGE, SEX

1 BODY — WING L / R

9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	(10)
O	O	O	O	O	O	O	O	O	N	N	4	2	O	O	O	O	O	X

'tertials' ← Secondaries → ← Primaries →

TAIL

6	5	4	3	2	1	1	2	3	4	5	6
O	O	O	O	O	O	O	O	O	O	O	O

LEFT RIGHT

OFFICIAL Score

p.p.	s.s.	tail
16	O	O

2 BODY
GREATER COVERTS — APPARENTLY ALL NEW ____ OLD ____
ACTIVE MOULT
BASTARD WING — APPARENTLY ALL NEW ____ OLD ____
ACTIVE MOULT L R

3

APPARENTLY	ALL OLD	STAGE OF MOULT: BEGIN.	MID.	END.	MOULT COMP.
Lesser & Med. Wing Coverts					
Underwing Coverts					
Head					
Upper parts					
Under parts					

Moult cards for the above bird. Note that the tenth primary is minute in this species, and is thus excluded. Only the tail and flight feathers have been recorded.

POST JUVENILE MOULT OF THE TREE SPARROW

Introduction

During August and September 1970, some 350 Tree Sparrows were caught, mainly in the fields adjoining St. Edmund's Fen. All but five of these were juveniles, and the majority were in active moult; the Tree Sparrow being one of the few species in which young birds replace all their flight feathers in the first autumn of life. Details of all moulting birds were recorded on BTO moult cards, with the flight feathers of the right wing and the rectrices each being scored between 0 (old) and 5 (new) in accordance with the BTO convention (Snow 1967). 290 cards were filled in, all by the same person to minimise error; the birds were also weighed and measured.
This paper discusses the timing and duration of the moult, and the weight changes during the period. The sequence of the moult of the tail and flight feathers is described.

Sequence of the moult

The sequence of the moult is the same as that found in most passerines (Snow 1967). Moult commences with the replacement of the innermost primary, and these feathers are then replaced centrifugally. During this time, the tail and the tertials are completely renewed. The secondaries, starting after the primaries, are completed after them. This is discussed more fully below.
To describe the state of moult of each bird for analytical purposes, the scores of the primary, secondary, and tail feathers are added to give three separate scores.

Secondary moult

In Fig 1 the secondary scores are plotted against the primary scores. The six outer secondaries moult inwards in sequence, and only these are considered, so the score at completion is 30. The inner three feathers of this tract, known as the tertials, moult in a different manner, being replaced in the order, middle, innermost, outermost. The tertials are all replaced within the period of the primary moult. The secondary moult commences on average at a primary score of 22, by which time there are usually three old primaries remaining. This tract is completed after the primaries, at a time when the primary score would have reached 57 if it continued

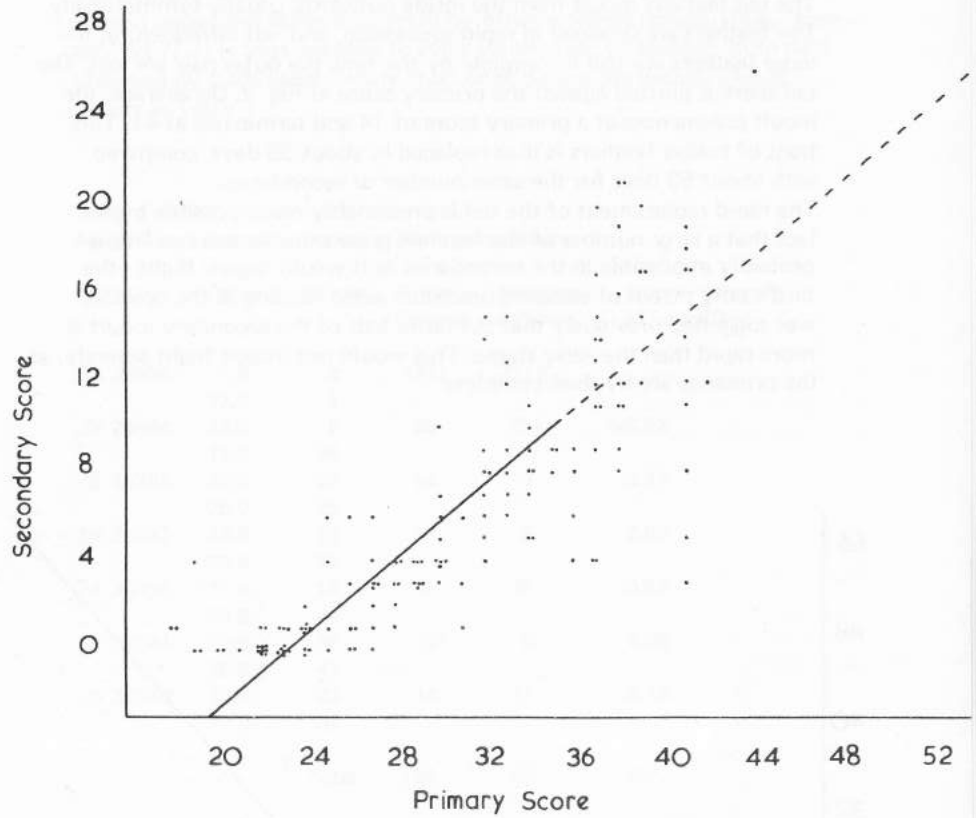


FIGURE 1 Secondary scores plotted against primary scores.

to this stage. This is at about 17 days after the completion of the primary moult, assuming a rate of advance of primary score of 0.7/day as found later. At this rate of advance of primary score, the total time taken to replace the secondaries is 53 days (the time in which the primaries advance from 22 to 57).
It seems possible however, from the limited number of birds caught in advanced secondary moult, that the inner three feathers are replaced more rapidly than the outer three. For this reason, the regression line drawn on Fig. 1 is dotted at the stage at which it may no longer be straight. The estimate of 53 days for the period of the secondary moult must thus be considered to be a maximum.

Tail moult

The tail feathers moult from the inside outwards, usually symmetrically. The feathers are dropped in rapid succession, and not infrequently, the inner feathers are still incomplete by the time the outer pair are lost. The tail score is plotted against the primary score in Fig 2. On average, the moult commences at a primary score of 14 and terminates at 41. This tract of twelve feathers is thus replaced in about 38 days, compared with about 53 days for the same number of secondaries.

The rapid replacement of the tail is presumably made possible by the fact that a large number of the feathers grow simultaneously. This is probably impossible in the secondaries as it would impair flight - the bird's only means of escaping predators when feeding in the open. It was suggested previously that the latter half of the secondary moult is more rapid than the early stages. This would not impair flight severely, as the primaries are by then complete

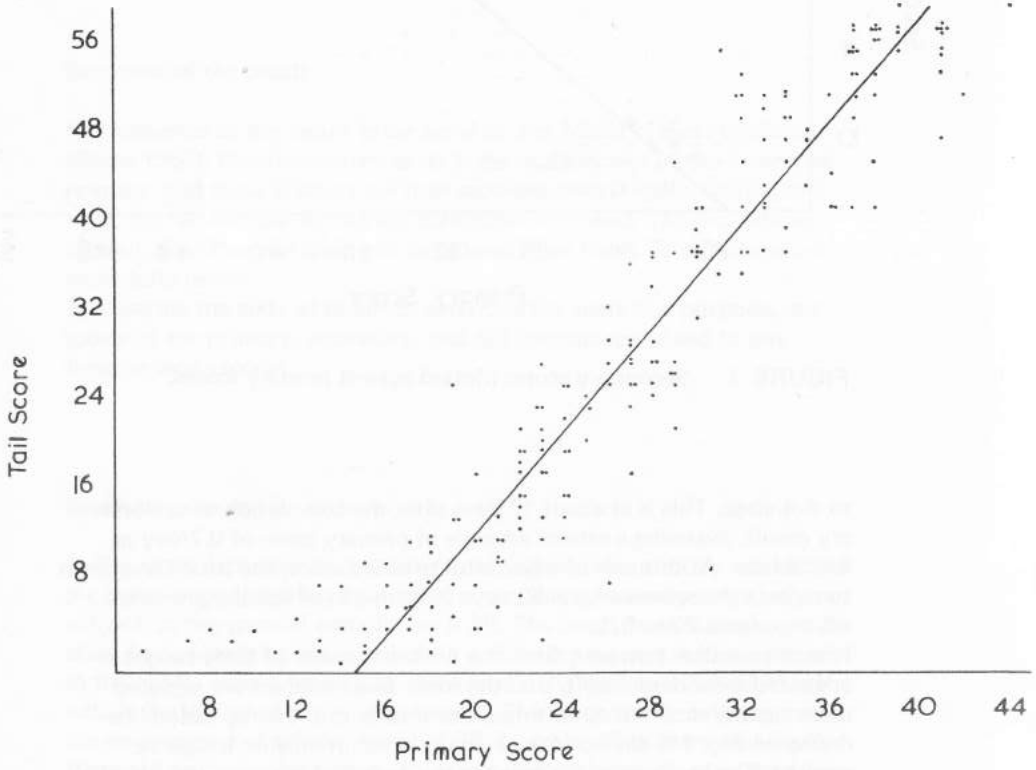


FIGURE 2 Tail scores plotted against primary scores. Tail scores of zero are omitted.

Duration of the moult

The primary score has been found to advance nearly uniformly with time in passerines studied in detail by other workers (Evans 1966, Newton 1967). It is thus possible to estimate the rate of advance from data provided by birds caught more than once during the moult. This is shown in Table 1.

Table 1
Moult scores and rate of moult of birds caught twice

Ring No.	Dates	Scores	Time Interval	Advance of Score	Rate of Advance of Score/Day
JB 29584	1.8	0	(12)	(1+)	-
	13.8	1			
JB 29694	13.8	0	30	25+	>0.83
	12.9	25			
JB 30305	12.9	22	14	13	0.93
	26.9	35			
JB 30382	13.9	24	13	8	0.62
	26.9	32			
JB 30019	17.8	19	40	25	0.63
	26.9	44			
JB 30344	13.9	36	13	5	0.39
	26.9	41			
JB 30340	13.9	23	14	11	0.78
	27.9	34			
		Total	124	87	0.7

These six birds caught twice while in moult show a mean rate of advance of primary score of 0.7 per day, ranging from 0.39 to 0.93, but more data are required to know the precise variation of rate between birds and its causes. This small sample suggests a very considerable variability, which would not have been expected from the results of most previous work.

Lack of the information provided by catching individual birds more than once during the moult is a problem that has been encountered by previous workers in this field, and is overcome by plotting the scores against the date and fitting a regression line. This method assumes that all birds moult at a uniform rate, and that the spread of starting date is small compared with the duration of the moult. The validity of both these assumptions is questionable, but interesting observations can still be made.

In Fig 3 the number of birds at each primary score is plotted against the date. The areas of the circles are proportional to the number of birds in each group as shown beside the figure. The figures for August 15th represent birds caught between the 13th and the 17th, but are grouped for simplicity, as in the other instances the samples were all caught within a twenty-four hour period. The average score of each sample (median), and the limits within which there is a 95% chance of the true value lying are marked for each sample by three horizontal lines; these values are tabulated in Table 2. Continuous lines represent the six birds mentioned previously, which were caught twice, and the dotted lines show the average rate of 0.7/day calculated from these birds

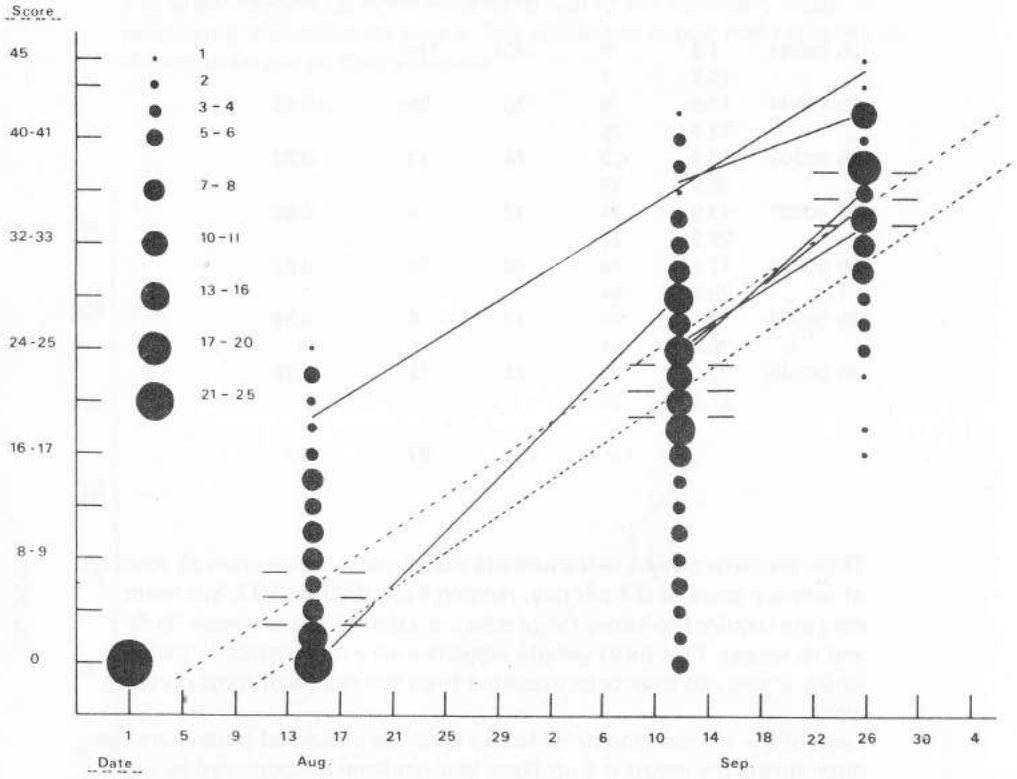


FIGURE 3 Primary scores (grouped in twos) plotted against date. Solid lines represent six birds caught twice during the moult. The dotted lines show a rate of advance of primary score of 0.7/day. For a full discussion see text.

Table 2

Average scores and rate of moult of all birds

Date	Median Score	Time between Samples	Change of Score	Rate of Advance of Score per Day - Estimated Range (95%)
1:8	0			
		13	5.0	.24 - .53
15:8	5.0			
		29	16.3	.49 - .63
13:9	21.3			
		14	13.5	.84 - 1.09
26:9	34.8			

Note that the first estimate of the rate is a minimum, as on Aug 1st, no birds had started to moult, and the calculation assumes that they commenced immediately afterwards. It will be seen that the rates of advance of score in the other two periods are significantly different. This result is unexpected, and means that no straight line on Fig 3 properly represents the moult of this population. Previous studies have not encountered this problem.

There are two possible explanations for this discrepancy;

1) The assumption that the advance of primary score is not linearly related to time is false.
2) The samples caught are not representative of the same population.

These possibilities are considered in turn.

1) Primary score does not advance linearly with time.

This would be contrary to all previously published material. Precise observations however can only be made when the same bird is studied more than once during the moult, and this is rarely possible with wild birds. As a result, the most comprehensive data have been collected from captive birds. It is possible that wild birds, subject to more variable weather conditions and food supplies do not behave in the same way. Newton (1967) found that captive Greenfinches and Bullfinches moult such that the primary score did advance linearly with time except at the very beginning and end of moult (when fewer feathers are growing). The captive Greenfinches moulted significantly slower than data from wild birds had implied. Thus although conclusive data are unavailable for the Tree Sparrow, this hypothesis is considered to be improbable.

2) The samples caught are not representative of the same population.

Except for some of the early ones (up to Aug 16th), all the birds were caught in the same place, and it seems unlikely that the samples represented populations which either moulted at different speeds or started at different times. This however is the possibility which must be considered.

Further inspections of Fig 3 suggests that it was the birds caught on the evening of Sep 12th and the morning of Sep 13th which had scores incompatible with the other samples. There was a range of scores of 0 - 42 compared with 16 - 45 a fortnight later. If these ranges are representative of the same population, the lowest scoring birds, whose primary scores advanced by at least 16 in 14 days were moulting much faster than the findings of Table 1 allow. It seems possible than on Sep 12/13 there were a number of birds present, which were in a less advanced state of moult than expected. In the absence of this group, the regression line would be much as the upper dotted line (slope calculated from the retraps), and the rates of advance between Aug 15th and Sep 12th, and Sep 12th and 26th would be more similar.

The area of catching was at a boundary between a large area of scrub and open arable fields. Birds, which were feeding on wheat stubble, were caught as they entered the scrub for cover, and the catch was probably supplemented by birds coming from other nearby areas to roost in the bushes. The feeding flock appeared to consist of up to 500 birds, but the retrap rate was very low, and suggested a population of 3,000 - 5,000 which was being sampled.

If any differences of population were involved in this situation, the most likely source, would be the difference between the roosting and the feeding birds. Birds caught between 2000 hrs and 0900 are arbitrarily taken to represent roosting birds, and those caught earlier or later, feeding birds. Although there is obviously no such clear cut distinction, this does not alter the argument. In Table 3 these two groups are arbitrarily split into those scoring 20 and below, and those scoring 21 and above; this being approximately the average of the roosting birds.

Table 3
Number of birds divided into groups of score and time of capture

	Score 20 & below	Score 21 & above
Roosting	45	46
Feeding	24	31

The proportion of low scoring birds is lower in the feeding than the roosting birds. This difference is not significant but the suggestion implied is strengthened by the fact that none of the low scoring birds caught at this time were retrapped on Sep 26th, though four higher scoring ones were. It therefore remains a reasonable possibility that two different populations were involved on this occasion.

To conclude, it appears likely that the average rate of advance of primary score is about 0.7/day, as estimated earlier. Although the plot of scores

against date in Fig 3 suggests that the rate changes during the moult, this is considered to be unlikely, and the discrepancy is caused by the presence of a number of less advanced birds on Sep 12th/13th. If these are not considered, the rate of 0.7/day would be approximately correct, and the upper broken line in Fig 3 is thus probably close to the best regression line for the majority of birds.

Why different flocks of birds should simultaneously be in different states of moult is not clear. Time of birth must affect the time of commencement of moult as the bird is sometimes triple brooded (Creutz 1949) and the earliest birds will already have started to moult before the latest have even left the nest (this is discussed further in the next section). Pinowski (1965) showed that the late hatched Tree Sparrows dispersed further from their breeding sites than earlier ones. Thus there seems to be reason to believe that different flocks might be of different aged birds, and hence in different states of moult.

On Aug 1st/2nd, 35 birds were caught in another locality about half a mile from the main catching area. These birds were also feeding in a wheat field and sheltering in scrub; all were juveniles and none had commenced to moult, although about 25% might have been expected to have done so, as will be seen in the next section. These late starting birds, which were caught within a hundred yards of a breeding colony may well have been from second or third broods. One, JB 29584, had just started moulting when caught a fortnight later at the same site.

This observation adds further support to the suggestion made earlier, that different flocks of birds may well represent different age groups and hence different states of moult.

The duration of the moult is the time taken to replace the primaries plus up to 17 days to complete the secondaries after the primaries are finished. This makes a total time for the average bird of about 81 days, or nearly 12 weeks. This is a time comparable to that found in non-migratory finches such as the Yellowhammer, and considerably more than the sixty odd days found in migratory birds such as the Reed Bunting (Newton 1968). The Tree Sparrow is generally considered to be highly sedentary.

Onset of moult

To determine when the moult commences, a starting date has been estimated for each bird handled on Sep 12th/13th and 26th, assuming a rate of advance of primary score of 0.7 per day. The figures for Aug 12th - 17th have been ommitted as about 25% of the birds had not started to moult, and it is thus impossible to estimate their starting dates. Only six birds (of 144) had not started to moult on Sep 12th/13th and one (of 77) had finished on Sep 26th, so little bias is introduced. In Fig 4 the percentage of birds starting to moult is shown for each five day period. Also shown in the same manner, is the breeding season of the Tree Sparrow represented by the date of laying of the first egg, after Seel (1964). Moult commences during a very wide range of time

between Jul 10th and Sep 20th. This is probably related to the wide range of times of birth of the birds, though there is no evidence to suggest that the three peaks of apparent commencement of moult are related to the three peaks for the three broods.

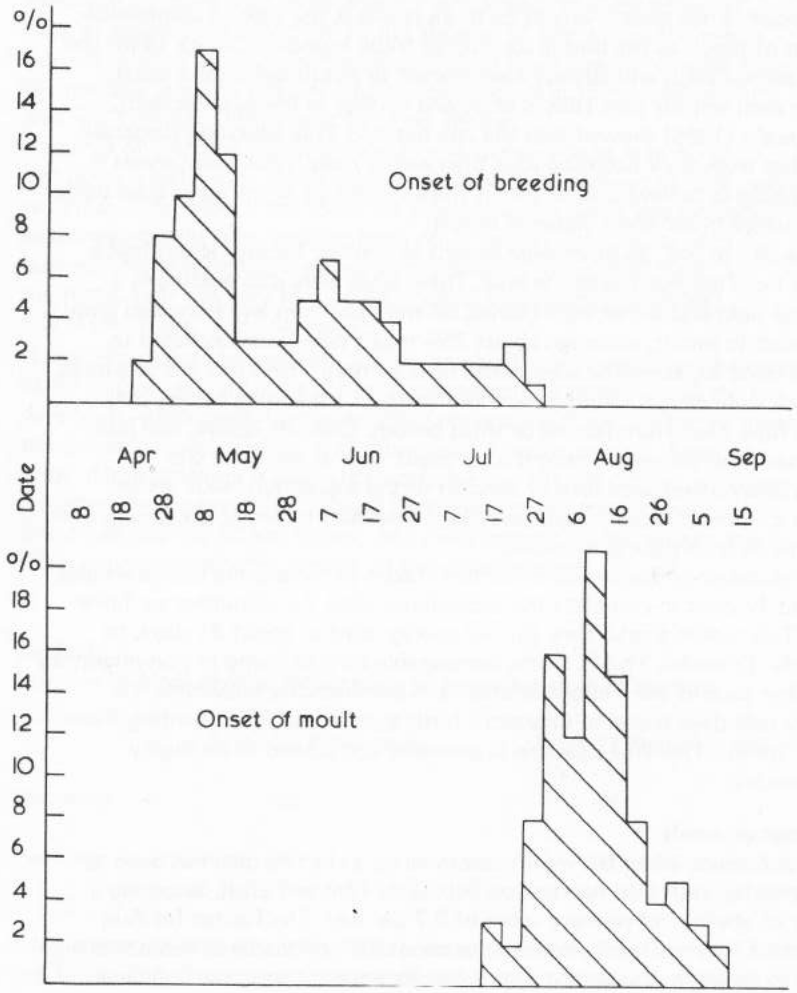


FIGURE 4 Percentages of birds commencing to breed (date of laying of first egg) and moult in five day periods.

Weight changes during the moult

All birds handled were weighed to the nearest tenth of a gram on a Pesola spring balance, as soon as possible after capture. Several variables influence the weight of birds, including the time of day, the size of the bird, the time of year and the state of moult. The weights were plotted against time of day (not illustrated for economy of space), and it was found that there was a steady increase of weight during the day at a rate of about 0 1 gram/hour. All weights referred to subsequently have been adjusted by this amount to give an estimated weight at 1400 hrs. Because of the problems discussed earlier of the presence of different populations, the weight changes during moult are difficult to evaluate with the data available. In Fig 5, the average weights are plotted against each group of scores, from which it will be seen that there is a fairly steady increase of weight during the moult. This is partly independent of the moult, as the weights of birds at the same score showed an increase from one catching time to the next. This is probably a response to the falling temperature, as has been described for increases in weight in winter (Newton 1966b). On any date however the birds in more advanced states of moult are found to be heavier. Previous workers have described both weight gains and losses during the moult of various species (Bell 1970), but no further discussion is presented here, as further material is required before reliable conclusions can be drawn.

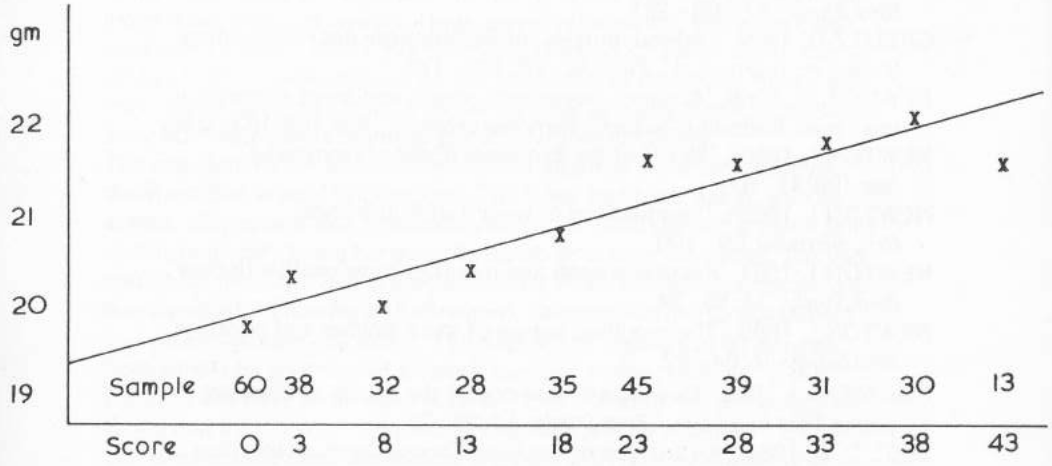


FIGURE 5 Mean weight plotted against primary scores (grouped in fives)

Summary
The Tree Sparrow undergoes a complete post juvenile moult. The sequence of wing and tail moult is the same as that found in most passerines. The moult takes about 80 days, commencing between Jul 10th and Sep 20th; the few birds caught more than once showed considerable variation in the rate of moult. Different groups of birds are thought to start moulting at different times, and this is tentatively suggested to be related to the time of birth. There is an increase in weight during the moult. Further work is required.

Acknowledgements
I am grateful to those members of the Group who assisted in the catching and ringing of the birds in question; they bore the burden nobly. M J Allen, Dr R P Axton and H J Harvey kindly read a draft of the paper and made some very helpful comments.

References

BELL B. D. 1970. 'Moult in the Reed Bunting - A Preliminary Analysis'. *Bird Study,* 17:269 - 281.

CREUTZ G. 1949. 'Untersuchurgen zur Brutbiologie des Feldsperlings (Passer m. montanus)'. *Zool.Jb.* 78:133 - 172.

EVANS P. R. 1966. 'Autumn movements, moult and measurements of the Lesser Redpoll (Carduelis flammea cabaret)'. *Ibis* 108:183 - 216.

NEWTON I. 1966a. 'Moult of the Bullfinch (Pyrrhula pyrrhula)'. *Ibis* 108:41 - 67.

NEWTON I. 1966b. 'Fluctuations of weight of Bullfinches'. *Brit. Birds* 59:89 - 100.

NEWTON I. 1967. 'Feather growth and moult in some captive finches'. *Bird Study,* 14:10 - 24.

NEWTON I. 1969. 'The moulting season of some finches and buntings'. *Bird Study* 15:84 - 92.

PINOWSKI J. 1965. 'Overcrowding as one of the causes of dispersal of young Tree Sparrows.' *Bird Study,* 11:27 - 33.

SEEL D. C. 1964. 'An analysis of the Nest Record Cards of the Tree Sparrow.' *Bird Study,* 11:265 - 271.

SNOW D. W. 1967. 'A Guide to the Moult in British Birds'. *British Trust for Ornithology Field Guide no. 11.*

ACROCEPHALUS POPULATIONS ON THE REED BED

A knowledge of the size of animal populations is of great importance in a variety of fundamental biological and applied conservation management problems. For many purposes a relative estimate such as that used in the British Trust for Ornithology 'Common Bird Census' scheme is satisfactory. For certain purposes, as in the calculation of mortality rates or the estimation of the productivity of an ecosystem, absolute estimates of numbers are essential, such estimates are however difficult to achieve.

If it were possible to obtain regular absolute estimates of the population size of colonial nesting species throughout the breeding season then a number of interesting fields of study would seem possible. These might include: the seasonal build-up and decline of the population; variation between years in the number of breeding pairs; estimation of breeding success; calculation of mortality rates; the amount of immigration into the area resulting from post-breeding dispersal; the amount and timing of migration passage; etc. It therefore seemed desirable to examine the value of currently available population estimation techniques when applied to data such as that collected at Wicken Fen for an isolated colony of Sedge and Reed Warblers.

A number of methods are available for estimating population size. Methods developed before 1966 have been well reviewed by Southwood (1966) who recommends three methods for situations in which population size may be changing between samples as a result of immigration, emigration, births or deaths. These three methods are, the triple-catch method of Bailey (1951), the stochastic method of Jolly (1965) and Craig's (1953) method based on the frequency of recapture. Manly and Parr (1968) have developed a method similar in many respects to that of Jolly but having the advantage of considerable simplicity.

The populations for which estimates are required are those occupying the Reed Bed area of Wicken Fen. The Reed Bed itself has an area of almost 20 hectares and a boundary of about 1900 metres, about a third of this boundary being bordered by scrub or overgrown hedge. The vegetation of the Reed Bed is predominantly Reed (Phragmites communis) but stands of Willow-herb (Epilobium), Stinging Nettle (Urtica dioica) and various grasses also occur. The population appears to be isolated from others by a variety of physical barriers; to the north by Wicken Lode; to the west by an open grass field; to the south by Burwell Lode; to the east by a line of trees and a grass field and by Harrison's Drove.

The populations were sampled by trapping with mist nets erected at a number of sites around the perimeter of the Reed Bed. In general less than half the possible sites were in use on any one sampling occasion. The use of net sites was determined by those erecting the nets for each sampling occasion and no random pattern of use was laid down. The absence of any planned relationship between the position of nets for one

sample and their position for the next together with the large number of people involved in net erection would suggest however that the use of net sites might be considered to be random.
Birds were trapped on almost every week-end from April to August. Sampling intensity may be assessed by multiplying the total amount of net erected by the length of time for which nets were operated, this yields a value in terms of metre net hours. Values for this parameter and the number of birds caught at each sample are given in Table 1. The ring number of all birds captured or recaptured is known so that a complete record of the date of capture and recapture of all birds is available.

TABLE 1 SAMPLE DETAILS

	Date									
	18/4	25/4	2/5	9/5	16/5	23/5	30/5	6/6	13/6	20/6
Metre net hours	1268	3681		5072	2875	622	1317	1290		1061
Number of Adult Sedge Warblers;										
Captured for first time	2	6	13	39	9	3	7	9	-	6
Recaptured	0	0	1	5	7	5	7	5	-	3
Number of Adult Reed Wablers;										
Captured for first time	0	0	0	26	15	1	13	1	-	7
Recaptured	0	0	0	0	6	0	0	0	-	4

	Date									
	27/6	4/7	11/7	18/7	25/7	1/8	8/8	15/8	22/8	29/8
Metre net hours	2877	2241	1537	1665	2540	3293	6219		2049	3067
Number of Adult Sedge Warblers;										
Captured for first time	8	6	2	11	4	7	11	-	0	0
Recaptured	4	2	3	5	0	5	7	-	0	0
Number of Adult Reed Warblers;										
Captured for first time	17	15	11	10	7	15	24	-	2	1
Recaptured	1	14	9	10	7	9	8	-	2	0

Tables 2 and 3 give the estimated number of adult Sedge and Reed Warblers present on each weekend as calculated by five different methods. Standard errors have been calculated where possible but are not included.

Notes:–
1. Estimates were calculated using 'Bailey's correction factor' because of the low number of recaptures.
2. It is impossible to estimate numbers for many dates.
3. A Lincoln Index estimate is included for comparative purposes. It is unlikely that the assumptions of this method are valid for the Reed Bed population.

There are considerable differences between the estimates obtained by the various methods. Some estimates are clearly erroneously high (e.g. Jolly - 1461 Reed Warblers on June 27) or low (e.g. Craig - 12 Sedge Warblers on July 4). In general Craig's method tends to produce the lowest values and Jolly's to produce the largest.
The methods do however agree on some points. All methods suggest that fewer Sedge Warblers are present in late May and in early-mid July than at other times of the year and that Reed Warbler numbers increased in late July - early August.
A number of factors may contribute to the unsatisfactory nature of these results.
All of the methods of calculation used are based on the assumption that the birds in any one sample constitute a random sample of the population. Individual birds may be distributed randomly over the area at certain times of the year but will not be so distributed during the breeding season. Thus although net sites may have been used in random fashion the non-random distribution of birds may mean that samples are not random.
In particular the low estimates obtained from the Craig method may be a reflection of its application to a non-randomly distributed population. This method is based on the number of times individual birds are caught at a particular sampling occasion. If the population is a static breeding season one then, only those birds breeding in the immediate proximity of the nets will be sampled and the population estimate will be of the number of birds breeding in that more limited area. It is interesting to note that estimates for the Sedge Warbler obtained by this method increase outside the breeding season when mobility might be expected to be greater and distribution more random. Reed Warbler estimates obtained by this method also rise in August.
The other methods used are based on the recapture of previously caught birds. The holding of territory and the restriction of most activities to that territory for certain periods of the year is less likely to have a serious effect on these methods, especially if large numbers of birds are caught in the season before territory is held.

TABLE 2 ESTIMATES OF ADULT SEDGE WARBLER NUMBERS

Method	Date																
	18/4	25/4	2/5	9/5	16/5	23/5	30/5	6/6	13/6	20/6	27/6	4/7	11/7	18/7	25/7	1/8	8/8
Bailey [1]	- [2]	-	21	-	34	16	-	315	-	270	156	-	15	-	40	-	-
Jolly	-	-	56	67	66	38	75	124	-	224	282	480	75	230	-	185	-
Craig	-	-	40	213	39	30	30	44	-	-	31	12	32	162	-	72	220
Manly and Parr	-	-	28	66	67	36	72	60	-	110	140	162	56	108	-	-	-
Lincoln [3]	-	14	45	126	93	48	40	105	-	140	117	108	48	42	80	52	114

TABLE 3 ESTIMATES OF ADULT REED WARBLER NUMBERS

Method	Date																
	9/5	16/5	23/5	30/5	6/6	13/6	20/6	27/6	4/7	11/7	18/7	25/7	1/8	8/8	15/8	22/8	29/8
Bailey [1]	- [2]	-	-	-	4	-	342	-	37	42	525	150	132	-	-	-	-
Jolly	-	45	-	-	-	-	41	1461	77	154	100	406	109	288	-	-	-
Craig	38	53	-	54	-	-	25	66	96	42	88	72	91	306	-	18	-
Manly and Parr	-	-	-	-	-	-	41	378	56	79	80	210	88	-	-	-	-
Lincoln [3]	-	82	42	14	26	-	6	66	170	68	84	150	350	198	-	80	8

It is possible that estimates reflect variation in sampling effort rather than any property of the populations or of the methods of calculation. This has been tested by correlation analyses between population estimates and the associated sampling effort (Table 4).

TABLE 4. Correlation coefficients between Sampling Intensity and Population Estimates.

Method of Calculation	Species	
	Sedge Warbler	Reed Warbler
Bailey	-0.24	-0.21
Jolly	0.02	0.16
Craig	0.76	0.69
Manly and Parr	0.14	0.53
Lincoln	0.30	0.54

Clearly sampling effort has little or no direct effect on the estimates derived from most methods. As might be expected from the previous discussion Craig's method appears to be the most susceptible to this bias.

The low retrap rate is clearly an important fact affecting population estimates. The absence of retraps means that no estimate can be made while a low number of retraps may result in very inflated estimates, (e.g. One extra Reed Warbler retrap on June 27 would have roughly halved the population estimate.)

Despite these qualifications the general agreement between methods in trends at certain times of the year may be suggestive that true fluctuations in population size due to immigration, emigration or death are being observed. It must however be concluded that present methods of estimating population size cannot be satisfactorily applied to populations of the size occupying the Reed Bed area with the level of sampling employed.

Summary

Attempts were made to estimate the size of adult Sedge Warbler and Reed Warbler populations at weekly intervals in the Reed Bed area of Wicken Fen, using data collected during intensive sampling from April - August, 1970. It proved impossible to obtain consistent estimates with any of the five methods employed, possible reasons for this are discussed.

References

Bailey, N. T. J. 1951 On estimating the size of mobile populations from recapture data. *Biometrika,* 38, 293 - 306.

Craig C. C. 1953 On the utilization of marked specimens in estimating populations of flying insects. *Biometrika,* 40, 170-176.

Jolly G. M. 1965 Explicit estimates from capture - recapture data with both death and immigration - stochastic model. *Biometrika,* 52, 225 - 247.

Lincoln F. C, 1930 Calculating waterfowl abundance on the basis of banding returns. *U.S.D.A.* Circ., 118, 1 - 4.

Manly B. F. J. and Parr, M. J. 1968. A new method of estimating population size, survivorship, and birth rate from capture - recapture data. *Trans. Soc. Br. Ent.,* 18, 81 - 89

Southwood T. R. E. 1966 *Ecological Methods,* Methuen, Lond. 75 - 89.

POPULATION ESTIMATES AND MIST NETTING: AN INTERIM REPORT

Introduction

This note describes the result of an attempt made in 1970 to sample the bird populations in different habitats by means of mist netting. The areas concerned are not wholly suited to mapping census work, because of the very dense vegetation; mapping has not however been attempted. During three weekends (May 16th-17th, July 4th-5th, and August Ist-2nd), netting was carried out simultaneously at five different sites, which are described below. The nets were placed in the same sites each time, in order to make the programme reproducable in subsequent years. Two hundred feet of net were used on all sites except B (300 ft) from Friday evening to Sunday morning. To consider the catching effort to be the same on all sites is probably erroneous however as the net sites vary in their conspicuousness and susceptibility to wind. It is hoped that the numbers of each species caught are closely related to their number in the area with the exception of all non-passerines and corvids, which are unlikely to be caught as they do not move in thick vegetation.

Tables 1 and 2 show the total numbers of captures of each species on the five sites. Adults and juveniles are separated. The five sites are briefly described below, and some of the more obvious differences in the bird numbers are noted.

The Sites

A1 is the old brick pits in the NE corner of the Fen. Deep water, with a sturdy growth of reeds on the borders is surrounded by willow and hawthorn, with woodland adjoining. The habitat is the nearest to the climax found on the Fen, where mature trees are uncommon. Reed and Sedge Warblers are both numerous, but surprisingly perhaps, woodland birds such as tits and thrushes are not particularly numerous.

A2 is the common Fen in the NE corner. A narrow plot of uncut sedge is edged on both sides by carr, which on the north side is fairly mature, with a small area of young Oakwood. Reed and Sedge Warblers are present in roughly equal numbers but are not particularly numerous. A wide range of species is present, but none are very abundant, although tits and finches are fairly well represented.

B lies at the extreme NE corner of the Fen, and in this area, the underlying clay soil reaches the surface, and there is thus a different kind of habitat from that found on the peat-covered fen. The netting sites represent the boundary between dense hawthorn and willow thickets on the peat, and the hawthorn scrub interspersed with rough grassland on the clay. Sedge grows in the small open areas on the peat. This area has the richest and most diverse avifauna of any found on the Fen. Tits, thrushes, Reed, Sedge and other Warblers, Dunnocks and finches are well represented. This is shown particularly by the very large numbers of juveniles caught. It must be remembered that 300 feet of net were used on this site as against 200 on all the others, but the catches are still larger on this site than any other even when this has been allowed for.

FR is the ride running along the SE edge of the Reed Bed on Adventurers' Fen. The reed bed is a large (50 acres) stand of almost pure reed, with a thick hawthorn-fringed ride between it and a wet field of rough pasture with rushes. Sedge and Reed Warblers are approximately equally numerous. Some tits and finches are fairly well represented.

FL is on the opposite side of the Reed Bed from FR, from which it differs somewhat. On FL, the Reed Bed is edged with scattered hawthorns and a dense growth of grasses and willow herbs, and this appears to make it a better habitat, particularly for Reed Warblers, but also for Sedge Warblers. For some unknown reason, many more juvenile birds were caught on this site than on FR, although there were less adults.

Conclusions

Before it is possible to assess the suitability of this method of estimating bird numbers in a habitat, it is necessary to repeat the observations over several years to see whether any changes are consistent from one site to

Table 1
Captures of adult birds

Species	Site totals A1	A2	B	FR	FL	Grand Total	Weekend totals May	Jul	Aug
Snipe	-	-	-	3	-	3	3	-	-
Swallow	2	1	2	2	-	7	4	3	-
Cuckoo	-	-	-	1	-	1	1	-	-
Jay	-	-	1	-	-	1	-	1	-
Great Tit	-	3	2	-	1	6	3	1	2
Blue Tit	-	5	4	3	3	15	9	3	3
Willow Tit	-	2	2	-	2	6	1	3	2
Long-tailed tit	2	3	3	2	-	10	6	3	1
Tree Creeper	1	1	-	-	-	1	-	1	-
Wren	5	3	8	2	1	19	7	8	4
Song Thrush	4	2	23	2	4	35	18	10	7
Blackbird	5	4	14	5	2	30	18	9	3
Nightingale	-	-	1	-	-	1	-	1	-
Robin	5	1	2	2	3	13	7	4	2
Grasshopper Warbler	-	1	2	-	1	4	1	2	1
Reed Warbler	31	19	31	18	70	169	37	80	52
Sedge Warbler	30	19	42	16	33	140	70	37	33
Blackcap	5	1	8	5	-	19	6	6	7
Garden Warbler	-	-	-	-	-	-	-	-	-
Whitethroat	2	-	5	2	3	12	7	4	1
Lesser Whitethroat	1	-	9	-	2	12	10	1	1
Willow Warbler	3	3	7	-	2	15	10	2	3
Chiffchaff	-	2	2	-	-	4	1	2	1
Spotted Flycatcher	3	-	1	-	2	6	-	5	1
Dunnock	7	16	22	2	13	60	20	26	14
Red-backed Shrike	-	-	-	-	-	-	-	-	-
Greenfinch	3	7	2	5	2	19	10	3	6
Goldfinch	2	2	6	2	-	12	4	8	-
Linnet	-	-	-	-	-	-	-	-	-
Redpoll	4	2	9	2	10	27	14	10	3
Bullfinch	10	7	23	1	7	48	25	11	12
Chaffinch	-	-	9	-	-	9	2	5	2
Yellowhammer	-	-	2	-	-	2	1	1	-
Reed Bunting	2	6	8	8	3	27	15	6	6
Tree Sparrow	5	-	10	-	-	15	10	3	2
Totals	131	110	260	83	164	748	320	259	169

another. When more data of this kind have been accumulated, a fuller analysis of the diversity of species in a habitat and the habitat preferences of particular species should be possible. The difference between sites and species which have been shown briefly in this note are, by and large, as one would expect, and it is hoped that more work of this kind will provide more detailed and useful information.

Table 2
Capture of juvenile birds

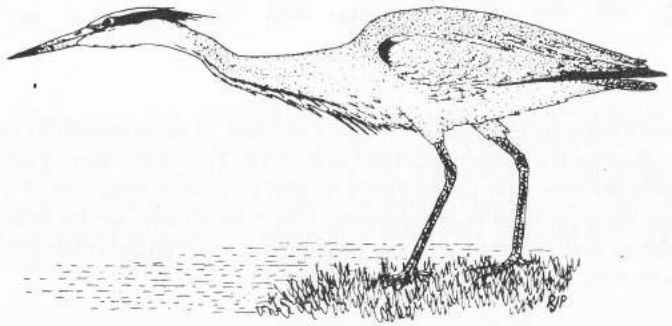
Species	Site totals A1	A2	B	FR	FL	Grand total	Weekend total May	Jul	Aug
Snipe	-	-	-	-	-	-	-	-	-
Swallow	-	-	-	1	-	1	-	1	-
Cuckoo	-	-	-	-	-	-	-	-	-
Jay	-	-	-	-	-	-	-	-	-
Great Tit	-	2	10	10	-	22	-	5	17
Blue Tit	3	8	40	6	8	65	-	22	43
Willow Tit	2	4	6	3	1	16	-	8	8
Long-tailed Tit	-	1	1	-	-	2	-	1	1
Tree Creeper	1	-	1	-	-	2	-	1	1
Wren	7	9	10	4	8	38	-	16	22
Song Thrush	1	-	13	5	-	19	4	8	7
Blackbird	-	1	6	6	2	15	-	6	9
Nightingale	1	-	-	-	-	1	-	1	-
Robin	14	12	14	3	-	43	-	21	22
Grasshopper Warbler	-	-	3	-	1	4	-	-	4
Reed Warbler	6	13	11	15	16	61	-	4	57
Sedge Warbler	22	11	46	18	34	131	-	65	66
Blackcap	4	3	9	8	5	29	-	2	27
Garden Warbler	-	-	3	-	-	3	-	-	3
Whitethroat	1	-	16	-	4	21	-	8	13
Lesser Whitethroat	-	-	3	-	-	3	-	-	3
Willow Warbler	3	13	18	15	12	61	-	19	42
Chiffchaff	3	6	10	3	4	26	-	13	13
Spotted Flycatcher	-	-	-	-	-	-	-	-	-
Dunnock	1	6	48	9	3	67	-	24	43
Red-backed Shrike	-	-	-	1	-	1	-	-	1
Greenfinch	-	-	1	-	-	1	-	-	1
Goldfinch	-	-	1	3	1	5	-	3	2
Linnet	-	-	1	-	1	2	-	1	1
Redpoll	2	-	17	3	1	23	-	4	19
Bullfinch	4	4	4	14	3	29	-	4	25
Chaffinch	1	-	12	2	-	15	-	4	11
Yellowhammer	-	-	5	-	-	5	-	-	5
Reed Bunting	-	-	9	2	1	12	-	7	5
Tree Sparrow	-	-	43	-	-	43	-	9	34
Totals	76	93	361	131	105	766	4	257	505

It need hardly be emphasised that the number of birds caught in the three weekends of intensive effort was 1512. This respresents a very valuable contribution to the year's ringing total and collection of information on wing lengths and weights. This reason alone would almost be enough to justify continuing the programme, even without the promise of some very interesting findings in years to come.

ACCURATE WEIGHING IS IMPORTANT

One of the interesting results found at Wicken during 1969 concerned the weights of Reed and Sedge Warblers: the average weight of Sedge Warblers was found to increase smoothly with time of day, whereas the average weight of Reed Warblers did not show such a smooth pattern but appeared to reach a maximum about 10 hours after sunrise. During 1970 about twice as many Acrocephalus warblers were handled as in the previous year, and attempts were made to weigh birds to the nearest 0.1 gm; accordingly a great wealth of data is now available for analysis. A preliminary analysis of some of this data is shown in the Figure. The thick line shows the mean weight (averaged over three hour periods) derived from 625 handlings of Reed Warblers during 1970, and the results are in fact consistent with a uniform increase of weight with time for the birds handled. However there are various selection effects which must be considered before these results can be applied to the behaviour of the 'average' Reed Warbler: for example birds which have fully fed may be inactive and thus unlikely to get caught; furthermore at any time of day there is a wide scatter in the weights of birds caught, and so the average weight derived must inevitably have a considerable random error attached to it.

An alternative method of investigating weight changes is to follow the weight of an individual bird throughout the day. In the Figure the thin lines represent the weight changes observed in six birds which were captured and weighed three or more times in a single period of 24 hours. Birds *c, d* and *e* seem to have followed the general trend of a uniform weight increase with time, but birds *a, b* and *f* have significantly departed from this trend; *a* and *f* had a rapid increase in weight early in the day, whereas *b* had its main increase in weight late in the day. Although only six birds have been discussed here, it does seem from these measurements that Reed Warblers have the ability to put on weight at a rate as high as 1 gm in 4 hours; this ability is no doubt of advantage to the species when on migration. However not all Reed Warblers on Wicken Fen feed this rapidly, and the average weight increase for all birds handled is less than 1 gm in 12 hours.



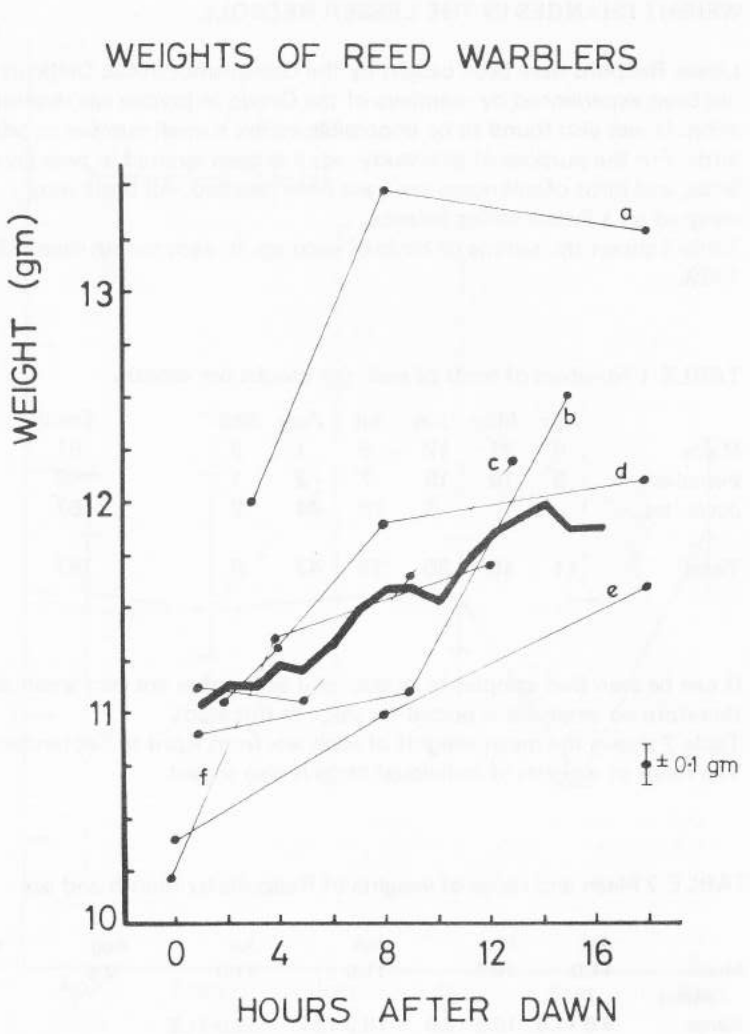


FIGURE weights of Reed Warblers. Thick curve: mean weight (averaged over three-hour periods) derived from 625 weighings of Reed Warblers during 1970; thin lines: weights during a single 24-hour period of six Reed Warblers.

This simple analysis illustrates the need to weight every bird as accurately as possible. The ringer can never know whether the bird he is weighing will have an extensive retrap history, and thus provide important information on the weight changes which really do take place in a single bird.

WEIGHT CHANGES IN THE LESSER REDPOLL

Lesser Redpolls have been caught by the Group since 1968. Difficulty has been experienced by members of the Group in precise age determination. It was also found to be impossible to sex a small number of adult birds. For the purpose of this study, age has been ignored in post-juvenile birds, and birds of unknown sex have been omitted. All birds were weighed on a Pesola spring balance.
Table 1 shows the sample of birds of each sex in each month from 1968-1969.

TABLE 1 Numbers of birds of each sex caught per month.

	Apr	May	Jun	Jul	Aug	Sep	Total
Males	6	21	12	8	1	3	51
Females	5	19	15	7	2	1	49
Juveniles	-	-	3	18	44	2	67
Total	11	40	30	33	47	6	167

It can be seen that samples in August and September are very small and therefore no emphasis is placed on them in this study
Table 2 shows the mean weights of each sex from April to September. The range of weights of individual birds is also shown.

TABLE 2 Mean and range of weights of Redpolls by month and sex

	Apr	May	Jun	Jul	Aug	Sep
Mean Males	11.0	10.9	11.0	11.0	9.5	11.6
Range	9.8-11.5	10.5-12.0	10.0-12.7	10.0-11.5	-	11.0-12.3
Mean Females	10.9	10.9	12.0	12.4	11.9	10.9
Range	8.5-12.0	9.5-12.5	9.5-14.0	10.6-14.5	11.0-12.8	-

It can be seen from the above table that whereas the males maintained a fairly steady weight throughout the summer, the weight of females increased substantially in June and July. The increase from May to June is about 1.1 grams in females but only 0.1 in males. This is expressed graphically in Fig 1 to give a visual impression of the rise.

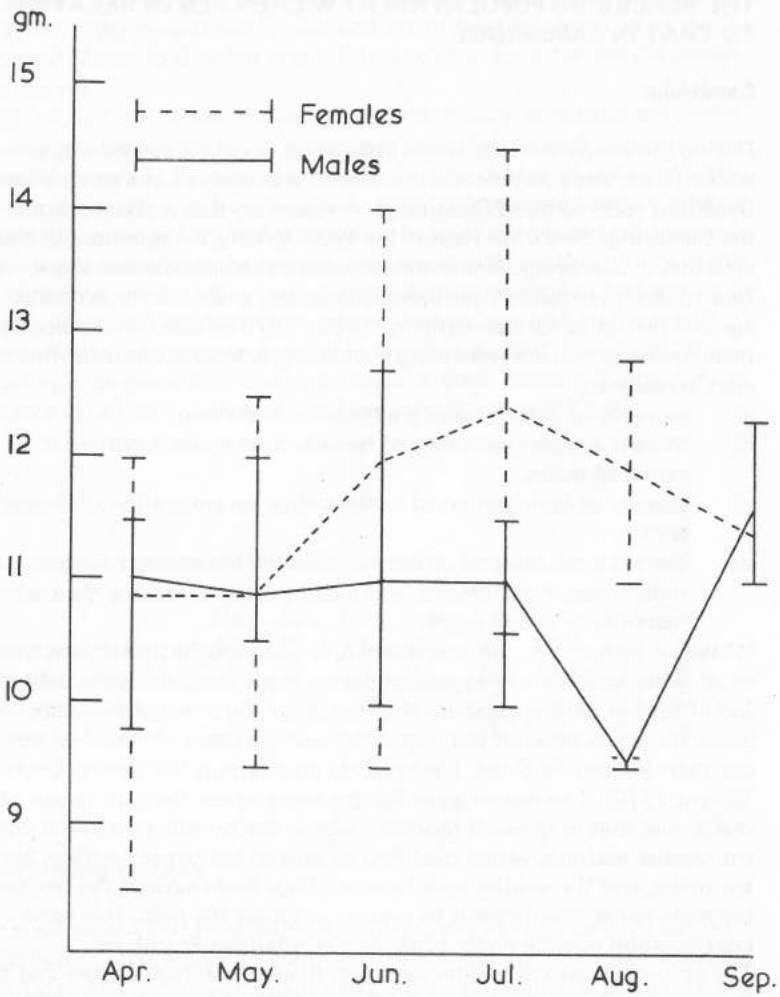


FIGURE 1 Mean weights and ranges of males and females by month.

Summary
It is concluded that female Lesser Redpolls caught at Wicken Fen show a marked increase in body weight in mid summer; whereas males of the species apparently do not.

THE BLACKBIRD POPULATION AT WICKEN FEN IN RELATION TO THAT IN CAMBRIDGE

Cambridge

During the winter months, when little or no ringing is carried out at Wicken Fen, some members of the Group are involved in a study of the Blackbird roosts around Cambridge. A report on that work appears in the Cambridge Bird Club Report for 1969. Briefly the summary of the situation in Cambridge is that the respective catchment areas of the four roosts investigated have been established, and an analysis of the age and sex ratios for the winter of 1969 - 1970 revealed that twice as many males as females were caught and ringed. Four reasons for this were considered.

a) more males than females are hatched in the nest.
b) there is a higher mortality of females than males, resulting in an excess of males.
c) there is an immigration of males and/or an emigration of females in winter.
d) there is a behavioural difference between the sexes; males using roosts more than females, and moving around, making themselves more likely to be caught.

Whilst no firm conclusion was reached, it was thought that d) was the most likely solution and suggestions were made concerning the collection of further data to establish the reason for the unequal sex ratio. Since the preparation of that report however, a paper on the unequal sex ratio in nestling Great Tits in study populations has been published (Dhont 1970). The reason given for the unequal sex ratio, in favour of males, was that in times of food shortage in the breeding season, it was the smaller nestlings which died first in general the larger nestlings are the males, and the smaller ones females. Thus there existed the tendency for more males than females to survive and leave the nest. This same consideration might equally apply to the suburban Blackbird .
The percentage success of the suburban Blackbird is higher than that of the woodland nesting one, but the fledging rate is lower (Lack 1966), i.e. in general the average woodland nest is predated, but if it is not, then all the eggs hatch and all the young leave the nest, and in the average surburban nest all the eggs hatch, but few of the young leave the nest. Thus reason a) may not be as unlikely as was originally considered, but could be a contributory factor to the sex ratio in Cambridge in winter, where a largely suburban population is involved.

Wicken Fen

During the breeding season too few adult Blackbirds are caught in Cambridge to establish the sex ratio then. However over three hundred

Blackbirds have been ringed at Wicken Fen in the summers 1968 - 1970 so details of these are examined to throw some light on the subject. Table 1 is the breakdown by age and sex of the birds handled in the months March to October and is intended as a guide for the discussion following.
The totals for each sex for each month from May to August are divided into adults and juveniles. It is thought that ringers can distinguish male juveniles at an earlier age than females, as the change of colour during the body moult is more obvious. Another bias probably occurs towards breeding males in May and June when females are incubating eggs and are thus less available for capture. When considering the months March and October in the table further caution must be applied concerning the presence of non-resident birds, winter visitors may still be present in early March, and may be arriving in October, so that one could be dealing with more than one population in these months. Retraps are included on a one handling allowed per calender month basis.

Table 1

Numbers of captures of Blackbirds

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Breeding males	14	39	71	43	20	24	7	6
Breeding females	9	31	28	32	27	15	1	10
Juvenile males	-	-	1	1	4	9	4	9
Juvenile females	-	-	-	-	1	-	6	6
Unsexed juveniles	-	-	1	12	12	24	1	-

Concluding remarks

It is suggested that in order to study the sex ratio in a purely resident population, the month to consider is September, a time when juveniles, at the end of their body moult period, can be resolved into males and females, and before the population is too greatly affected by immigration and dispersal. At present the data are insufficient for any firm conclusions to be drawn, but it is hoped that this discussion will stimulate thought and action.

References

DHONT A. A. 1970 'The sex ratio of nestling Great Tits'. *Bird Study,* 17: 282-286
LACK D. 1966 *Population Studies of Birds.* Oxford

MEMBERSHIP OF THE GROUP

The Wicken Fen Group is anxious to enrol new members either as ringers, trainees or friends, but potential trainees are reminded of our two basic principles:

i) Ringing is a serious and disciplined undertaking, and those wishing to train must be prepared to visit the Fen frequently, particularly between April and October when the major part of the year's work is done. The recommendation for a permit is not an inevitable consequence of ringing a certain number of birds or completing a given number of month's training, but depends on the complete confidence of the trainer concerned. The 'C' permit is awarded, after all, in his name.
ii) A good knowledge of bird identification is a necessary first step for the potential trainee.

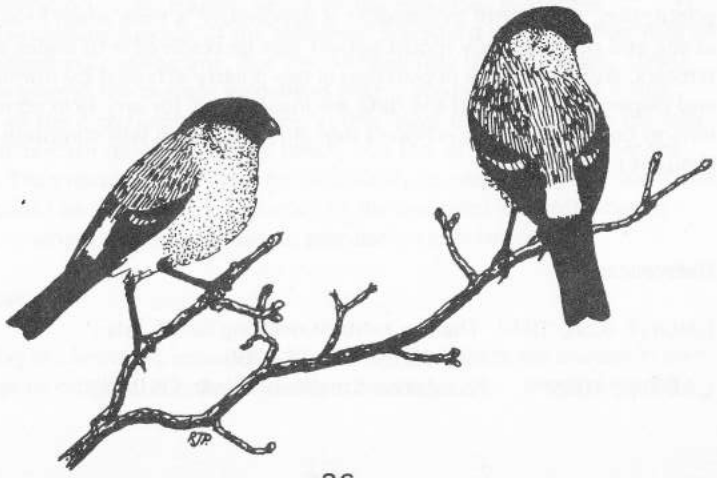
There are two membership categories:

a) Members (including 'A', 'B' and 'C' permit holders and trainees after their probation period). £2.50 per annum
b) Friends 50p per annum

Both classes of members will receive the periodic bulletins produced by the Group and one copy of each report.

A prospective trainee will serve a probation period of not more than six months and will pay an enrolment fee of 50p. On acceptance as a trainee he will pay the additional £2.00 and become a full member.

The category of Friends is open to all who are interested in the Group's activities and would like to support them, but do not wish to take part in ringing itself.



MEMBERS

Honorary Secretary:	M.J.Allen, Stuart House, Mill Lane, CAMBRIDGE CB2 1RY
Honorary Treasurer & Ringing Officer:	D.J. Steventon, St. John's College, CAMBRIDGE
Honorary Research Officer:	C.J. Bibby, St. John's College, CAMBRIDGE
Members:	Dr. N.J.B.A. Branson, Trinity College, CAMBRIDGE
	P.M.M. Bircham, 10 Duxford Road, WHITTLESFORD
	J.A. Dick, Trinity Hall, CAMBRIDGE
	A.B. Gammell, Honey End, Honey Hill, Fenstanton, HUNTINGDON
	H.J. Harvey, School of Agriculture, Downing Street, CAMBRIDGE
	P.R. Messent, Pembroke College, CAMBRIDGE
	A.K.M. St. Joseph, Histon Manor, Histon, CAMBRIDGE
	J. Sorensen, R.S.P.B., Purl's Bridge, Manea, via MARCH, Cambs
	Dr. C.J.R. Thorne, St. Catherine's College, CAMBRIDGE
Trainee Members:	P.E. Coe, 28 Pen Close, Cherry Hinton, CAMBRIDGE
	Miss C.M. Cousans, High Street, Bassingbourn, Nr. ROYSTON, Herts
	W.J.A. Dick, 8 Madingley Road, CAMBRIDGE
	P. Harris, 5 Chalmers Road, CAMBRIDGE
	R.C. Kedge, 19 Sterne Close, CAMBRIDGE
	G.E.Mann, 1 Stockwell Street, CAMBRIDGE
	Miss A. Naylor, 3 Mortimer Road, CAMBRIDGE
	H.A. Slatter, Pembroke College, CAMBRIDGE
	W.C. Smith, 26 Almond Grove, Bar Hill, CAMBRIDGE
Friends of the Group:	Lavenham Bird Club, c/o R.F. Britten, The Old Forge, CHELSWORTH, Suffolk
	B.S. Nau, 30 Manor Road, BARTON-LE-CLAY, Beds
	M.R. Payne, Field Barn, Boughton, KINGS LYNN, Norfolk
	P. Reynolds, Pincote, Wildman's Lane, Kingston, CAMBRIDGE
	N. Smith, 20 Manor Park, Histon, CAMBRIDGE
	M. Wynn, Glebe House, Kirtling, NEWMARKET, Suffolk