

*P. Roberts.*

**THE WILDFOWL TRUST**

**SLIMBRIDGE GLOUCESTERSHIRE**



**NATIONAL WILDFOWL COUNTS**

**1952-1954**

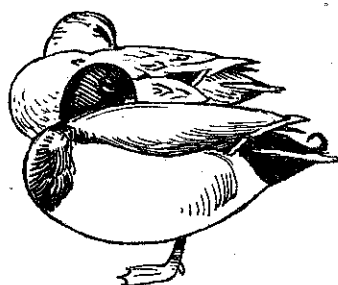
**BY G. ATKINSON-WILLES**

**COUNTRY LIFE LIMITED FOR THE WILDFOWL TRUST**

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SLIMBRIDGE GLOUCESTERSHIRE

**National**  
**Wildfowl Counts**  
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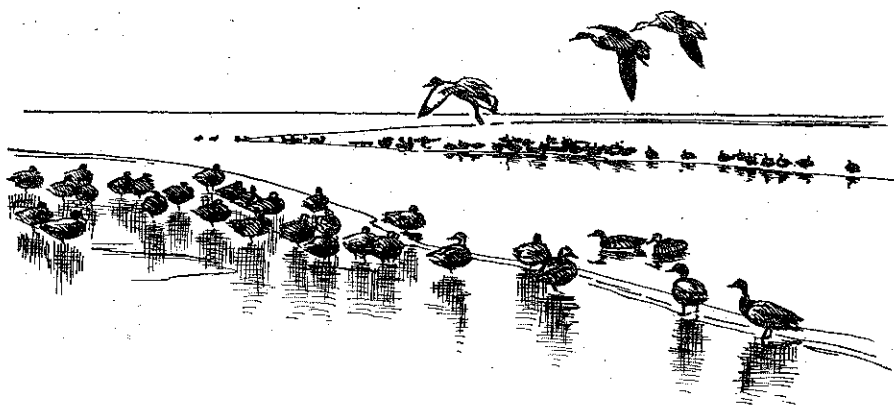
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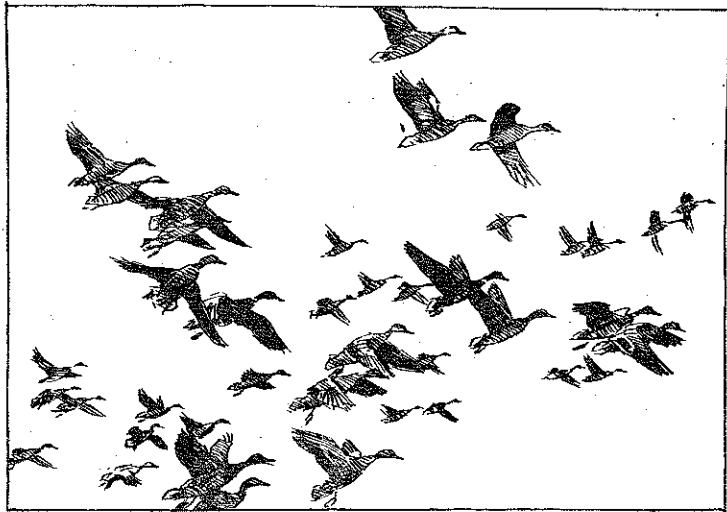
## FOREWORD

DURING the years that I served on the British Section of the International Wildfowl Inquiry Committee, I was able to watch the growth of the Wildfowl Counts from their early beginnings to their present country-wide organisation. So when in the spring of this year the British Wildfowl Inquiry Committee was dissolved and offered the responsibility for the counts to the Wildfowl Trust I felt that we were accepting a commitment which was already an old friend. I had read the favourable report of the Oxford statisticians to whom the count data were submitted and was encouraged, as I feel many counters will be, to learn that the degrees of accuracy attained were adequate to give important scientific results and to justify the expenditure of time and effort involved in counting. It so happened that the offer of the responsibility for the counts coincided with a decision on the part of the Wildfowl Trust Council to undertake a much wider programme of scientific research. So the counts fitted into the programme and the expansion of staff was geared to receive them. In addition to their main object of detecting population trends, the counts are a most valuable survey of the distribution of wildfowl in Great Britain, and contain so much essential data which we need as a basis for our scientific studies of wildfowl that we were delighted to have the opportunity of taking them over from the Wildfowl Inquiry Committee. The Wildfowl Trust is fortunate to inherit an organisation which has already overcome its teething troubles and I should like to take this opportunity of expressing my appreciation of all the hard work which has been done by Miss Barclay-Smith and the honorary staff of the International Wildfowl Research Institute to foster this investigation in its early days. We hope that the enthusiasm shown by counters hitherto will be maintained, and we intend to extract every morsel of information from the enormous quantity of data which has been collected and which will, I hope, in the future continue to pour in. It is our plan to try to extend the coverage of the scheme during the next ten years until it represents a survey of all the most important wildfowl habitats in the land.

*Slimbridge, Glos.*

PETER SCOTT





## PART I

### WILDFOWL COUNTS IN THE BRITISH ISLES

BEFORE describing the development of the Wildfowl Counts since the last report, it would be as well to summarise very briefly their early history. They were started in 1947 by the British Section of the International Wildfowl Inquiry Committee in an attempt to ascertain whether the populations of wildfowl wintering in this country were increasing, decreasing, or remaining unchanged.

The original conception of regular monthly counts of wildfowl for a prolonged period as the best means of providing the necessary evidence remains sound and unaltered in the light of experience and is a striking credit to the foresight of its authors. Certain refinements in the uses to which the results may be put have been evolved since, but the original plan of comparing year by year the numbers of each species on selected waters remains the basis of the investigation.

It was on these lines that the Wildfowl Counts were started, and by the spring of 1951 the results were so promising that it was decided to extend the cover as widely as possible. It is doubtful whether this decision would have been made had the Committee not had abundant evidence of the goodwill and interest of the counters in the early days.

During the season of 1951-52 the Wildfowl Counts greatly increased the extent of their cover, and reference to the table below, which shows the progress of the counts before and since then, indicates that there is every sign of this interest remaining unabated. The upper columns of the table show the number of waters which were counted regularly each month throughout the season, whilst the lower columns show the number of waters for which isolated or irregular returns were received. It will be noticed that the figures here do not tally with those published in the previous report on Wildfowl Counts. They have been reviewed in the light of experience and are thought to present a truer picture of the progress of the counts.

	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54
<i>Regular Counts</i>						
England .. ..	185	242	219	368	327	345
Scotland .. ..	37	50	53	85	77	91
Wales .. ..	7	7	3	7	6	5
Ireland .. ..	—	—	—	18	39	36
	229	299	275	478	449	477
Percentage of counts which are regular ..	40%	59%	55%	71%	72%	77%
<i>Occasional Counts</i>						
England .. ..	253	163	166	137	124	103
Scotland .. ..	86	37	52	42	39	22
Wales .. ..	5	6	7	5	5	7
Ireland .. ..	—	—	—	12	3	6
	344	206	225	196	171	138
<i>Total Regular and Occasional</i> ..	573	505	500	674	620	615

It will be seen that the number of 'regular' counts have increased whilst the number of 'occasional' counts has tended to dwindle. This steady rise in the percentage of 'regular' waters counted is eminently satisfactory, as they have a much wider application in the analysis of population trends. Do not, however, think that the 'occasional' counts are wasted effort. In the new work proposed, which is described in a later section of this report, it will be seen that they are to play a very important part in assessing the status of wildfowl in Great Britain.

It is perhaps of interest to note that the decrease in the number of 'occasional' counts is due not so much to their transference to the list of 'regular' counts but rather to the temporary abandonment of small waters which showed little or no results. The 'regular' counts on the other hand owe their increase in number to the addition of more major waters. Since the Wildfowl Counts started six years ago, information, some of it admittedly very incomplete, has been collected on the wildfowl populations of some 1100 waters.

#### Organisation of the Counts

It was appreciated at the very beginning that a project such as the Wildfowl Counts must depend for its success on the enthusiasm of its voluntary counters, and that as much use as possible must be made of local knowledge. It was decided that the only way to achieve this was to find county or regional organisers who would be prepared to run the counts in their own areas with a minimum of interference from headquarters. In this the Wildfowl Counts have been most fortunate. Seldom can an organisation have been served by such a willing band of helpers, and the success of the project is a direct reflection of their whole-hearted efforts. It is sad that space prohibits a full list of all counters, but below is given a list of those king-pins, the Regional Organisers.

## REGIONAL ORGANISERS

\*denotes British Trust for Ornithology's Regional Representative

BERKSHIRE	W. D. Campbell * assisted by	The School House, Cholsey. C. E. Douglas (Reading Ornithological Club). Middle Thames Natural History Society. Newbury Field Club.
BUCKINGHAMSHIRE	J. Field	Widbrook Cottage, Widbrook Common, Cookham (Middle Thames Natural History Society).
CAMBRIDGESHIRE	I. C. T. Nisbet	King's College, Cambridge. (Cambridge Bird Club.)
CHESHIRE	Maj A. W. Boyd, M.C. *	Frandley House, Northwich.
CORNWALL	A. G. Parsons	Parc Vean, Redruth. (Cornwall Bird Preservation Society.)
CUMBERLAND	W. Atkinson *	2, Duke Street, Penrith.
DERBYSHIRE	Capt W. K. Marshall *	The Silverhill, Radburne, Kirk Langley, Nr. Derby.
DEVONSHIRE	D. P. Holmes	25, Lang's Rd., Paignton. (Devon Bird Watching and Preservation Society.)
DORSETSHIRE	J. C. Follett and P. S. Day	Windward, Mayfield Ave., Parkstone. 15, Old Station Rd., Upwey, Weymouth.
ESSEX	Maj-Gen C. B. Wainwright, C.B. assisted by	Little Berechurch, Colchester. G. A. Pyman and R. U. A. Marshall (Essex Bird Watching & Preservation Society).
GLOUCESTERSHIRE	H. Boyd	The Wildfowl Trust, Slimbridge.
HAMPSHIRE	N. Gray	I.C.I. Game Research Station, Burgate Manor, Fordingbridge. (Retired April 1954, successor not yet appointed.)
ISLE OF WIGHT	J. Stafford *	24, Cypress Rd., Newport, I.O.W.
HEREFORDSHIRE	C. J. Brecknell	243, Ledbury Rd., Hereford. (Herefordshire Ornithological Club.)
HUNTINGDONSHIRE	Professor A. N. Worden	Cromwell House, Huntingdon. (Hunts Fauna and Flora Society.)
KENT	G. B. Rimes	65, Third Ave., Gillingham. (Rochester and District Naturalists Society.)
LANCASHIRE, N.	R. M. Band	516, North Drive, Cleveleys, Nr. Blackpool.

LANCASHIRE, S.	E. Hardy	47, Woodsorrel Rd., Liverpool, 15. (Merseyside Naturalists Association.)
LEICESTERSHIRE and RUTLAND	Mrs Richardson	48, Stoneygate Rd., Leicester. (Leicestershire and Rutland Ornithological Society.)
LINCOLNSHIRE	R. K. Cornwallis	Bleasby Grange, Legsby, Market Rasen. (Lincolnshire Natural- ists Trust, Ltd.)
LONDON and MIDDLESEX	R. C. Homes *	5, Shelveys Way, Tadworth, Surrey. (London Natural History Society.)
NORFOLK	J. Williams	Old Hall Farm, Tunstead, Nr. Norwich.
NORTHAMPTONSHIRE	R. Felton	37, Brecon St., Spencer Estate, Northampton. (Northamp- tonshire Natural History Society and Field Club.)
	M. Goodman	18, Hallwood Rd., Kettering. (Kettering and District Naturalists Society and Field Club.)
NORTHUMBERLAND and DURHAM	G. W. Temperley *	Restharrow, Stocksfield, North- umberland.
	assisted by	Miss U. M. Grigg, 13, St. George Terrace, Newcastle- on-Tyne. (Natural History Society of Northumberland, Durham and Newcastle-on- Tyne.)
NOTTINGHAMSHIRE	A. Dobbs	40, Caythorpe Rise, Sherwood, Nottingham. (Trent Valley Bird Watchers.)
OXFORDSHIRE SHROPSHIRE	Dr Bruce Campbell *	2, King Edward Street, Oxford.
	E. M. Rutter *	Eversley, Kennedy Rd., Shrews- bury.
SOMERSET	B. King	Mayfield, Uplands Rd., Saltford, Bristol. (Somerset Archeo- logical and Natural History Society.)
STAFFORDSHIRE, WORCESTERSHIRE and WARWICKSHIRE	A. R. M. Blake	472, City Rd., Birmingham, 17. (Birmingham and West Mid- land Bird Club.)
SUFFOLK	Lt-Col Penn	Bawdsey Hall, Woodbridge.
SURREY	J. N. Bateson	The Spinney, Carthouse Lane, Horsell, Nr. Woking. (Retired April 1954, successor not yet appointed.)
	assisted by	Charterhouse Natural History Society.
SUSSEX	J. Reynolds	6, Argyle Rd., Bognor.

WESTMORLAND and LANCS in FURNESS	J. W. Allen	122, Highgate, Kendal. (Kendal Natural History Society.)
WILTSHIRE	Mrs E. C. Barnes *	Hungerdown, Seagry, Chippen- ham. (Wiltshire Archeological and Natural History Society.)
YORKSHIRE	A. Walker	Penlee, 14, St. Helen's Rd., Harrogate. (Harrogate and Wharfedale Naturalists Society.)
	J. Cudworth	17A, Prospect Rd., Ossett, Yorks. (Leeds Bird Watchers Club.)
	R. M. Garnett *	The Chapel House, Whitbygate, Thornton-le-Dale.
	E. C. J. Swabey	46, Kennedy Ave., Fixby, Huddersfield. (Huddersfield Naturalists Society.)
WALES SOUTH	Col H. Morrey Salmon *	24, Bryngwyn Rd., Cyncoed, Cardiff.
CENTRAL WALES	W. M. Condry	Eglwysfach, Machynlleth, Montgomery. (West Wales Field Society.)
WALES, NORTH	D. J. Williams	13, Hendre St., Caernarvon, N. Wales.
SCOTLAND	assisted by Miss E. V. Baxter	Bangor University Bird Group. The Grove, Upper Largo, Fife. (Scottish Ornithologists Club.)
	assisted by	Col W. M. Logan Home, Edrom, Berwickshire. P. E. D. Cooper, 31, Rosebank- by-Carlisle, Lanark. Miss M. Flower, 5, Airthrey Ave., Glasgow, W. 5. Mr Milligan, High Street, Rothesay. J. Bartholomew, Glenorchard, Torrance, Stirling. (Retired April 1954.)
NORTHERN IRELAND	L. Turtle	34, Malone Park, Belfast.
Co. FERMANAGH	Mrs Richardson	Rossfad, Ballinamallard, Co. Fermanagh.
<b>Eire</b>		
Co. DUBLIN	G. R. Humphreys	59, Sandymount Rd., Dublin.
Co. WESTMEATH	Maj-Gen G. L. Verney, D.S.O., M.V.O.	Cromlyn, Rathowen, Co. West- meath.
Co. CORK	J. E. O'Donovan	Union Hall, Co. Cork.

#### The Analysis of the Wildfowl Counts

In the last report on the Wildfowl Counts,<sup>1</sup> published in 1952, the methods

<sup>1</sup> Obtainable from Miss Barclay-Smith, c/o British Museum (Natural History), Cromwell Road, London, S.W.7. (Price 2s.)



used to collate the information were described at some length. As these methods are still in use and remain fundamentally unaltered, it is felt that only a very brief summary is required here.

When the completed returns are received at the end of each season they are grouped into the geographical area to which they belong. For the purposes of analysis the British Isles have been divided into 23 areas, each of which is bounded so far as is possible by high ground or other terrain providing unsuitable habitats for wildfowl. Since each count is made on the same set date, the monthly records for every water in the same area may be added together with little fear of duplication, and the resulting totals, when plotted on a graph, will show the seasonal fluctuations in population. If, in later years, similar totals for the same group of waters are superimposed on the graph a direct comparison of one year with another may be made, and by this means in due course an indication of any population trend will become apparent. In this method of analysis, however, only counts made regularly throughout each season under review can be used as the direct comparison is essential and only a limited amount of interpolation is permissible.

### The Value of the Wildfowl Counts

It was decided during the summer of 1953 that the time was ripe to review the uses to which the Wildfowl Counts could be put and to obtain statistical advice on their value as a means of detecting population trends. The results for the years 1948-1952 were therefore submitted to Dr M. R. Sampford of the Lectureship in the Design and Analysis of Scientific Experiment at Oxford, and he very kindly spent a considerable amount of his time on them.

He reached the conclusion that the value of the counts might be considered under three main headings :

1. *As contemporary records* : If nothing more, the counts are a contemporary record of the populations of wildfowl on various selected waters. If a similar survey had been made during the first decade of this century, it would be of the greatest value at the present time, and it is reasonable to suppose that the present survey will in future years assume a similar importance.
2. *In relation to other branches of wildfowl research* : The Wildfowl Counts are primarily a study in distribution, and since distribution must necessarily be the basis of any investigation into the status and ecology of a species it seems probable that future studies into wildfowl problems and related research might well be based on information obtained through the counts.
3. *In detecting population trends* : The question has been raised whether the acknowledged lack of precision (caused by such factors as errors in estimating numbers, large fluctuations due to day-by-day weather variations, disturbance, etc.) which is inevitable in investigations of this type, would vitiate any attempt to detect population changes of a magnitude short of catastrophic. Dr Sampford has expressed the opinion, based on his provisional analysis, that such sources of variability will be of less importance than the considerable year-to-year fluctuation (due to periods of prolonged hard weather, etc.) which is likely to be the principle factor in tending to mask population trends. The investigation has not yet been carried on for a sufficient number of years for a reliable estimate of the magnitude of this variation to be available, and without such an estimate it is impossible to assess the duration of observation which will be needed to detect a trend of any given

order. In simpler language it is those sudden freeze-ups which are more likely to upset the value of the counts rather than the possible errors in counting.

### Reliability of the Counts

It is most satisfactory to learn that the standard of accuracy in counting is considered to be more than adequate for the main purpose of the investigation, but it is felt that every effort ought to be made to overcome as many of the numerous small sources of error as possible. To this end a review of them was made and is passed on to counters for their consideration. The possible sources of error fall into four categories.

#### 1. Errors in Counting

(a) Incorrect recognition. Occasional cases of incorrect identification, usually of rarer species, are not disastrous as the numbers are likely to be small and in any case the counts are mainly designed to produce information on the main body of the common wintering fowl.

(b) Incorrect estimation of numbers. Overestimation of large numbers is possibly one of the commonest sources of error, but one which is likely to be reduced by experience. It must also be realised that underestimation, where it exists, is just as serious an inaccuracy, and the practice of subtracting a few hundreds from a large figure to allow for overestimation is not to be recommended.

(c) Lack of synchronisation in counting. It is not reasonable to ask for every count to be made at exactly the same time on the same day, and therefore some duplication must result. Disturbance due to counting is, however, more likely on small waters with correspondingly small numbers of wildfowl, and in some areas where duplication is likely to occur steps have been taken to synchronise counts.

#### 2. Errors due to Natural Conditions

(a) Differences in weather conditions. Certain weather conditions may be responsible for considerable error. During rough weather ducks inland are likely to be tucked away in reedbeds or sheltered bays, and on the coast to remain in creeks and saltings out of sight. A space is, however, provided on the count forms for observers to record unusual weather conditions which may be responsible for an abnormally high or low return.

(b) Differences in the density of vegetation. The density of aquatic vegetation in summer and early autumn and the tendency of moulting ducks to keep in cover are responsible for low returns at that period, but there is no reason to suppose that this factor varies unduly from year to year. Many species of wildfowl are not present in significant numbers in this country during this period, and only certain types of habitat are affected.

#### 3. Errors due to Incomplete Cover

Three main sources of error arise from incomplete cover :

(a) Disturbance or weather conditions might drive the wildfowl off a water normally counted on to one which is not, or vice versa.

(b) A large number of minor waters with small populations of wildfowl not normally counted might show a considerable change in status, especially of particular species, without this being reflected in the returns from the major waters.

(c) A certain type of water (e.g., gravel pits, ornamental lakes, etc.) might not be adequately represented in the cross section of selected waters, with the result that any change in status of wildfowl peculiar to that particular type of water would not be presented in its true proportion.

The factors responsible for errors in this section, and to a large extent the solutions, are common to all three and may be discussed together.

The greatest difficulty has been found in recruiting observers in some of the more remote districts of the British Isles, although it is known that large numbers of wildfowl are present there. Even in areas where plenty of observers are available, there are many minor waters which are too small to warrant regular counting. They may, however, in the aggregate, carry a considerable population. Hitherto all the available effort has been directed towards an attempt to extend the counts in the thinly covered areas and a certain measure of success has been achieved in some places, but it now seems probable that an effort ought to be made to improve still further the cover in those areas already most thoroughly counted. To this end the following plan has been devised and is to be put into general use. It was tried as a pilot scheme in certain areas last year and proved successful.

All waters are to be divided into two categories.

*Category A* will contain all major waters which have been counted for some years and which are to continue being counted on the set count dates as hitherto.

*Category B* will contain all minor waters which carry small populations of wildfowl and for which a counter cannot be found on the set count dates. They are to be counted three or four times during the year, at any time convenient to the observer, but at about monthly intervals between October and February. At the end of the season the approximate capacity of each will be assessed and the counts on them will be abandoned for four or five years whilst other similar water are being counted. In this way the wildfowl population of a very considerable number of minor waters can be assessed and a check on their status can be maintained every fourth or fifth year.

With regard to the correct proportional representation of the various types of water covered by Wildfowl Counts, it has been suggested by Dr Sampford that in as much as the sample of waters counted will not be a true random sample of all waters in the British Isles because of the inconvenience of reaching remote areas, there is a very definite need for a register of all waters in the land. Such a register should include details of the type, size, environment and peculiarities of each water and would indicate whether any particular type of habitat was being ignored. A task of such magnitude would not, however, be worth undertaking for this single purpose, however important it might be. There are, though, many other uses to which a complete register could be put, both in direct relation to the Wildfowl Counts and in connection with studies into other forms of aquatic life. It is thought that if, as well as the details of the water itself, there could be added a note of the average population over a period of years of both surface feeding and diving ducks, it might in due course help to make possible an estimate of the country's total wildfowl population. In this project the returns from *Category B* waters would, of course, be of the greatest value. It should also be possible to determine which factors are most conducive to a high wildfowl population, a piece of information of the greatest importance in selecting sites for possible sanctuaries.

The size of the task is enough to make the stoutest heart quail, but the aid of the British Trust for Ornithology is being sought and it is hoped to make a

start quite soon. It is expected that counters will also be able to provide from their fund of experience much useful information. Eventually, no doubt, a final check will have to be made from the 1 : 25,000 maps to ensure that no waters have been missed, but in the early stages it is hoped that the B.T.O. and counters will produce most of the preliminary data.

#### *4. Errors of Analysis and Interpretation*

As has been explained above, the method of analysis consists of adding together the monthly counts of wildfowl on all waters which have been covered regularly in each geographical area and comparing the totals for each species graphically with similar totals obtained in previous years. This method has, however, two disadvantages. In the first place only the results from waters counted consistently throughout the season can be used (i.e., those in Category A). The results from waters in Category B (those counted irregularly or occasionally) can only be used to provide a check against a sudden change in status occurring on a large number of minor waters. It is, however, reasonable that the survey of population trends should be confined to the major waters provided that it can be proved that its accuracy is not being prejudiced by a change in status on the smaller waters.

Secondly, whenever a count on a Category A water is missed an interpolation must be made. Frequently this estimate can be based on an observation made a few days earlier or later, or on the preceding and subsequent counts. In such cases the accuracy of the interpolation is probably adequate, provided that it does not form too high a percentage of the total for the whole series. But if two or three consecutive counts on an important water are missed interpolation is impossible, and the series, being incomplete, cannot be plotted on its graph in that year.

The necessity for interpolation and the inflexibility of the system of analysis are without doubt two further sources of possible error, but so far no alternative method has been suggested.

In endeavouring to assess the reliability of the counts all these numerous possible sources of error must be taken into account. Dr Sampford has, however, expressed the opinion that singly none of them is likely to vitiate the value of the counts. But it should be realised that errors in individual counts, although perhaps not so serious as year-to-year fluctuations caused by weather conditions, will nevertheless be superimposed on the variability caused by these fluctuations, and will still further add to the difficulty in detecting a trend of moderate order. It is therefore desirable that individual counts should be made as reliable and as representative as possible.

#### **Wildfowl Counts and Ringing Data**

Ringing is, perhaps, the field of investigation most intimately allied to the Wildfowl Counts, but hitherto no attempt has been made to combine the information provided by the two methods of inquiry. A form of graphic analysis of ringing returns has now been designed, which it is hoped will help to disclose the three main items of information required by the counts.

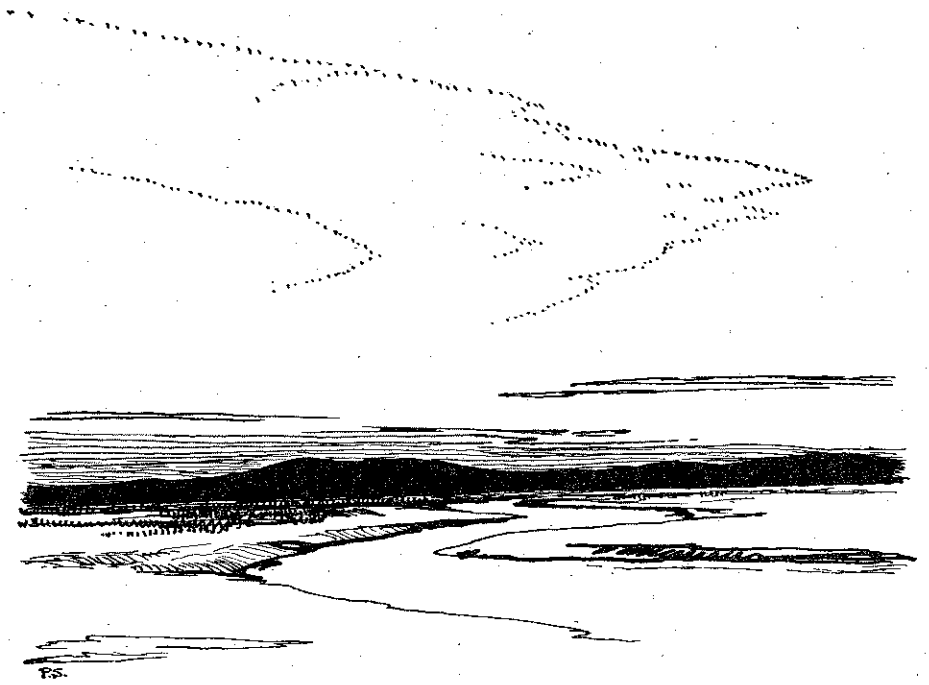
1. The general line of the migration routes of each species which pass through a ringing station.

2. The 'speed of flow' of migrants passing through a ringing station at various times of the year.

3. The probable location at any given time of birds ringed at any other given time.

When this information is available it should be possible to relate the fluctuations in one geographical area to corresponding fluctuations in others, and even, eventually, to assess the success of the breeding season in certain areas outside the British Isles by relating them to wintering populations. Furthermore, some indication will be available of areas of high shooting pressure and periods of especial vulnerability, when the percentages of recoveries in various places and at various times are compared. It may also be possible to detect any differential patterns of migration (if these exist) by distinguishing in analysis between cock and hen and young and old birds.

It is hoped that this long discourse on the problem of dealing with the mass of information collected annually from the duck counts will have been of interest to counters. We should like them at least to know that a great deal of thought has been given to the best possible use of the fruits of their labours. The following section gives some idea of the nature of the results which are being obtained from analysis of the counts. We think they are interesting, indeed important and even rather exciting ; we hope that observers may perhaps agree with us and be fired with enthusiasm for future counting.



## PART II

### RESULTS AND IMPRESSIONS GAINED FROM THE WILDFOWL COUNTS 1952-54

IN the last report on the Wildfowl Counts published in 1952, it was not possible to draw any conclusions about the trend in the status of wildfowl populations wintering in Great Britain, and it is regretted that the time is still not yet ripe for a comprehensive survey. Counters will, however, quite rightly, expect to see some return for their labours and so it has been decided to analyse the figures for Mallard, *Anas platyrhynchos*, for the past three seasons, 1951-52 to 1953-54 and to attempt to discover the normal pattern of fluctuation in population.

Such fluctuations may be influenced to a greater or lesser degree by weather conditions prevailing in N.W. Europe and in the British Isles, and so a meteorological summary is included to show to what extent deviations from the apparent normal pattern may be attributed to hard weather and inclement breeding seasons.

In considering the normal pattern of fluctuation in population it is as well to refer first to the graph of the numbers of Mallard which have been recorded throughout the whole of the British Isles before discussing to what extent the individual populations in various parts of the country differ from it. It will be seen that this graph (figure I) has been compiled from the records of 326 waters, of which 228 are inland and 98 coastal. In the case of the Mallard, which is predominantly a freshwater species, this proportion seems a reasonable one.

The first impression gained from this graph is of the similarity of the three years under review, especially during the latter part of the season. The regularity

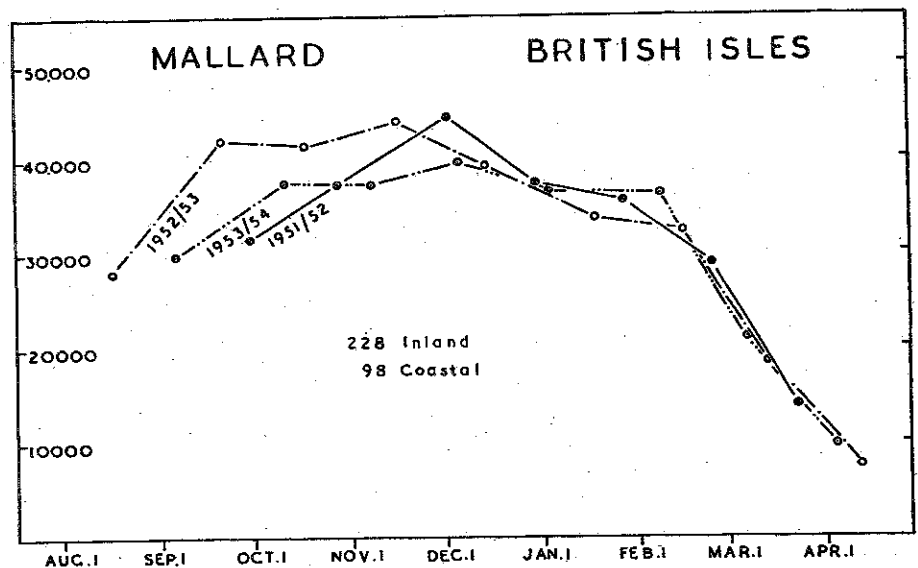


FIGURE I

with which the period of peak population occurs in late November and early December and the small difference between the number recorded in each year at this time are also features of note. The actual figures for these three peaks are 44,496 on 2 December 1951, 44,094 on 16 November 1952, and 39,836 on 6 December 1953, and the difference between the maximum and minimum is 4660 or just over 10 per cent. It should be stressed that it is the actual points only which are significant on the graph, as the lines joining them give no indication of fluctuations between count dates.

If the graph is studied in more detail, the following points may be noted :

1. *Autumn*.—There is considerable divergence between the three years during the autumn. In 1951 there were noticeably fewer Mallard recorded and the minor peak found in late September in the other two years is missing. In 1952 substantially more Mallard were observed and in fact the difference between the 31,486 recorded on 30 September 1951 and the 42,069 of 21 September 1952 amounts to 10,583 or a 30 per cent. variation on the 1951 figures. The early count of 6 September 1953, 29,961, and the rather later one of 11 October 1953, 37,649, indicate that there were probably more Mallard in this year than in 1951 and considerably fewer than in 1952.

2. *Early Winter*.—As has already been remarked, the peak population of all three years appears in late November and early December, and by this time the divergence between the respective populations has become less marked. A month later the difference between the 1951-52 count and that of 1953-54 has been reduced to just over 600 and there is every indication that the figure for 1952-53 is very similar. The actual figures are 37,250 on 30 December 1951, 36,647 on 3 January 1954, and in the 1952-53 season 39,199 on 14 December 1952 and 33,805 on 18 January 1953.

3. *Late Winter*.—In January and February there appears to be a tendency for the lines, representing the Mallard totals of the three years, to diverge slightly once more, with evidence of some 4000 more on 7 February 1954 than on 15 February 1953.

4. *Spring*.—After mid-February the pattern for the three years shows an astonishing similarity.

Having considered the relationship of the total Mallard populations observed in the British Isles during the past three seasons, a comparison of the weather prevailing at the time should be made in an attempt to discover whether the divergences and similarities noted on the graph may be attributed to climatic conditions. The following tables have been compiled from Air Ministry Monthly Summary and Daily Weather Reports and are reproduced by kind permission of the Director of the Meteorological Office and H.M. Stationery Office. The first table gives a brief summary of the weather during each month of the three years, whilst the second set of diagrams explores in more detail the incidence of frost on the continent of N.W. Europe and in Great Britain during the winter months.

The table opposite summarises the broad outline of climatic conditions in the British Isles throughout the three years February 1951-February 1954, but it was felt that some further indication was needed of the incidence of frost in N.W. Europe during the winter months. The following three diagrams show the air temperatures when below freezing point, at each of eleven stations. These stations have been chosen to demonstrate the advance of cold weather from the eastern end of the Baltic, and to indicate the extent of frost in the British Isles. The records refer to readings of air temperatures, which are

TABLE I

## MONTHLY SUMMARIES OF THE WEATHER IN GREAT BRITAIN

	1951-52	1952-53	1953-54
February ..	Very unsettled	Sunny : dry on the whole	Dry : cold then mild
March ..	Very unsettled	Mainly mild and dull, but wintry with snow and frost at the close	Exceptionally dry
April .. ..	First half wet, second half mainly dry	Dry, warm and sunny	Showery and rather cool
May .. ..	Cool, with excess of cloud and rain in England and Wales. Dry and sunny in Scotland and Ireland	Warm, thundery rain ; very sunny in second half	Changeable but sunny. Rainfall and sunshine both above average
June .. ..	Sunny and mainly dry	Changeable ; warm in last week	Rainfall normal, abnormally little sunshine
July .. ..	Mainly fine and warm	Mainly dry, fine and warm	Showery, dull and rather cool
August ..	Unsettled, rainfall above normal	Fine in N.E. Sunshine normal elsewhere, but heavy rain in S.	Fine, then changeable. Drier and sunnier than normal
Summary of Breeding Season	Feb.-May : unusually wet except for brief intervals. Thereafter mainly fine	Sunnier and drier than normal throughout, except possibly in early June	Feb.-May : mild and dry ; April-May : changeable ; June-July : dull and cool
September ..	Dull and wet	Cold and changeable, rainfall well above normal	Fine, then changeable. Severe gale on 21st
October ..	Dry and sunny	Changeable and mostly cold	Dry at first, wet later
November ..	Exceptionally wet but mild	Dull and cold ; wintry in last week with snow and frost	Exceptionally mild : mainly dry
December ..	Changeable, mostly mild	Mainly cold. Temperature well below normal	Mainly mild. Temperature much above average
January ..	Sunny, but temperature generally low, particularly in the North	Dry in most districts, rather cold in S.W., otherwise temperature average	Changeable : very wintry in last week
Summary of the Autumn and Winter	Unusually mild until January, when harder weather prevailed	Colder than average in nearly every month	Unusually mild until the last week of January



normally considerably higher than ground temperatures, taken at 06.00 daily. The scales used in the diagrams are as follows :

On the vertical scale	1st Step	=	32° to 26°F	:	0° to 6°F of frost
	2nd Step	=	25° to 21°F	:	7° to 11°F of frost
	3rd Step	=	20° to 16°F	:	12° to 16°F of frost
	4th Step	=	15° to 11°F	:	17° to 21°F of frost
	5th Step	=	10° to 6°F	:	22° to 26°F of frost
	6th Step	=	5° to 1°F	:	27° to 31°F of frost
	7th Step	=	0° to -4°F	:	32° to 36°F of frost
	8th Step	=	-5° to -9°F	:	37° to 41°F of frost

The horizontal readings are at 24-hour intervals, and the division above the months are at weekly intervals on each Sunday.

A brief study of these tables and diagrams reveals that in season 1951-52 a mainly wet and cold breeding season was followed by an unusually mild autumn and winter. The season of 1952-53 was warmer and drier than normal during the spring and summer, but after September the autumn and winter were cold and dull. In 1953-54 a mild and dry February and March were followed by a changeable but fairly average April and May and a cool and dull June and July. The autumn and winter of 1953-54 were again unusually mild until the last week of January, when extremely hard frost set in.

If reference is once more made to figure I (the graph showing the totals of all Mallard recorded in the British Isles during the three years), it will be seen that up to early November the Mallard figures are below normal in 1951, above normal in 1952 and about average in 1953. There is no certain proof of the

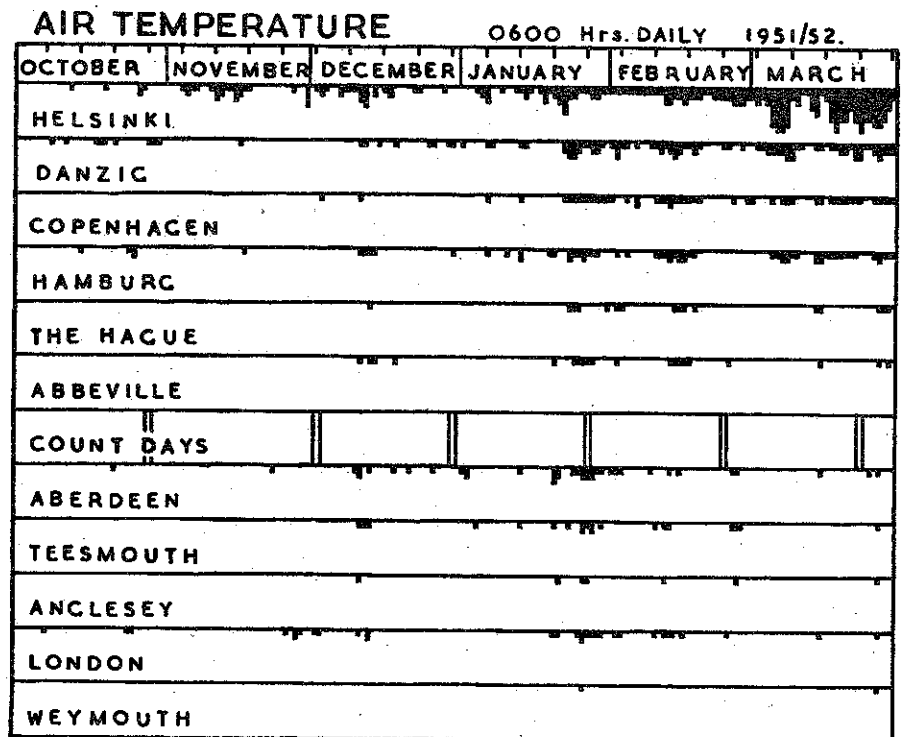


FIGURE II

## AIR TEMPERATURE

0600 Hrs. DAILY 1952/53.

OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH
HELSINKI					
DANZIC					
COPENHAGEN					
HAMBURG					
THE HAGUE					
ABBEVILLE					
COUNT DAYS					
ABERDEEN					
TEESMOUTH					
ANGLESEY					
LONDON					
WEYMOUTH					

FIGURE III

## AIR TEMPERATURE

0600 Hrs. DAILY 1953/54

OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH
HELSINKI					
DANZIC					
COPENHAGEN					
HAMBURG					
THE HAGUE					
ABBEVILLE					
COUNT DAYS					
ABERDEEN					
TEESMOUTH					
ANGLESEY					
LONDON					
WEYMOUTH					

FIGURE IV

relationship between the autumn populations of Mallard and the weather during the breeding season, but it is perhaps significant that 1951 showed the lowest numbers after an unusually wet breeding season, that 1952 produced the maximum numbers after an abnormally dry one, and that the average weather of the spring of 1953 was followed by numbers of Mallard which take the mean of the preceding two years. This result is not entirely unexpected as experience at the Wildfowl Trust and elsewhere has shown that young Mallard ducklings, and indeed ducklings in general, are very susceptible to chilling.

It is not, however, so easy to attempt to explain why the low numbers of September 1951 should be followed by a peak in early December which equals and in fact exceeds that of the two other years. Unfortunately no information is at present available about the dryness of the 1951 season on the Mallard breeding grounds of Eastern Europe, and so no estimate of their probable success there can be made. The Continental weather system is, however, less liable to variations in rainfall than the oceanic system obtaining in the British Isles, and it is quite possible that the spring and summer in Eastern Europe was not abnormally wet. If this possibility is accepted and the feasibility of a normal breeding season admitted, the following hypothesis may explain this otherwise inexplicable peak in early December.

It will be noticed in the graph that the numbers of Mallard in 1952 and 1953 remain more or less constant between early October and late November and that the early December peak is not very marked. It is unlikely, however, that these totals represent identical populations. A very considerable proportion of home-bred Mallard are likely to be shot during the first ten weeks of the open season or to have migrated, and in order to maintain the level of the total numbers a considerable influx from overseas must be expected. In other words, although the total may remain constant, the proportion of foreign-bred birds within that total is likely to be steadily increasing as the season progresses.

In 1951, however, home-bred Mallard were scarce, possibly on account of the wet breeding season, but the influx of foreign-bred birds may not have been affected. In this case one might expect to find a steady increase in the number of birds observed, rather than a constant level produced by an ever-growing influx superimposed on an ever-dwindling home-bred stock.

As the season advances immigrant Mallard may be expected to influence more and more the pattern of population fluctuation in the British Isles. The contention that increases in the number of fowl in this country may be related directly to the severity of the weather abroad is widely held, and reference may be made to the diagrams representing the incidence of air frost in N.W. Europe (Figures II, III and IV).

From them the following information may be summarised :  
1951-52

- Prior to count .. Mild frost in the Baltic and Elbe estuary.  
date 28 Oct.
- Prior to count .. Increased frost in the Eastern Baltic ; elsewhere open, except  
date 2 Déc. in the London area during the week prior to the count.
- Prior to count .. A short cold snap of no great intensity affected all stations  
date 30 Dec. except Southern England during the second week of  
December.
- Prior to count .. Scattered records of frost confined to the Baltic and N. Britain  
date 27 Jan. during the first three weeks of January. Widespread frost  
covering all stations attained considerable severity,

especially in Britain, in the days immediately prior to and after the count.

- Prior to count .. The cold spell over the count date 27 January continued for  
date 24 Feb. several days and returned ten days later, lasting for a week before finally breaking seven days prior to the count.
- Prior to count .. A short and not severe spell of frost affected most areas in  
date 23 Mar. Britain during the last four days of February. Intense frost occurred in the East Baltic during the first ten days of March and was felt as far west as Hamburg for the remainder of the month, and elsewhere on the 14th and 28th.

## 1952-53

- Prior to count .. No frost worthy of note anywhere.  
date 19 Oct.
- Prior to count .. Except in the East Baltic ; scattered records only, but during  
date 16 Nov. the three days prior to the count frost was recorded at most stations west of Hamburg.
- Prior to count .. Widespread intermittent frost of considerable severity for  
date 14 Dec. the time of year was recorded from all Continental stations, but in Britain this was mostly limited to the last week of November and the actual date of the count.
- Prior to count .. The intermittent frost of November and December relaxed  
date 18 Jan. during the week following the December count in all Continental stations east of Copenhagen but returned on 29 December. This was reflected throughout Britain at various times during the first ten days of January.
- Prior to count .. A further relaxation of Continental frost was noted during  
date 15 Feb. the last week of January, but it returned with greatly increased severity for two or three days on 6 and 7 February and was reflected throughout Britain with the exception of Anglesey.
- Prior to count .. A noticeable lack of frost was recorded from all stations  
date 15 Mar. west of Danzig during the ten days following 15 February. The first fortnight of March brought intermittent and slight frost to almost all areas.

## 1953-54

- Prior to count .. No frost.  
date 11 Oct.
- Prior to count .. No frost except for a slight touch at Helsinki and Danzig  
date 8 Nov. during the first four days of November.
- Prior to count .. A sharp spell of frost in the Eastern Baltic on 21 November  
date 6 Dec. was temporarily felt over most of N.W. Europe, but not in the British Isles. It relaxed almost at once and the ten days prior to the count were frost-free.
- Prior to count .. Almost immediately after the count of 6 December frost  
date 3 Jan. set in in the Eastern Baltic and spread over N.W. Europe during the period 18-21 December and the three days prior to the January count. It was not, however, felt noticeably in Britain.

Prior to count .. The Continental frost which started on 31 December continued until about 10 January and scattered frost was recorded in Britain. On 24 January cold weather set in in earnest in N.W. Europe and continued with great severity for the 14 days prior to the count. It was reflected by almost continuous frost of unusual severity in the British Isles, during the same period.

Prior to count .. The cold weather of early February relaxed during the following days but returned to a lesser extent in N.W. Europe during the third week of February and in Britain during the first few days of March.

The relation of this weather information to Mallard populations is again complex, and it seems possible that there may be a considerable time lag between the onset of hard weather on the Continent and the arrival of weather migrants in Britain. Conversely, some people attribute to wildfowl the power of forecasting the advent of cold weather and moving ahead of it. It is thought that at the moment insufficient evidence is available to draw any firm conclusions on this subject, but the following points are worth noting and may give some clues to the probable importance of the relation.

1. The presence or lack of frost in N.W. Europe between October and the end of December appears to have no great influence on the numbers of Mallard in this country, unless possibly one is prepared to accept the hypothesis of wildfowl moving ahead of hard weather. The evidence for this is contained in the records for 1951 and 1952. In the former year there was no frost of note except at Helsinki prior to the count date of 2 December, although a widespread but light spell of frost was recorded throughout on about 10 December. In the latter there was widespread and almost continuous frost in N.W. Europe between 12 November and 18 December and yet the Mallard peak of 2 December 1951 equalled that of 16 November 1952 and the count of 14 December 1952 showed a marked decrease on those for the previous month. Furthermore in 1953, although the pattern of population fluctuation follows a course remarkably similar to that of 1952, but at a different level, the weather during the two years was quite different. The prolonged frost of the second half of November and the first half of December 1951 bears no relation to the exceedingly mild autumn of 1952 which was broken only by one short spell of slight frost on 21 November. It seems then that with the limited evidence available the only conclusion to be drawn about the relationship between Continental weather and Mallard populations in Britain during the early winter is that the one appears to have no great influence on the other.

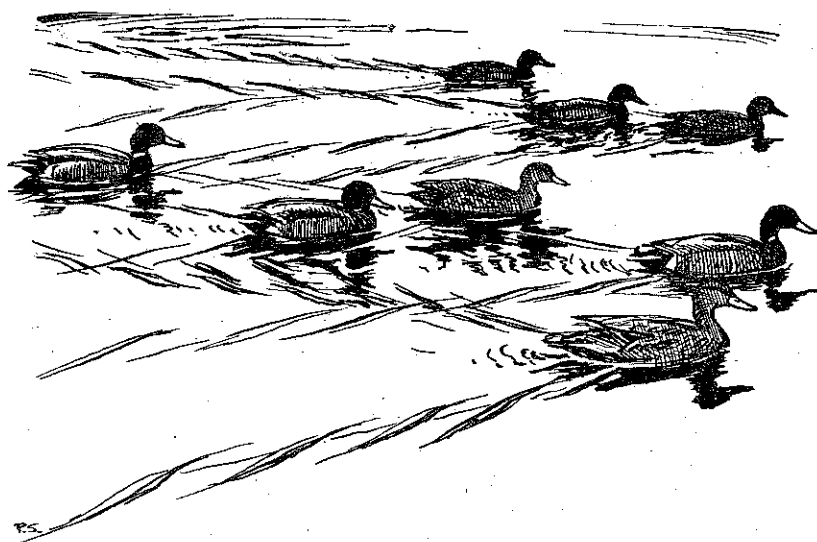
2. During the late winter the graph shows that after the beginning of January, the Mallard populations for the three years follow a surprisingly similar pattern except for a slight divergence around the beginning of February. In 1951 and 1953 the count date at this time fell during a period of widespread frost in Europe and Britain, but in 1952 the count date occurred about a week later than the peak frost of the Continental winter, although frost was recorded at some stations in Britain over the actual day of the count. It will be seen that the Mallard figures of the two former years are rather higher than those for 1952 and it is thought that this is due more to local conditions than to the effects of Continental weather. During the opening days of a spell of hard weather it has been noticed that there is a tendency for birds to concentrate on the larger waters as the food on the smaller ones becomes inaccessible, and to be more

liable to be included in a count. It is thought that these slight divergences at this period are more readily explained by this than by complicated references to weather migration.

3. The regularity of the spring decrease in Mallard cannot readily be attributed to weather. The frost charts from February onwards for the three years show little of the resemblance which would be demanded to relate them to the extreme constancy of the Mallard figures.

Counters are invited to give this problem their consideration, and it is hoped that this kind of analysis in future years may produce further evidence and throw more light on it. Next year we hope to attempt a similar analysis into the fluctuations in Teal populations, and to correlate the information gleaned from ringing data.

Having considered at some length the total population of Mallard recorded in Wildfowl Counts in the British Isles, a considerable amount of further information is revealed by studying the populations of the various areas into which the country has been divided for analysis. It becomes immediately apparent from the graphs on the following pages that the pattern of population fluctuation is by no means similar in different parts of the country. Each area is considered separately and the possible reasons for divergence from the general pattern and the relation with neighbouring areas is examined. In order to give some idea both of the extent of each area and the completeness of the cover of the counts therein, a map has been incorporated in every graph, giving these details. The count points marked on these maps are limited to those for which returns are available in each of the three years under review, and which have been used in compiling the graphs.

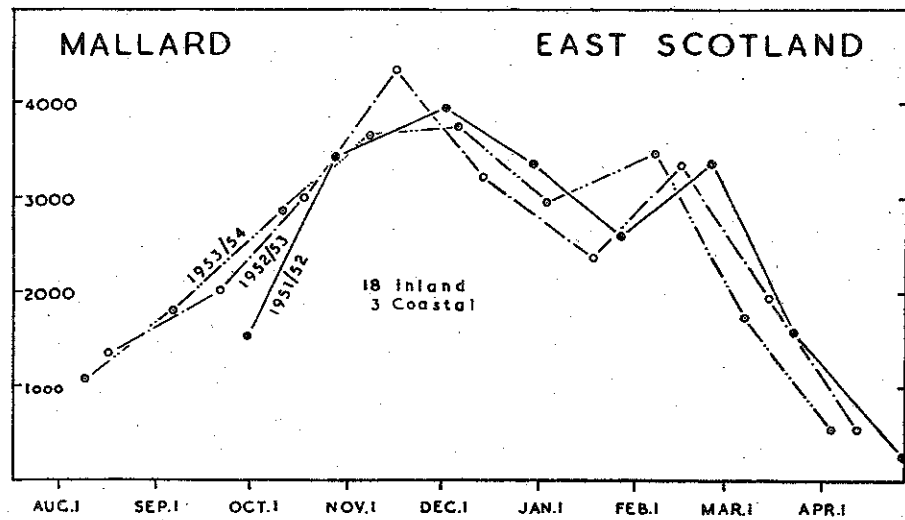
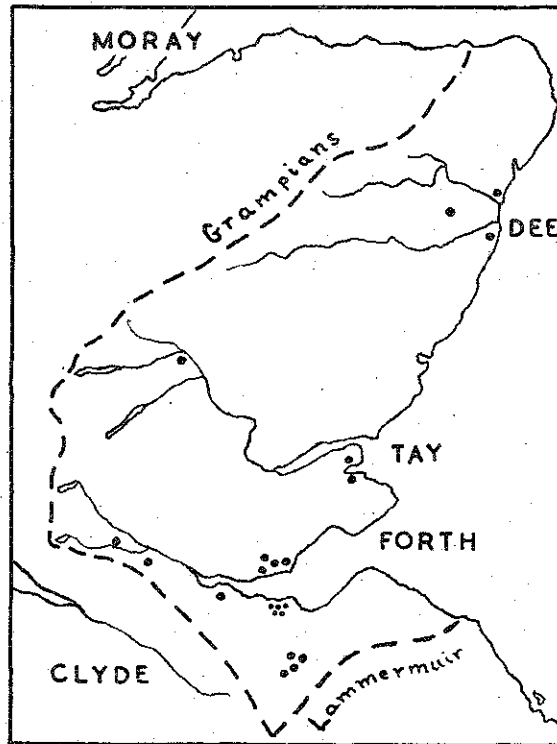


## EAST SCOTLAND

IN compiling this graph the faunal areas of Forth, Tay and Dee have been combined. The cover is fairly adequate in the southern part of the area, but becomes scattered and incomplete in the north. The results, however, are sufficiently regular to be of interest and provide a pattern with few divergences requiring explanation.

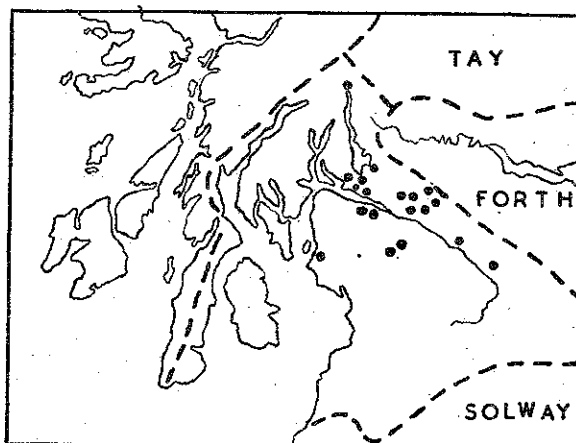
The main peak of the winter occurs regularly in late November, and it seems

probable that it fell slightly before the counts of 2 December 1951 and 6 December 1953. A subsidiary peak appears with great regularity in February of each year. The reasons for the low numbers in late September 1951 have already been discussed, and if, as has been suggested, they are due to wetness of the British breeding season, it may be deduced that the early winter peak is composed largely of foreign immigrants. The February peak may reasonably be supposed to represent a northern movement of Mallard towards the breeding grounds. It is, however, of interest to note that in the Border area which lies immediately to the south there is only a slight indication of a spring peak.



## THE CLYDE

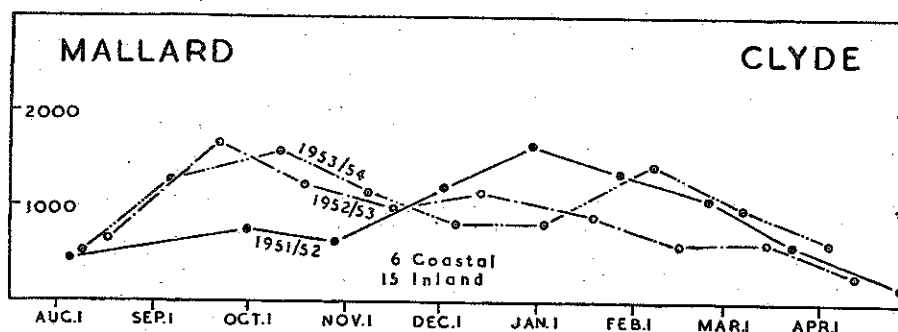
THE cover of Wildfowl Counts in the Clyde area is good within a 25-mile radius of Glasgow, but many of the hill lochs to the south of the area are not counted and comparative cover in the west is missing. During the season of 1953-54 a number of additions have been made to the list of waters counted, notably in the Isle of Bute, and when these counts mature they will be of considerable interest. At present they do little more than accentuate the pattern already



shown in the graph, as reference to the following table will show. The table compares the totals for 1953-54 for the waters counted in all three years (those plotted on the graph), with the totals of all waters counted in season 1953-54.

It will be seen that the addition of the new waters which increases the size

1953-54	9 Aug.	6 Sept.	11 Oct.	8 Nov.	6 Dec.	3 Jan.	7 Feb.	7 Mar.	4 Apr.
Total of waters counted in all three years .. ..	500	1222	1522	1148	829	811	1438	990	620
Total of waters counted 1953-54 only .. ..	776	1746	2024	1856	1603	1811	2568	1925	1095





of the sample from six coastal and 15 inland waters to eight coastal and 22 inland waters leaves the general pattern of fluctuation unaltered except possibly in January and it seems therefore that the graph of the sample used may be representative.

The results of the season 1951-52 are at complete variance with those of the succeeding years, a feature which occurs elsewhere, notably in Ireland. The seasons 1952-53 and 1953-54 are not dissimilar if allowance is made for the peak of 7 February 1954 being due to extreme frost conditions. The general pattern seems to indicate a later September or early October peak, followed, in an average winter, by a gradual dwindling in numbers, with no marked evidence of a spring passage.

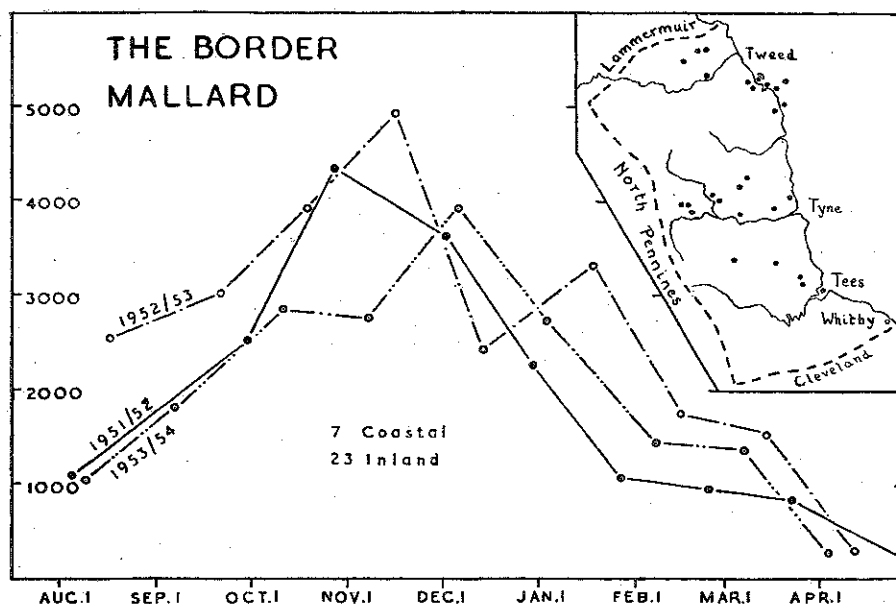
### THE BORDER

THE 23 inland and seven coastal waters which have been used in compiling this graph are thought to provide a very adequate cross section of the principal wildfowl habitats in the area. In 1948 and 1949 a wide survey was made of the wildfowl populations on the majority of the waters in Northumberland and Durham, and places now being counted represent all the more important waters. In spite of this much of the regularity of pattern expected in a well covered area is missing, and interpretation is not altogether simple.

Up to the beginning of October it will be seen that the figures for 1951 and 1953 resemble each other closely, and that the results for 1952 are considerably higher. This is a marked divergence from the results obtained for the British Isles as a whole, where the figures for 1951 were much lower than those of the succeeding two years. It will be noticed, however, that the monthly summary of weather for May 1951 records that in Scotland and Ireland the weather was dry and sunny, but cold and wet in England and Wales. Admittedly the graph for eastern Scotland gives no indication that the 1951 breeding season was much more successful than elsewhere, but it seems possible that on the Border it may have been so. If, however, it is argued that the graph lines for 1951 and 1953 represent the normal autumnal pattern, there is no evidence to explain why the season of 1952 should have been almost twice as successful. It seems that more evidence is needed before attempting to determine the normal pattern at this time of year.

During November an even wider divergence of the graph lines occurs. The figures for 1951 and 1952 show considerable similarity, especially if it can be assumed that the counts of 28 October and 2 December 1951 fall on either side of a mid-November peak, but the results for 1953 are abnormally low. This low count for 8 November 1953 might possibly be explained by a delay in the arrival of foreign immigrants but it is not reflected in either the graph of eastern Scotland, the area to the north, or in the Humber area to the south, although it is noticeable in the Thames Estuary.

By early December the graph lines have converged once more and thereafter continue to run parallel except for a sudden peak on 18 January 1953. As this peak is so strikingly at variance with the other two years, some explanation of it is required. Reference to the frost charts at Teesmouth provide the following information which may be significant. The count of 14 December 1952, which is rather low, coincided with a short spell of hard frost, whilst that of 18 January 1953 was preceded by ten days of open weather. The counts



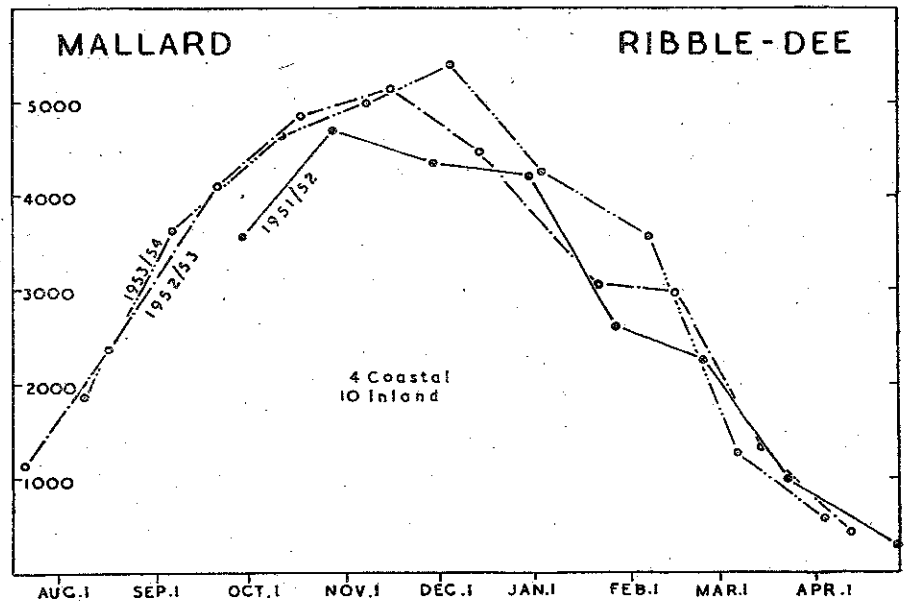
of 30 December 1951 and 3 January 1954 were both preceded by long periods of open weather, but those of 18 January 1952 and 7 February 1954 coincided with prolonged periods of hard frost. From consideration of these records it may be possible to infer that, provided the weather is sufficiently open, a spring migration passes through the Border area at this time. Reference to the graph of eastern Scotland shows that this movement is a marked feature of the February counts there in all three years. It seems impossible to do more than suggest this hypothesis until more evidence is available.

The step in the graph lines which occurs during February of each year is of interest, and suggests one of two explanations. It may be no more than a small migration superimposed on a steadily dwindling local population, or it may represent the resident stock lingering in flocks until warmer weather encourages scattering and nesting. In this case, the decline in numbers during March can easily be accounted for by the withdrawal of the females to their nests, a feature which is apparent throughout the country.

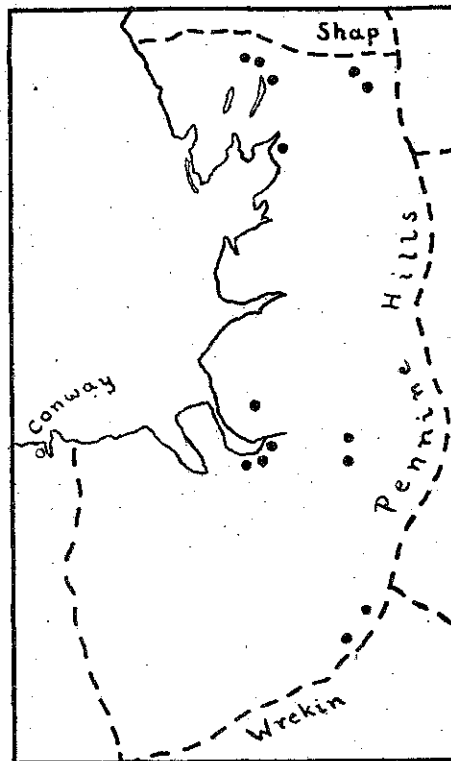
### THE RIBBLE-DEE AREA

THIS rather large area includes to the north the southern end of the Lake District and to the south the whole of the Cheshire and Shropshire plain. It is bounded to the east by the Pennine chain and to the south-west by the Snowdonia range. It is divided across the centre by the industrial area of Lancashire, but it is thought that the northern and southern halves may be treated together. Count points are scattered throughout the area and several important waters are not available for comparative study.

In spite of this a graph of unusual regularity has been obtained which clearly indicates for all years a steady increase of Mallard numbers to a November or early December peak, followed by a gradual but steady decrease for the remainder



of the season. It is an area less liable to extremes of temperature than some of the more easterly ones and this may account for the lack of marked fluctuations in population pattern.



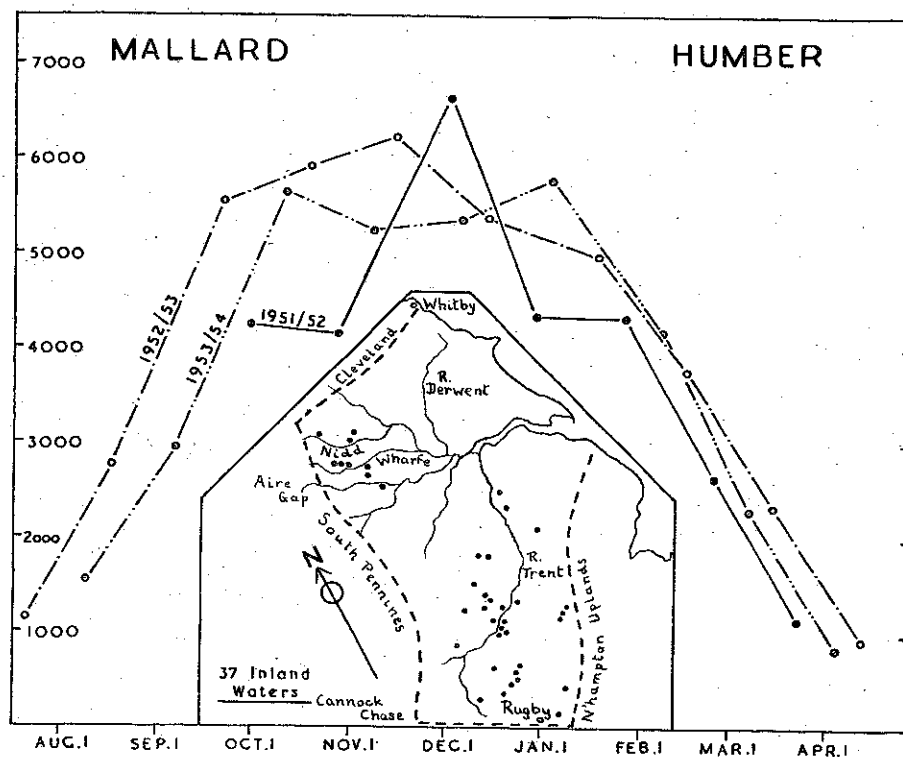
Comparison of the graph for this area with the one for the Border which lies to the north-east shows that it bears some similarity in that the single peak occurs on the corresponding date each year. The Humber area which lies immediately to the east shows that a peak is reached much earlier in the year and that a more or less constant level of population is maintained for several months. Why the results from the Ribble-Dee area should approximate towards those of the Border and the graphs of the Humber should tend, if anything, to follow the pattern of those from the Wash is once more a problem in which speculation must at present play too large a part. The solution must, it is feared, await the establishment of a ringing station in the north of England.

## THE HUMBER

THE Humber and Severn areas have now both been enlarged to absorb the Midlands area shown in the previous report on Wildfowl Counts. The former boundary between the Humber and the Midlands areas ran through Sherwood Forest to the north of Nottingham, but experience has shown that as the Trent Valley probably provides a thoroughfare for wildfowl movements its arbitrary division was unreasonable. The sketch map shows that the Humber area now includes the basins of all rivers flowing into that estuary, and although this comprises a larger area than most others, it seems more rational.

The southern half of the area, centred on the Vale of Trent, is very well covered, as are the big reservoirs in Wharfedale and Nidderdale to the north-west, but comparative counts are completely lacking from north Lincolnshire, the Humber Estuary itself, and much of the East and North Riding. This is unfortunate, as occasional counts from these areas indicate that large numbers of Mallard may be present in parts of Holderness and in the Derwent Valley.

In spite of this the graphs for the three years demonstrate several points of interest. It is at once obvious that, prior to November, the season of 1951-52 was abnormal, but that during November an influx of birds from outside restored the population to its usual level. The seasons of 1952-53 and 1953-54 are very similar up to early October, but there is an indication of an earlier build-up in numbers in the former which is not remarkable in view of the warmth and dryness of its breeding season. After mid-October the graph lines for these two seasons separate and do not converge again until mid-December. The peak of 16 November 1952 may possibly be attributed to the spread of cold weather



across the continent of N.W. Europe during the three days prior to the count, and the subsequent decrease in numbers on 14 December 1952 to the short but severe local frost which had a similar effect in the Border area to the north. This interpretation is perhaps confirmed by the occurrence of the peak of the 1953-54 season on 3 January 1954. Reference to the frost charts of N.W. Europe for this year show that the weather was unusually mild up to mid-December but that widespread frost had set in by 31 December 1953, three days prior to the count date.

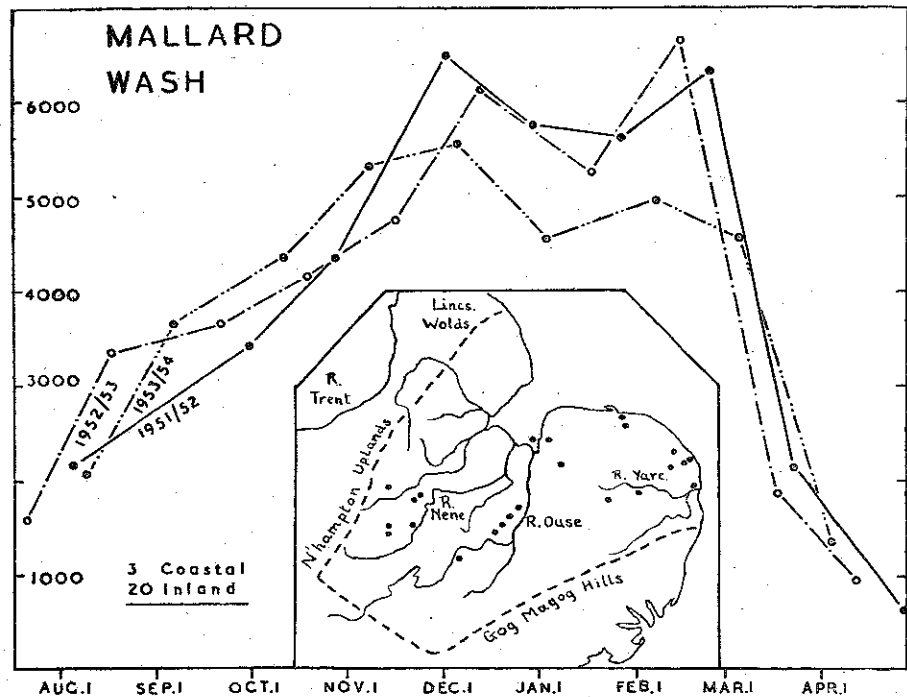
The results for the latter part of the season from late January onwards are remarkably similar, and it is interesting to note that the hard weather of early February 1954 had no apparent effect on the total Mallard population. Reference to individual counts at this period shows a concentration on to the rivers and larger reservoirs and an almost complete absence of birds on many smaller waters.

The low figure of 30 December 1951 may be partly due to the over-cautious interpolation of the numbers on one or two major waters which were not counted, but it seems probable that, even so, the number was substantially below that of the other two years and no explanation for this can be found.

### THE WASH

THE Wash area which includes the basins of the rivers Ouse, Nene and Welland as well as the north Norfolk coast and the Broads is adequately represented in most inland areas, but is sadly lacking in comparative coastal counts. The cover, however, seems to be sufficiently complete to give a consistent picture of the fluctuations in population. It will be seen that the results in the Wash area are typified by a double peak, occurring in early December and late February, and that both are of a very similar magnitude. It seems reasonable to suppose that these may represent a southward movement in the autumn and a northward migration in the spring, but none of the adjoining areas shows a convenient January peak to suggest the direction and destination of the migration. It is hoped that the ringing data, when correlated with the counts, may help to answer this problem.

1953-54	9 Aug.	6 Sept.	11 Oct.	8 Nov.	6 Dec.	3 Jan.	7 Feb.	7 Mar.	4 Apr.
BROADLAND 9 waters	1105 37%	1794 36%	1869 32%	2573 32%	3001 43%	1673 22%	2363 27%	2015 36%	822 49%
COASTAL 6 waters	397 13%	230 5%	257 4%	1369 17%	1101 16%	2087 28%	2003 23%	854 15%	152 9%
FENLAND 6 waters	420 14%	1010 20%	1520 26%	1720 21%	1055 15%	925 12%	335 4%	1288 23%	391 24%
RESERVOIRS AND LAKES 9 waters	1058 36%	1987 39%	2210 38%	2401 30%	1865 26%	2918 38%	4105 46%	1457 26%	298 18%
GRAND TOTAL	2980	5021	5856	8063	7022	7603	8806	5614	1663



During the season of 1953-54 the number of counts made in the Wash area increased considerably, both on the coast and inland, and although, of course, comparison with previous years is not possible it is thought that the results are worth publishing. They give an idea of the movements of Mallard between various types of habitat within the area under varying conditions of weather. In the table opposite are shown the total number of Mallard counted on each of four different types of habitat and the percentages of the total for the whole area which these represent. The four habitats discussed are the Norfolk Broads, which include also the Breckland meres; the coast; the Fens, which include the flood water of the Ouse and Nene washes; and the large reservoirs and ornamental waters on the rising ground to the south-west of the area.

It should be stressed that great care is needed in interpreting these figures as the size of the sample used for one type of habitat may not necessarily be in proportion to the size of the sample used for the other types of habitat. This means that undue emphasis may be laid on one or other habitat and that the percentage of the Mallard population counted on each will not reflect the true distribution. It must therefore be remembered that the percentages refer only to the number of birds actually counted on each type of habitat, but even this limited survey gives some indication of their relative importance at various times of the year. If these percentages are studied month by month some interesting facts emerge.

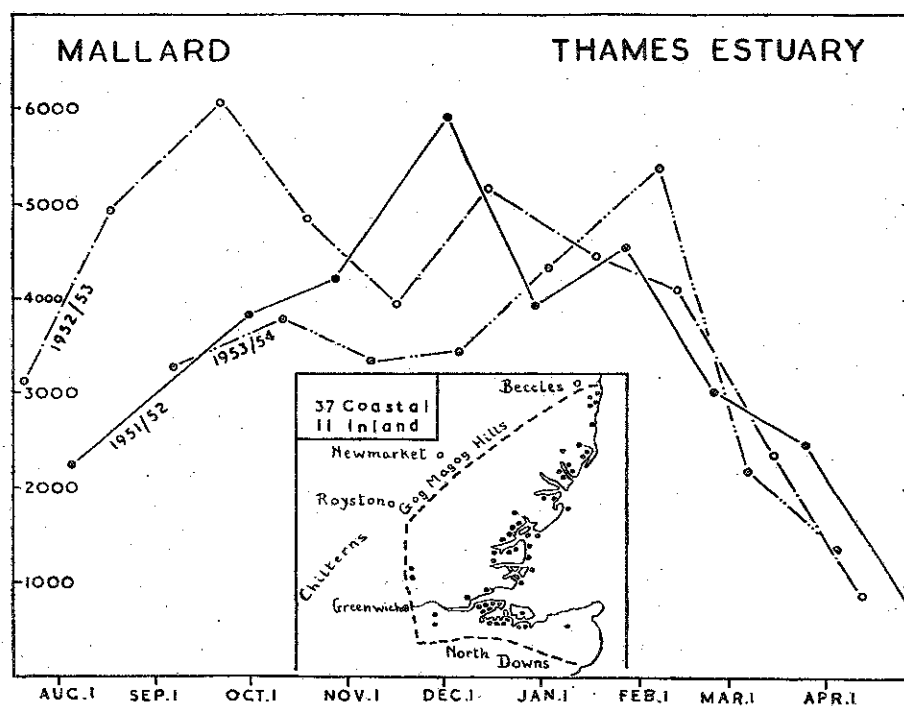
<p>9 August 6 September</p>	}	<p>The percentage of Broadland Mallard remains constant; those of the Fenland and waters in the S.W. show a slight increase; on coastal waters there is an actual diminution of numbers and a sharp fall in the percentage of the total which these represent.</p>
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- 11 October** Although the number of Broadland and coast Mallard remains unaltered, a sharp increase in the number of Fenland birds lowers slightly the percentage of population in all other habitats.
- 8 November** With the influx of a large number of birds from outside, the ratio of population on the various habitats alters. Coastal waters carry relatively four times as many birds, Fenland and S.W. waters carry relatively fewer, whilst the percentage of population on the Broads remains unchanged.
- 6 December** With the passing of the autumn peak, the Broadland waters are the only ones to show an increase in numbers and this is reflected by a decrease in the proportion of birds using the Fenland and S.W. waters. The percentage on coastal waters remains relatively unchanged.
- 3 January** Fenland numbers remain more or less unaltered in spite of slight flooding on the Ouse and Nene washes, but a sharp increase in the number of birds using coastal waters and the reservoirs of the S.W. is balanced by a corresponding decrease in the numbers and ratio of Broadland birds.
- 7 February** The spring peak, normal in February in this area, coincided in 1954 with a period of extreme cold. The floods were out on the Ouse and Nene washes, and although the frost had begun to break and they were ice-free, the Mallard had not returned to them. Concentration of birds on to the reservoirs in the S.W. probably accounted for the large numbers on them, and it is most interesting to note that the numbers on tidal waters remained unchanged. It almost seems as though the Fenland Mallard prefer to concentrate on ice-free inland water than to move on to the tide. This may possibly be accounted for by the presence of pack ice on the saltings, which would reduce the available feed.
- 7 March }  
4 April }** With the spring decline in numbers the Broadland and Fenland habitats carry once more an increasing proportion of the population, whilst the coastal areas and the large reservoirs carry less and less. This is not unexpected as the former categories provide much more attractive breeding sites. The high proportion of Mallard on Fenland waters in March is no doubt also influenced by the heavy flooding on the Nene washes and the light flooding on the Ouse washes at this time.

### THAMES ESTUARY

THE Thames Estuary area differs from all others in that the proportion of coastal counts is much higher and in fact exceeds that of inland counts by more than three times. A possible result of this is that the pattern of population fluctuation is, to say the least of it, confused. No attempt is made to determine the normal pattern, but the following observations may help to explain some of the more outstanding discrepancies. The low numbers of the autumn of 1953 might possibly be attributed to the disastrous flooding of much of this part of the East Coast in early February 1953. The actual flooding and increased salinity of the fresh marshes may have affected the productivity of the resident popula-

tion, whilst the repair work on the sea walls which continued late into the autumn in many parts may have driven the immigrant birds away. The low numbers of the early autumn of 1951 have already been discussed at length, and have been tentatively attributed to the unusual wetness of the British breeding season. The rapid build-up in numbers during the early autumn of 1952 has similarly been related to the dryness of the current season. The peak of 7 February 1954 may reasonably be assumed to be due to the period of extreme cold prevailing at the time, and might be expected to be more apparent in this largely coastal area than elsewhere.



During the season of 1953-54 several important waters were added to the list of those counted, and an investigation into the movements of Mallard within the area may prove of interest. The following table shows the proportions of Mallard population counted on eight freshwater and nine coastal areas in Suffolk; three inland and 19 coastal waters in Essex; and three inland and 13 coastal areas in Kent. As in the case of the rather similar survey in the Wash area, it is stressed that these percentages are only of birds counted and may not exactly reflect the proportions of the total population.

Detailed study of this table shows that up to the October count, the ratio between the number of Mallard remains more or less unaltered, but there is an indication that the build-up in the number of birds is rather more marked in Essex. During November and December it will be noted that there is a slight decrease in the total number of birds observed and that this is due to a falling off in the Kent results, which is only partially compensated by a slight increase in Suffolk and Essex. In January the total for the whole area is found to be



1953-54	9 Aug.	6 Sept.	11 Oct.	8 Nov.	6 Dec.	3 Jan.	7 Feb.	7 Mar.
SUFFOLK ..	871 33%	1402 33%	1586 30%	1866 37%	1759 37%	1989 31%	2452 34%	863 30%
ESSEX ..	593 23%	1180 27%	1540 29%	1347 27%	1820 38%	1762 27%	1761 25%	1331 47%
KENT ..	1146 44%	1724 40%	2160 41%	1849 36%	1214 25%	2674 42%	2931 41%	652 23%
TOTAL OBSERVED	2610	4306	5286	5062	4793	6425	7144	2846

once more increasing and this is largely due to the recovery of the Kentish figures. In February, at the peak population for the season, the ratio between the numbers in the three areas has changed little since the January count, indicating that the increase has been evenly spread over each. The level of the March figures is much below that of the preceding month, and here again it is the Kent results which appear to be most affected. If one's imagination were allowed to run riot, some fascinating speculation on the movement of birds up and down the coast might be indulged in, but until the ringing data has been analysed and correlated, such enthusiasm must be curbed. Counters are, however, invited to propound their own theories and to await their future confirmation.

Of interest also is the proportion of Mallard using fresh and salt water at various times of the year. The following table summarises the percentage of the total number of birds observed on each of these two habitats. It is once more stressed that the percentages are only of birds counted and not of the total population. Only 14 inland waters were covered by comparison with 41 coastal areas and this may cause discrepancy between the ratio here given and the true ratio in the population.

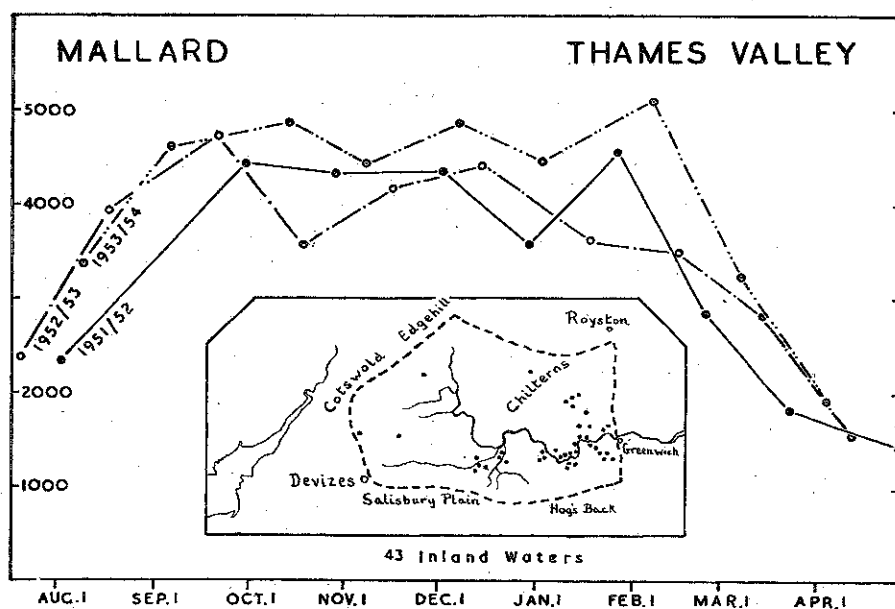
The result of this summary is perhaps no more than one might expect; an ever-increasing proportion of birds using the coastal waters as the season advances. It is, however, remarkable that, except in January and February, the 14 inland waters are found to be carrying a larger proportion of the total number of Mallard observed than the 41 coastal areas. This feature would seem to indicate clearly the Mallard's preference for freshwater habitats for as long as they are able to provide adequate feed.

1953-54	9 Aug.	6 Sept.	11 Oct.	8 Nov.	6 Dec.	3 Jan.	7 Feb.	7 Mar.
TOTAL MALLARD OBSERVED ..	2610	4306	5286	5062	4793	6425	7144	2846
FRESHWATER ..	65	60	57	59	54	40	31	54
SALT WATER ..	35	40	43	41	46	60	69	46

## THAMES VALLEY

THE Thames Valley area comprises the whole of the basin of the river above Greenwich. It includes all the large London reservoirs and many of the gravel pits and ornamental lakes of the Middle Thames area. To the west the cover is not so complete, but is not quite so sporadic as the sketch map might suggest, as much of the area is downland or rolling Cotswold country.

It will be seen from the graph that in general the winter level is attained early in the season, by mid-September, and that thereafter it is maintained more or less constantly until February. Individual seasons vary considerably, notably 1952-53, which was a winter of more prolonged frost. But although weather conditions might be held responsible for the early diminution of numbers in January and February 1953, they do not account for the low count of 19 October 1952. The peaks of 27 January 1952 and 7 February 1954 may be typically associated with the onset of the sudden and sharp spell of frost which obtained at both periods. A temporary concentration of fowl on to major waters is a common feature of the opening days of such spells of frost, and is due no doubt

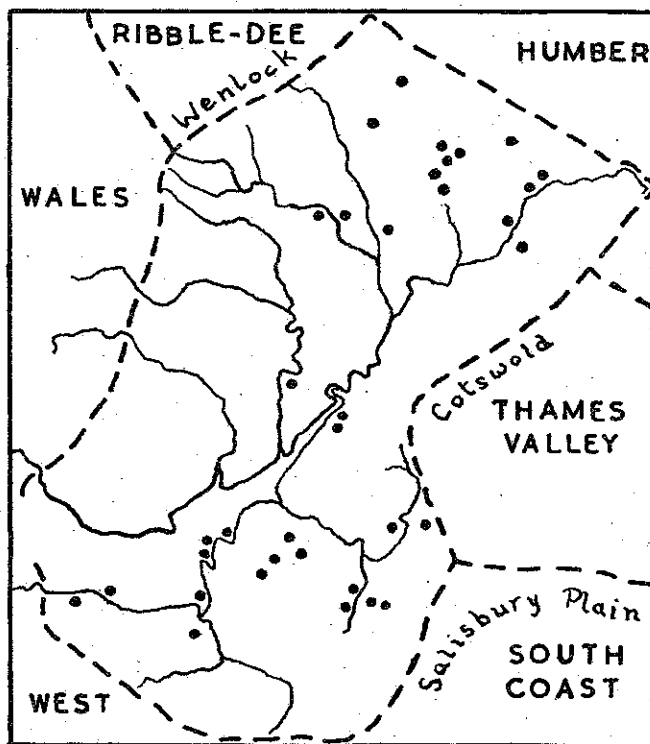


to the inaccessibility of food on the smaller pools, which rapidly become ice-bound.

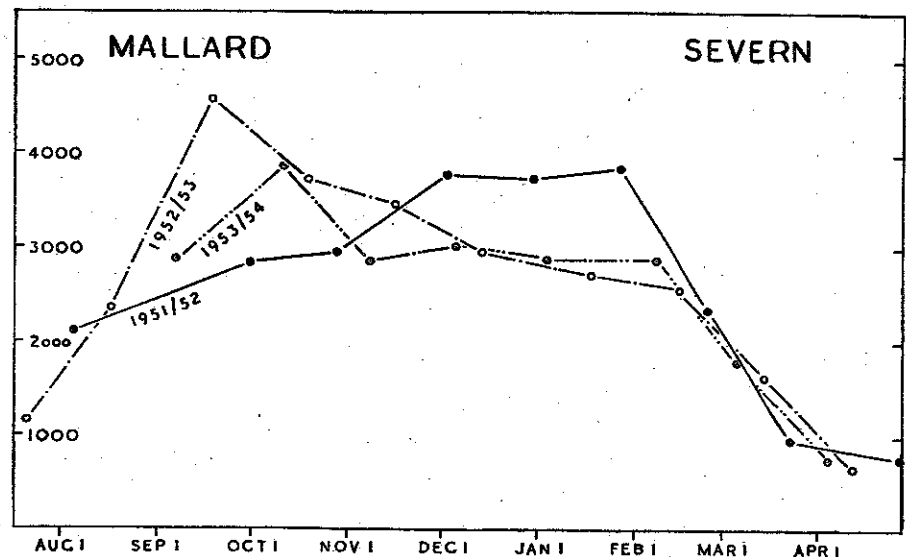
The Thames Valley area contains a remarkable variety of wildfowl habitats, ranging from the reservoirs of London to the peaty meres of the Bagshot sand, the gravel pits of the Middle Thames basin and the chalk streams of Wiltshire. It is hoped that, when the populations of each type of habitat have been fully analysed, much information will be forthcoming on the relative merits of each and on the density of fowl which each is able to carry.

## THE SEVERN

THE Severn area has been recently enlarged to absorb the southern half of the Midlands area, which was shown in the previous report on Wildfowl Counts. The reason for this rearrangement was primarily engendered by the necessity of enlarging the Humber area to include the whole of the basin of the River Trent, but as the new boundary now allows the whole of the Avon and most of the Severn Basin to lie inside the new Severn area, it is thought to be an improvement to the latter area as well. Except in the extreme west of the area on the Welsh side of the Wye, the cover is found to be well above average, being especially good in Somerset and around Birmingham.



The regularity of the population graphs is, however, at first sight not nearly so marked as it is in some other areas. The season 1951-52 is at complete variance with those of the two succeeding years, and although the low numbers of the early part of the season might be attributed, as elsewhere, to the wetness of the breeding season, there is no apparent explanation of the high numbers in the later stages. There is a considerable resemblance between the results for the seasons 1952-53 and 1953-54, especially if the peak of 21 September 1952 is attributed to the unusual clemency of the breeding season of that year. It seems probable that the typical population pattern approximates to that of these two years, and this is confirmed by Mr King, the Regional Organiser for Somerset, who maintains that the largest numbers of Mallard are normally to be found during September in that county. If this is true it argues that either a concentration of local birds or a passage of birds bred in Britain occurs during



the late summer, and that there is no peak of weather migrants later in the year. It is hoped that analysis of the ringing data will shed further light on this most interesting problem.

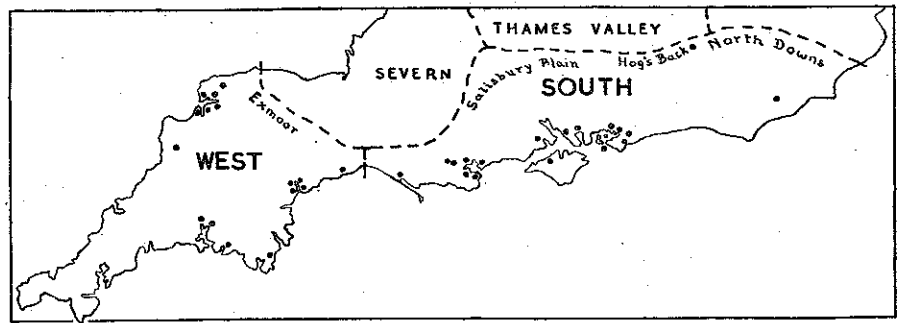
### THE SOUTH AND WEST

REFERENCE to the sketch map will show that the areas south and west between them include the whole of the south coast of England. The cover of Wildfowl Counts is patchy, and in the area south is confined almost entirely to Chichester Harbour, the Solent and Poole Harbour, whilst in the western area, although the important estuaries of Devonshire are very well covered, there is no comparative cover at all for Cornwall.

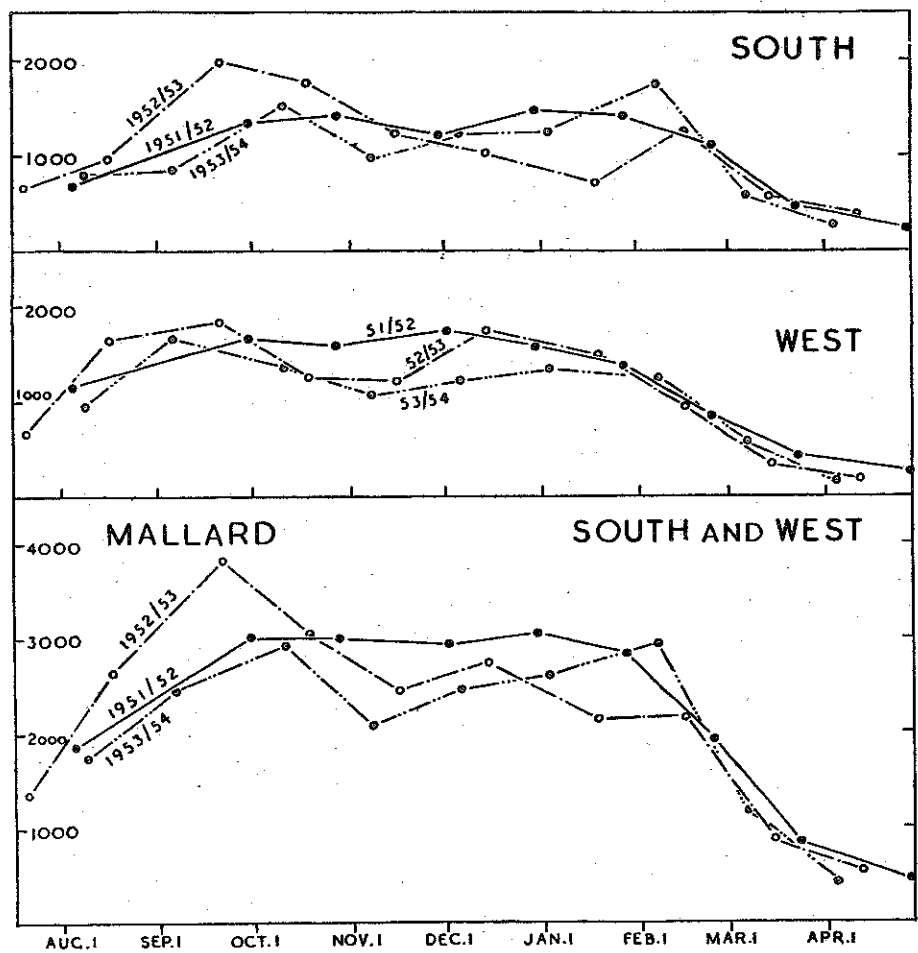
Very little is at present known about the origin of the fowl which use the south and west coasts, except that a proportion of the birds seen there are generally assumed to be British-bred birds moving southwards, particularly during hard weather. In this survey the south and west are first considered together and later separately.

In the graph which combines the results of the south and west it will be seen that an early autumn peak in September or early October appears in both 1952 and 1953, and less markedly in 1951. This feature occurs with striking similarity in the Severn area and seems to indicate that the same factors may obtain in both areas. Thereafter numbers of Mallard remain more or less constant until February when the normal spring decline begins. The peak of 7 February 1954 is due almost certainly to the hard weather prevailing throughout the British Isles at the time, and on the evidence of the other two years does not seem to be a usual feature under normal conditions.

In comparing the individual graphs of the south and west the most striking feature is that the west does not seem to be so liable to fluctuations in population due to weather conditions. It will be seen that from January onwards the results from the west follow a very similar pattern, but that results from the



south react vigorously to the hard weather of 15 February 1953 and 7 February 1954. This might indicate that any southward movement of British Mallard tends to pass through or concentrate to the east of Lyme Bay and not follow the coastline westwards in search of milder weather.



## IRELAND

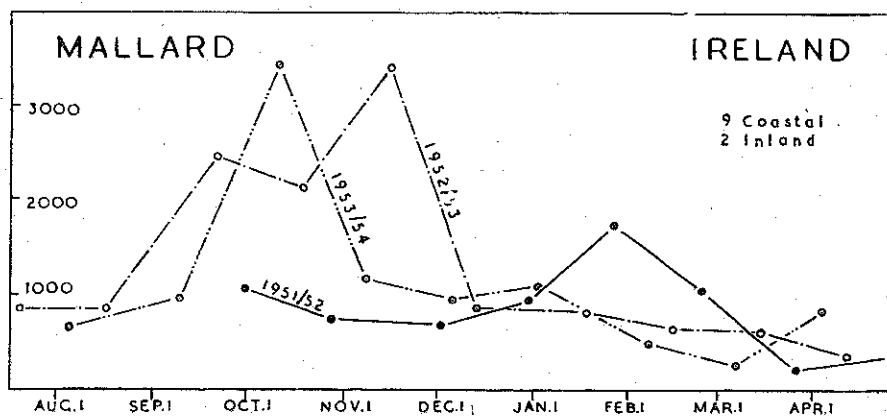
THE comparative cover available in Ireland is mainly concentrated in the areas of Strangford Lough and Dublin Bay, but during the past two seasons the counts have been extended considerably in Co. Fermanagh, Co. Cork and Co. Westmeath.

The graph shows a pattern of population fluctuation which is quite different to anything found in Scotland or England, and, with the almost complete lack of data from Central and South Western Ireland, one which is difficult to explain. The following table, which compares the results for 1953-54 which are available for comparison with the previous years with the wider cover available for 1953-54 only, gives no further hint of a possible solution. The latter set of results available for 1953-54 only are compiled from returns from the following counties: Co. Down 5, Antrim 1, Co. Armagh 3, Co. Fermanagh 12, Co. Derry 1, Co. Dublin 4, Co. Wicklow 1, Co. Westmeath 3 and Co. Cork 6.

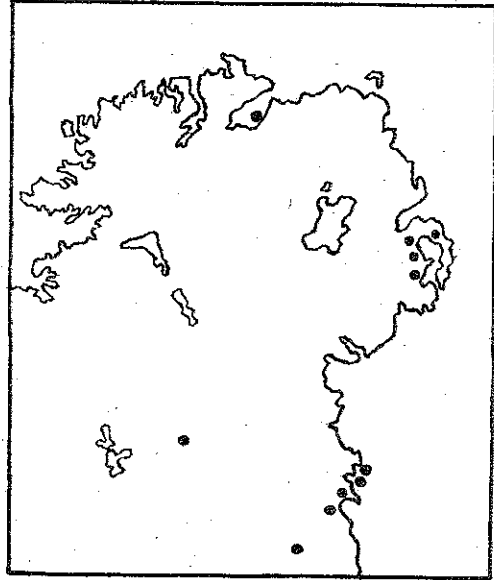
1953-54	9 Aug.	6 Sept.	11 Oct.	8 Nov.	6 Dec.	3 Jan.	7 Feb.	7 Mar.	4 Apr.
Total of waters counted in all three years ..	622	968	3450	1155	940	1053	494	285	846
Total of waters counted only in 1953-54 ..	1430	2267	4246	2497	1629	1772	1312	697	1097

It will be seen from these that there is no evidence of an increase in the additional areas counted which might compensate for the rapid decrease after November which is shown on the graph. It is possible that counts from Sligo, Co. Clare, and Limerick might show a marked increase at this time, as it is thought that the Shannon is likely to have a profound influence on the movements of Irish wildfowl.

With this rather depressing confession of ignorance concerning the origin



and movements of Mallard wintering in Ireland, this review of the Mallard population of Great Britain closes. It is perhaps as well that the area most shrouded in mystery should come last and serve as a reminder that much still remains to be learnt. Much of interest about the single species has, however, been disclosed by the Wildfowl Counts of the past three years. It has been shown that the season of 1951-52 differed, in some places completely, in others only partially, from the years which followed; that Continental weather conditions appear to affect the fluctuation of Mallard numbers in Great Britain rather less than local frosts; periods of peak population have appeared with great regularity in some areas and do not necessarily coincide with similar peaks in adjoining areas.



All these points now provide a basis for further study of the species; as has been remarked several times, it is hoped that analysis of the ringing data will do much towards providing a link between the information obtained from the different areas, and further analysis of weather conditions other than temperature may show results. The investigation of the movements of wildfowl between various types of habitat is in its infancy and its development, which requires the production of a register of waters, is one of the studies proposed for the coming years.

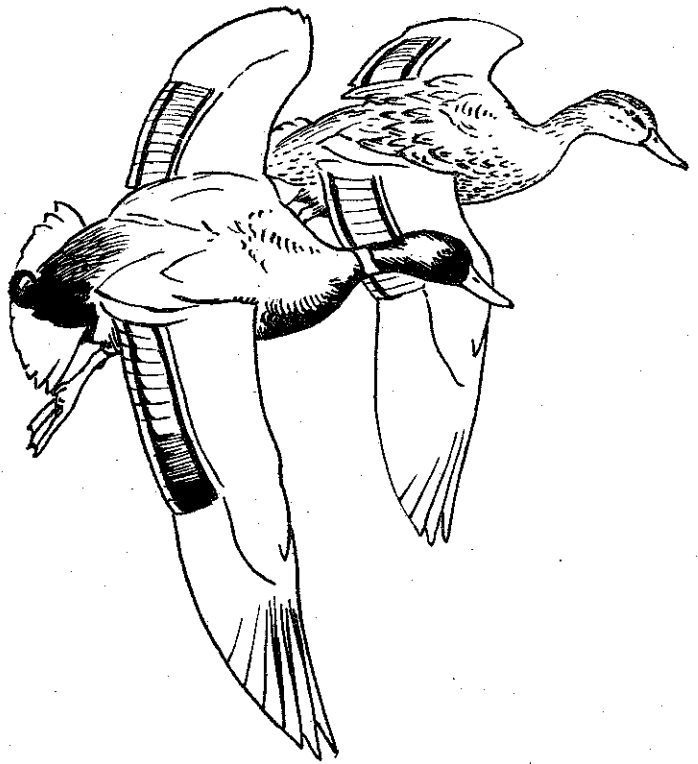
It can be said without complacency that the Wildfowl Counts are at last beginning to mature and to show some return for the lean years of hard work which counters have cheerfully contributed. May I once more thank you for your efforts, without which the investigation would be impossible.



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