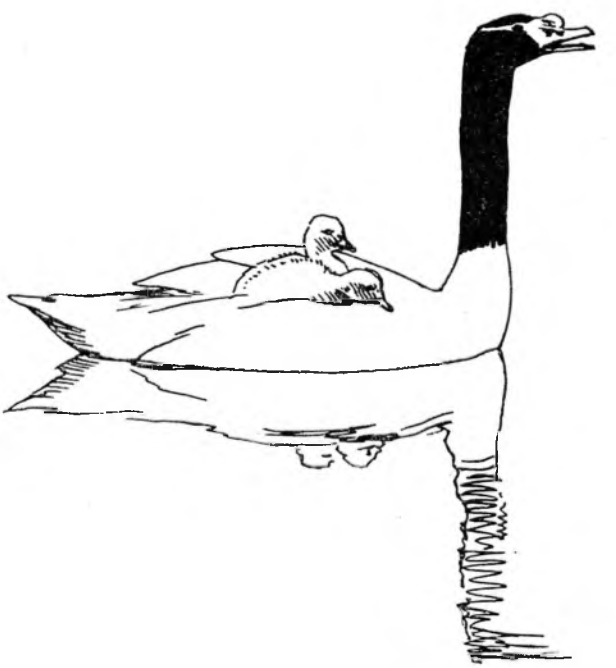
THE
FOURTEENTH ANNUAL REPORT OF

THE WILDFOWL TRUST

1961-62



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1963

THE WILDFOWL TRUST

CONTENTS

continuation of CONTENTS

ANNUAL REPORT 1961-62

The Officers and Council of the Trust, as at 31st December, 1962, are shown on p. 2. Council Meetings were held in 1962 on 10th January, 10th April, 10th May, and 25th October. The Finance Committee met on 10th January, 3rd May and 27th September. The annual meeting of the Scientific Advisory Committee was held on 10th April.

The Fifteenth Annual General Meeting was held at The Royal Society of Arts on 10th May, 1962. The Trust Dinner was held afterwards at the Park Lane Hotel. The Rt. Hon. the Lord Howick of Glendale, G.C.M.G., K.C.V.O., was in the chair and the speakers were Sir Thomas Lund, C.B.E. Mr. Peter Scott, C.B.E., D.S.C., Mr. Evelyn Talbot Ponsonby and Mr. Stanley Unwin.

The annual Gosling Party was held in the new restaurant at Slimbridge on 29th December, 1962. A hundred Goslings attended and saw films shown by the Hon. Director.

A Wildfowl Identification competition was held at the New Grounds on 24th March, 1962. It was attended by 76 boys and girls from 19 schools and was won by the Leighton Park 'A' team with teams from Bristol Grammar School and Winchester College second and third.

Membership

During the period under review membership continued to increase as shown by the following figures:—

Class of Membership	*1 Jan. 60*	*1 Jan. 61*	*1 Jan. 62*	*1 Jan. 63*
Life	184	229	298	299
Full	3024	2813	3360	3423
Associate & Parish ..	1505	1590	1704	1764
Junior Compounded ..	3	3	6	9
Gosling	331	254	296	285
Corporate	169	112	88	107
Contributors	28	28	34	32
TOTAL	5244	5029	5786	5919

Visitors

In spite of the cold summer the number of visitors to Slimbridge was a record and the following figures for the last five years show that the Trust's collections are not losing their appeal:—

	1958	*1959*	*1960*	*1961*	*1962*
Slimbridge ...	120,191	129,092	102,555	151,533	162,030
Peakirk ...	23,495	31,135	26,531	33,203	30,982
TOTAL	143,686	160,227	129,086	184,736	193,012

In March the total number of visitors to the New Grounds (excluding members) since the first opening in 1947 passed the million mark.

Building

A cedar-wood restaurant designed by Messrs. Hughes and Bicknell was constructed at Slimbridge in the Orchard Pen in 1962 and opened to the public on 15th December. This establishment accommodates 100 people and has been granted a restaurant licence. New lavatories, completed in July 1962, have also been provided.

Finance

The accounts for the year ending 31st December, 1961 are at page 10. They show a small surplus of income over expenditure, which enabled the Trust to make a modest start on repayment of loans. Unfortunately several items on the revenue side were non-recurrent and income dropped in 1962, while expenditure was increased by continued inflation and by essential expenditure on such items as renewing fences, reprinting Trust literature, providing new lavatories and augmenting the water supply. As a result the accounts for 1962 will show a serious excess of expenditure over income and in view of this the Council decided to increase the charges for admission from 1st January, 1963 to:—

	Adults	*Children under 16*
Slimbridge ...	5/–	3/–
Peakirk ...	3/6d.	1/6d.

In March 1962 the Trust received from The Wolfson Foundation a handsome donation of £10,000 towards the cost of its planned Research Centre. This sum was specifically intended to provide a lecture room and to enable the Trust to make a start on the project, which it is hoped to do in 1963.

Obituary

THE Council has learned with regret of the death of the following Members and Associates, notified since the last issue of the Report:

Mrs. E. C. Adam
Colonel G. H. S. Balmain
R. H. Bassett, C.M.G., C.B.E.
Dr. C. E. Brierley
L. W. Bugg
A. J. Bull
Mrs. A. Burke
A. E. Chappel
Miss S. Clements
Miss I. M. Cook
C. M. Curtis-Hayward
N. L. Denning
J. Y. Dent
Miss D. Doughty
Mrs. M. F. Duart-Smith
Sir Philip Grey Egerton, Bt., D.L.
K. V. Elphinstone
Miss A. C. Favell
Dr. D. M. M. Fraser
E. H. Gunter-Jones
L. C. Hadley
Miss J. W. Harvey
Miss E. Henney
H. J. Hobbs
Miss M. S. Hopton
Mrs. N. Jamieson
T. P. Jones, O.B.E.
J. Kemp
Mrs. H. Lees-Milne
J. Spedan Lewis
J. H. F. Mance
S. Marling
L. G. Moir
A. F. V. McConnell
Mrs. A. MacIlwaine
W. E. Palmer, M.B.E.
Mrs. G. E. Partridge
Mrs. V. B. Penny
Lord William Percy, C.B.E., D.S.O.
Mrs. J. A. Pottinger
J. L. Richardson
K. J. Sainsbury
J. H. Savory
The Hon. Mrs. A. C. Scott
Miss M. Stewart
Lt.Col. A. H. C. Sutherland
Mrs. C. E. Thompson
N. Type
G. B. Vaile
Dr. C. N. Vaisey
G. P. Vale
O. L. Whittle
Mrs. N. H. Winch
S. Woodward
Mrs. C. P. Wookey

ADMINISTRATION

STAFF

The administrative staff on 31st December, 1962 consisted of Brigadier C. E. H. Sparrow, O.B.E., M.C., Controller; Mr. E. A. Scholes, Secretary; Mr. H. G. Gower, Bursar; Mr. C. M. Garside, Mr. D. Eccleston and Mrs. Kistner, assistant secretaries, and Mrs. M. Knox, in charge of the Hostel. The Gate Houses were managed by Mrs. S. T. Johnstone with the help of Mrs. E. Warren, Mrs. V. M. Hawkins and Miss J. Price at the New Grounds and Mrs. J. Prendergast at Peakirk.

CLASSES OF MEMBERS

Life Members: Fifty guineas. Entitled to all privileges of Full Membership (see below) during life and exempt from payment of any subscription, excepting any sum being paid yearly under Deed of Covenant.

Full Members: Annual subscription £2. 2. 0d. Entitled to free access to pens and observation-huts at the New Grounds and at Peakirk, with one free guest, to one free copy of the Annual Report and of all Bulletins and to attend and vote at General Meetings.

Junior Compounded Members: Only persons under 21. One payment of £10. 10. 0d. Entitled to all privileges of Full Membership (as above) until attaining the age of 21. May then, if they wish, pay another 40 guineas and be elected Life Members.

Associate Members: Annual subscription 10/-. Entitled to free access to pens and observation huts and to free copies of all Bulletins.

Gosling Members: Annual subscription 7/6d. Limited to persons under 18. Entitled to free access to pens at the New Grounds, and at Peakirk. With the aim of encouraging interest in Wildfowl among children, a system has been introduced of grades of Goslings, with appropriate distinguishing marks and promotion by recognition-test. Full particulars of this scheme are given in the separate leaflet available at the Gate Hut at Slimbridge or Peakirk.

Corporate Members: Annual Subscription 10/-. Limited to Educational Establishments, Youth Clubs, and bodies which are Members of the Council for Nature. Admission to the Trust's collections for Corporate Members is on payment for each member of the party of the entrance fee in force at the time of the visit. Members of corporate bodies in parties of not less than 10 nor more than 35 are entitled at times previously arranged with the Gate Houses to a conducted tour of the enclosures at the New Grounds or at Peakirk and to access to the observation hides at the New Grounds in the company of a warden. One free Annual Report, one copy of all Bulletins.

Contributors: Organisations, institutions and establishments which do not qualify for corporate membership, may become Contributors by subscribing not less than one guinea a year. Contributors receive one copy of the Annual Report and of every bulletin.

General Public: The grounds are open to the public daily (excepting Christmas Day). Visitors are admitted from 9.30 on weekdays (from 12 noon on Sundays) up to 6.30 p.m. during the period of Summer Time and up to half-an-hour before sunset during the rest of the year. Sunday mornings are reserved for members. Charges for admission: Slimbridge — adults 5/-, children under 16 3/-; Peakirk—adults 3/6d., children under 16 1/6d.

Parties: Applications must be made well in advance in writing to Slimbridge or Peakirk. School parties can only be arranged when a Warden is available to show them round, and must not exceed one coach load (35-40 persons).

Minutes of the Fifteenth Annual General Meeting

1. The Fifteenth Annual General Meeting of the Wildfowl Trust was held at the Royal Society of Arts, John Adam Street, London W.C.2. on Thursday, 10th May, 1962 at 5.0 p.m.

2. The following Officers and Council Members and about 70 Members were present:—

   The Rt. Hon. the Lord Howick of Glendale, G.C.M.G., K.C.V.O. (Vice-President). In the chair.
   General Sir Gerald Lathbury, G.C.B., D.S.O., M.B.E. (Vice-President)
   Guy Benson, Esq. (Hon. Treasurer)
   Peter Scott, Esq., C.B.E., D.S.C. (Hon. Director)

   John Berkeley, Esq.
   Michael Crichton, Esq.
   J. O. Death, Esq.
   Captain J. A. Fergusson-Cuninghame
   K. Miller Jones, Esq.
   R. E. M. Pilcher, Esq., F.R.C.S.
   Miss P. Talbot-Ponsonby
   Dr. G. W. Storey
   Major-General C. B. Wainwright, C.B.

3. Apologies for absence were received from:—

   H.R.H. The Prince Philip, Duke of Edinburgh, K.G., K.T. (President)
   Capt. R. G. W. Berkeley (Vice-President)
   Sir Percy Lister (Vice-President)
   The Duke of Beaufort (Trustee)
   Lord Mansfield (Trustee)
   Dr. Bruce Campbell
   H. H. Davis, Esq.
   Harold C. Drayton, Esq.
   A. G. Hurrell, Esq.
   J. Jamieson, Esq.
   G. M. Jolliffe, Esq.
   Dr. J. Robertson Justice
   Sir Landsborough Thomson, C.B., O.B.E.

4. The minutes of the Fourteenth Annual General Meeting previously circulated with the agenda for the meeting were taken as read and signed by the Chairman.

5. After reporting on the Trust's activities during the year and giving the latest news of the collections the Hon. Director moved the adoption of the Report of Council. This was seconded by Mr. C. Sellick and carried unanimously.

6. The Hon. Treasurer proposed and Major Maxwell Knight seconded the adoption of the Accounts for the year ending 31st December, 1961. The motion was carried unanimously.

7. The Hon. Director proposed and Mr. K. Miller Jones seconded the following amendment to the Rules of the Wildfowl Trust:—

   Rules 13(1) and 13(2). Delete and substitute:—

   13(1). One third, or the nearest number thereto and not exceeding the same, of the members of the Council elected by the Members in General Meeting shall retire every year in rotation on the day of the Annual General Meeting and shall not be eligible for re-election until the Annual General Meeting in the following year, but shall be eligible to be co-opted by the Council under Rule 12(1).

   The Councillors to retire in any year shall be those elected Councillors who have been longest in office and their names shall be previously announced by the Council. As between two or more who

have been in office an equal length of time the Councillor to retire shall be determined by lot. The length of time a Councillor has been in office shall be computed from his last election.

(2). The co-opted Members of the Council and any chosen by the Council under Rule 12(2) to fill casual vacancies shall hold office only until the next Annual General Meeting, but shall be eligible to be co-opted again by the Council.

The proposition was carried unanimously.

8. The following elected Councillors retired under Rule 13(1) and as a result of the amendment to this rule were ineligible for re-election:—

Michael Crichton, Esq.
James Fisher, Esq.
Sir Landsborough Thomson, C.B., O.B.E., D.SC.

9. Under Rule 7 (6) the following having been nominated for election into five vacancies on Council were deemed to have been elected without vote:—

Dr. Bruce Campbell
J. O. Death, Esq.
Harold C. Drayton, Esq.
Capt. J. A. Fergusson-Cuninghame
G. M. Jolliffe, Esq.

10. On the proposal of Mr. H. K. Hallam seconded by Mr. C. A. Norris, the Council's nominees were elected Officers as follows:—

President :	His Royal Highness The Prince Philip, Duke of Edinburgh, K.G., K.T.
Vice-Presidents :	Captain R. G. W. Berkeley.
	The Rt. Hon. The Lord Howick of Glendale, G.C.M.G., K.C.V.O.
	General Sir Gerald Lathbury, G.C.B., D.S.O., M.B.E.
	Sir Percy Lister.
Trustees :	His Grace The Duke of Beaufort, K.G., P.C., G.C.V.O.
	The Rt. Hon. The Earl of Mansfield, J.P.
Hon. Director :	Peter Scott, Esq., C.B.E., D.S.C.
Hon. Treasurer :	Guy Benson, Esq.

11. The Hon. Treasurer proposed that Messrs. S. J. Dudbridge & Sons of Stroud, Gloucestershire, be re-appointed Auditors to the Trust for the ensuing year pursuant to Rule 19(1). Mr. J. O. Death seconded and the motion was carried unanimously.

12. The Chairman invited comments from the meeting and Mr. E. Cohen asked whether arrangements could be made for Members to have their Annual Reports bound in stiff covers. The Hon. Director undertook to look into this.

Mr. T. L. Outhwaite asked if it was known whether the Trust was receiving more visitors from abroad and stressed the importance of promoting such visits through tourist agencies.

13. Business being concluded the meeting was closed by the Chairman and the Hon. Director gave a talk on his last visit to Africa illustrated by photographs taken by Mrs. Scott.

THE WILDFOWL TRUST

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1961

	EXPENDITURE	£ s. d.	£ s. d.		INCOME	£ s. d.	£ s. d.
	To **Administration:**				By **Membership:**		
3152	Salaries and Superannuation ..	4810 5 7		7173	Subscriptions, Ordinary	8240 19 3	
273	Travelling	405 18 4		550	Subscriptions, Life Members ..	1280 5 0	
2072	Postage, Telephone and Miscellaneous Expenses	2494 13 0		1076	Donations	3925 7 6	
1182	Printing and Stationery	2015 4 6		266	Receipts from Sale of Annual Reports	361 13 11	
—	Loan Interest	613 18 11		170	Receipts from Annual Dinner ..	639 16 6	
310	Bank Charges, less Interest earned ..	164 5 3		6292	Income Tax repaid on Covenants ..	3457 5 7	
2150	Printing Annual Report	2191 2 5					
180	Expenses of Annual Dinner	585 18 8					
121	Advertising	1346 0 0					
9440			14627 6 8	15527			17905 7 9
	New Grounds and Peakirk:				**New Grounds and Peakirk:**		
8596	Salaries, Wages and Superannuation	10863 14 10		17999	Gate Takings	25845 17 6	
317	Travelling	332 9 9		3030	Sales of Surplus Wildfowl	4583 7 10	
732	Purchases and Transport of Wildfowl and Eggs	4040 15 2					
6351	Food for Wildfowl	6214 0 2					
1090	Rent, Rates, Water Rates and Insurance	861 6 6					
2287	Materials, Repairs and Replacements	2983 11 5					
716	Transport and Mechanical Equipment and Maintenance	1115 16 10					
1032	Fuel and Power	1060 11 11					
229	Hatching Expenses	157 10 3					
649	Hostel Upkeep	203 13 4					
587	Miscellaneous	833 15 5					
22586			28667 5 7	21029			30429 5 4
	Gate Houses:				**Gate Houses:**		
10186	Purchases for re-Sale	15726 13 9		15011	Sales, General	20025 7 5	
10186	Purchases for re-sale	15726 13 9		1851	Sales, Coloured Key, Publications ..	2282 12 9	
433	Royalties, Coloured Key, Publications	573 18 0					
2274	Salaries, Wages and Superannuation	2416 9 9					
12893			18717 1 6	16862			22308 0 2

7400	Salaries and Superannuation ..				10070	10	6		8250	The Nature Conservancy Grant ..			11005	5	6	
2039	Travel and Miscellaneous Research Expenditure				3042	15	5		133	Nuffield Foundation Grant ..			—	—	—	
1149	Abberton Ringing Station				1114	13	5		363	Donations from Abberton Ringing Station			262	10	0	
957	Borough Fen Decoy				906	5	7		530	Duck Adoption			435	17	10	
974	Aerial Survey				1194	8	3		—	Donations for Research			100	0	0	
12525								16328	13	2	9276					12661	12	10
	Capital Expenditure:																	
255	Office Equipment				145	8	7											
	New Grounds and Peakirk:																	
17	Development	620	0	0														
—	Gate House Extension	206	3	0														
172	Silo	—	—	—														
350	Transport	—	—	—														
304	Equipment	266	5	9														
795	Lavatories	100	0	0														
1638					1192	8	9											
	Scientific and Educational:																	
185	Coloured Film ..	—	—	—														
63	Equipment	125	0	0														
412	Borough Fen Perimeter Fence	—	—	—														
660					125	0	0											
	Properties:																	
1526	Glinton Cottage, at Cost	—	—	—														
1740	Patch Farm, at Cost ..	—	—	—														
450	do. Expended thereon	555	0	0														
3716					555	0	0											
6269								2017	17	4								
63713	**TOTAL EXPENDITURE FOR THE YEAR** ..							80358	4	3	62694	By **TOTAL INCOME FOR THE YEAR** ..				83304	6	1
20353	Valuation, 31st December, 1960							17321	0	0								
598	Written off Buildings							597	16	3	17321	Valuation, 31st December, 1961				19750	0	0
916	Balance, carried down							4777	5	7	5565	Transfer to Freehold Properties				—	—	—
85580								£103054	6	1	85580					£103054	6	1
5900	To Transfer to Accumulated Fund							4800	0	0	5046	By Balance, 31st December, 1960				61	14	1
62	Balance, 31st December, 1961							38	19	8	916	Balance for year to 31st December, 1961, brought down				4777	5	7
5962								£4838	19	8	5962					£4838	19	8

NOTE.—The figures in the margin are those for the year ended 31st December, 1960 and are given for the purpose of comparison.

THE WILDFOWL TRUST

BALANCE SHEET, 31st DECEMBER, 1961

LIABILITIES

		£ s. d.	£ s. d.
10103	**Sundry Creditors**		12148 0 2
	Peterborough Provincial Benefit Building Society :-		
	Balance, 31st December, 1960	1588 16 6	
	Less Repaid during year	28 4 1	
1589			1560 12 5
	Loan Accounts :—		
12663	Balance, 31st December, 1960	12512 13 10	
1500	**Add** Further Advance	1000 0 0	
14163		13512 13 10	
1650	**Less** Repaid during year	1150 0 0	
12513			12362 13 10
	Accumulated Fund :—		
	Balance, 31st December, 1961	10900 0 0	
	Transfer from Income and Expenditure Account	4800 0 0	
10900			15700 0 0
	Income and Expenditure Account :—		
62	Balance per Account		38 19 8
35167			£41810 6 1

ASSETS

		£ s. d.	£ s. d.
1979	**Cash at Bankers and in Hand**		5561 3 5
—	**Investment at Cost** (Market Value £967-10-0)		999 15 0
1508	**Sundry Debtors and Payments in Advance**		1737 18 6
	Valuation (as valued by the Honorary Director) :—		
	Membership and Administration		
495	Equipment	500 0 0	
	New Grounds and Peakirk :—		
8500	Wildfowl	9400 0 0	
750	Transport	710 0 0	
2901	Breeding Equipment, etc.	3465 0 0	
490	Hostel Equipment	325 0 0	
12641		13900 0 0	
	Gate Houses :—		
3176	Stock for re-sale	3350 0 0	
	Scientific and Educational :—		
1009	Equipment	2000 0 0	
17321			19750 0 0
	Freehold Properties :—		
7186	Amount, 31st December, 1960, at Cost or Valuation		7185 10 5
	NOTE.—The Freehold Properties are invested in The Wildfowl Trust (Holdings) Ltd.		
	New Buildings, etc., New Grounds, Slimbridge, Gloucestershire :—		
	Amount, 31st December, 1960	11362 13 10	
	Less Written off to 31st December, 1960	4188 18 10	
	Written off in year ended 31st December, 1961	597 16 3	
		4786 15 1	
7173			6578 18 9
	NOTE.—The New Buildings, etc., to be written off over a period not exceeding that of the Lease.		
35167			£41810 6 1

We have examined the above Balance Sheet of the Wildfowl Trust dated 31st December, 1961, together with the accompanying Income and Expenditure Account and find them to be in accordance with the Books and Vouchers produced to us and the information and explanations given to us.

STROUD, Gloucestershire.

S. J. DUDBRIDGE & SONS,

THE COLLECTIONS

The Breeding Season, 1962

S. T. Johnstone

1962 was heralded in by the coldest night recorded in the sixteen years history of the Trust, and the severe weather continued well into February. In consequence, the commencement of the breeding season was delayed for some three weeks. Some species that normally breed here—European Pochard, Canvasback and Tufted Duck—failed to nest at all. In all, some ninety-eight forms nested and from these some 900 birds of 83 different kinds were brought to maturity. This figure represents 80% of young hatched. One new form of goose was reared, the Vancouver race of Canada Goose *B. canadensis fulva.*

Sad failures were recorded with the Trumpeter Swan which failed to incubate her eggs consistently, letting them get chilled after the third day, and with the King Eider whose eggs were ruined by the bantam giving up sitting at a critical time. Only thirteen Hawaiian Geese were reared, the poorest figure for some years. On the other hand, considerable success was recorded with ducks from New Zealand: twenty-three Shovelers, twenty-two Brown Duck and thirty-three Scaup were reared as well as five Grey Duck. Further success has been recorded with the rare Pacific island duck the Laysan Teal, being reared on behalf of the American Fish and Wildlife Service. The twenty-five reared at Slimbridge this year increased the Trust population of this distinctive subspecies to forty birds.

Additions to the collection included a gift of a fine pair of Cuban Flamingos from Antwerp Zoo, and a further eight were obtained from Miami. A consignment of Steller's Eiders arrived from Alaska in rather poor condition, most of the males being dead on arrival. However, five ducks and two drakes survived to moult into full plumage and now form, along with Smew and Harlequins, a fine spectacle on the waterfall pond.

Another attempt was made to establish Kelp Geese in the collection, but this was again unsuccessful. Two males and a female were acquired in late August. Various seaweeds were collected on the south coast and all kinds of pond weed were offered unsuccessfully. The only food consumed in any quantity was turkey starter crumbs. The drinking water was treated with iodine. Nevertheless, all three birds had succumbed to aspergillosis by mid-February, 1963.

The most rewarding occurrence of 1962 for those working with the collection was the completion of the Ne-Ne project by the sending of thirty geese back to Hawaii, described elsewhere in this issue.

Breeding Analysis 1962—Slimbridge

species and race	reared artificially			reared by parents			Total
	eggs	hatched	reared	eggs	hatched	reared	reared
Magpie Goose	10	4	4			4	8
Fulvous Whistling Duck	21	2	2		29	23	25
Red-billed Whistling Duck	23	6	4		19	15	19
Black Swan				5	2	2	2
Black-necked Swan				5	3	3	3
Bewick's Swan				5	2	2	2
Swan Goose	20	7	6				6
Western Bean Goose	10	5	2				2
Russian Bean Goose	3	1	0				0
Pink-footed Goose	18	7	6		3	3	9
Greenland White-fronted Goose	6	2	1				1
Lesser White-fronted Goose	14	4	2				2
Western Greylag Goose					17	11	11
Eastern Greylag Goose				8	3	2	2
Bar-headed Goose	16	4	1				1
Emperor Goose	54	17	12				12
Greater Snow Goose	19	6	3		3	2	5
Ross's Goose	23	8	8				8
Atlantic Canada Goose				5	3	1	1
Manitoba Canada Goose				5	3	3	3
Taverner's Canada Goose				5	2	2	2
Dusky Canada Goose				5	3	0	0
Vancouver Canada Goose				4	3	1	1
Hawaiian Goose	146	14	13				13
Barnacle Goose	38	25	23	17	17	15	38
Black Brant	11	6	4				4
Red-breasted Goose	18	6	4				4
Cape Shelduck				6	4	4	4
European Shelduck	10	5	3				3
Abyssinian Blue-winged Goose	10	7	7				7
Ashy-headed Goose	9	5	1		3	2	3
Ruddy-headed Goose	9	3	0		2	1	1
Lesser Magellan Goose	13	9	3				3
Greater Magellan Goose	8	1	1		15	15	16
Cereopsis Goose	7	1	0		3	1	1
Andean Crested Duck	7	0			4	4	4
Marbled Teal	52	30	27				27
Cape Teal	52	29	24		12	9	33
Versicolor Teal	22	5	1				1
Bahama Pintail	40	27	26		7	5	31
Chilean Pintail	18	12	10				10
Northern Pintail	23	16	8				8
Kerguelen Pintail	4	3	2				2
Chilean Teal				5	3	0	0
Sharp-winged Teal	4	2	2				2
European Teal	6	6	6				6
Falcated Teal	8	5	2				2
Australian Grey Teal	5	1	0				0
Chestnut-breasted Teal	22	16	12		13	11	23
New Zealand Brown Teal	6	2	2		20	20	22
Hawaiian Duck	17	4	3				3
Laysan Teal	60	24	20		5	5	25
North American Black Duck	14	9	5				5
Indian Spotbill	6	1	0		5	1	1
Chinese Spotbill	10	2	1		15	12	13
New Zealand Grey Duck	14	9	5				5
Australian Black Duck	9	2	2				2
Philippine Duck	23	9	8		9	0	8
African Yellowbill	20	11	10				10
African Black Duck	15	1	1				1
Gadwall	27	24	24		11	11	35
European Wigeon	11	5	5				5
American Wigeon	11	1	0				0
Chiloe Wigeon	25	9	6		9	7	13

species and race	reared artificially eggs	hatched	reared	reared by parents eggs	hatched	reared	Total reared
Blue-winged Teal	10	10	7				7
Cinnamon Teal	36	21	15				15
Garganey	9	7	5				5
Cape Shoveler	32	7	3		13	8	11
New Zealand Shoveler	40	30	23				23
Common Shoveler	16	1	1		13	7	8
Ringed Teal	90	59	31		6	6	37
European Eider	8	5	4				4
Red-crested Pochard	58	25	18				18
Rosy-bill	8	3	2				2
Redhead	14	11	8				8
Common White-eye	16	7	7				7
Australian White-eye					7	1	1
New Zealand Scaup	61	38	33				33
Lesser Scaup	70	20	16				16
Greater Scaup	14	2	1				1
Greater Brazilian Teal	7	4	3				3
Mandarin Duck	28	3	2				2
North American Wood Duck							81
South American Comb Duck	6	4	1				1
Hartlaub's Duck					10	8	8
Barrow's Goldeneye	10	6	1				1
European Goldeneye	34	4	0				0
Smew	9	4	2				2
North American Ruddy Duck	7	4	1			29	30

In addition, the following forms laid eggs none of which hatched: Cuban Whistling Duck, Trumpeter Swan, European White-fronted Goose, Blue/Lesser Snow Goose, New Zealand Shelduck, Bronze-winged Duck, Puna Teal, King Eider, South American Pochard, African Pochard, Lesser Brazilian Teal, Spur-winged Goose.

Breeding Analysis 1962—Peakirk

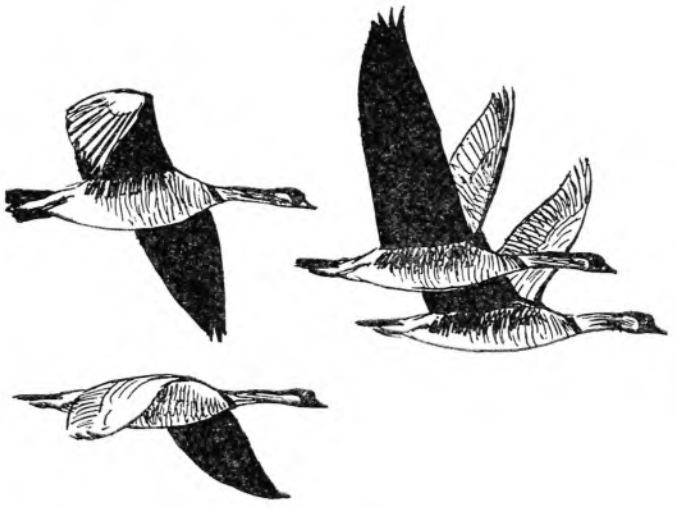
Species and race	No. of Breeding Pairs	No. of eggs	Hatched	Reared
Black Swan	1	6	6	6
Black-necked Swan	1	6	3	3
Swan Goose	1	10	4	2
Lesser White-fronted Goose	2	6	2	1
Western Greylag Goose	3	18	12	12
Eastern Greylag Goose	1	4	2	2
Emperor Goose	1	5	5	0
Blue Snow Goose	2	8	3	3
Barnacle Goose	2	20	2	2
Cape Shelduck	1	6	6	5
European Shelduck	2	12	6	6
Cereopsis Goose	1	7	1	1
Marbled Teal	2	17	12	1
Cape Teal	5	40	20	15
Puna Teal	2	22	8	3
Bahama Pintail	5	61	34	24
Pintail	3	38	22	21
Falcated Teal	1	7	2	2
Chestnut-breasted Teal	2	12	3	0
Mallard	1	8	8	8
North American Black Duck	1	8	1	1
Chinese Spotbill	1	15	6	5
New Zealand Grey Duck	1	5	4	4
African Black Duck	1	5	1	1
Gadwall	3	25	17	12
Wigeon	1	7	7	6
American Wigeon	1	8	4	3
Blue-winged Teal	1	7	7	6
Cinnamon Teal	2	20	7	4
Garganey	2	15	13	9
New Zealand Shoveler	1	5	2	1
Common Shoveler	3	31	20	18
Ringed Teal	1	3	2	0
Red-crested Pochard	3	35	17	12
Rosy-bill	2	13	11	10
Redhead	1	13	9	3
Tufted Duck	1	5	4	3
Brazilian Teal	1	22	21	19
Mandarin Duck	1	5	4	2
Carolina Duck	5	45	34	29
North American Ruddy Duck	4	38	33	0

Seven species laid eggs none of which hatched: Fulvous Whistling Duck, Lesser Canada Goose, Chilean Teal, Laysan Teal, Cape Shoveler, Australian White-eye, New Zealand Scaup.

Member's Collections

In 1962 the following Members showed their collections of waterfowl to fellow Members of the Trust:—

Arthur Cadman, T. Curtis, J. O. Death, A. W. E. Fletcher, Miss Enid Manasseh, C. Marler, E. A. Maxwell, R. E. M. Pilcher, G. L. Reid, E. O. Squire, R. J. Stainsby, Noel Stevens, Mrs. P. V. Upton, M. Vinson, J. Williams, D. Wintle.



Return of Slimbridge-reared Nene to Hawaii

FROM the beginning of the Trust's attempts to rear Hawaiian Geese *Branta sandvicensis* in 1950 it had been hoped that it would become possible to return Slimbridge-reared geese to Hawaii. The growth of the stock has been slow and some of the birds raised have been dispersed to other collections in Europe and North America in order to increase the chance of maintaining and developing flourishing stocks in captivity. By 1960, however, enough geese had been reared to allow the return of some of our Nenes to Hawaii. It was not until the summer of 1962 that this somewhat complicated and expensive operation could actually be carried out.

The Division of Fish & Game, Department of Land and Natural Resources of the State of Hawaii, the agency responsible for the welfare of the remnant wild population and for the captive-rearing programme on the Island of Hawaii, proposed that, rather than returning them to the Big Island, the Slimbridge-reared geese should be used in an attempt to re-establish the species on the Island of Maui, where it had been extinct for many years. A survey of the existing habitat on Maui in June, 1960 showed that there were 9000 acres of excellent Nene habitat and a further 30,000 acres likely to be of some value. A release site was selected near Paliku within the Haleakala National Park. There were strong reasons for this choice: the area, at the upper end of the Kampo Gap, provides excellent Nene habitat with food throughout the year; it is remote, ensuring a minimum of disturbance to the birds in a release pen; yet suitable accommodation existed for the people needed to care for the birds.

In June, 1962 thirty geese were despatched by air from Slimbridge to New York. They were taken to the U.S. Federal Quarantine Station at Clinton, New Jersey, where they were held for 21 days. Then they were sent on again by air freight to Honolulu. There they were kept in the Zoo for three days to recover from the journey and were given individually distinctive plastic leg bands. On 26th they travelled by air again to Kahului, on Maui.

The Slimbridge birds consisted of ten juveniles, seven one-year-old, ten two-year-old, two three-year-old and one four-year-old. 17 were females and 13 males. At Kahului they were joined by five juvenile females, reared by the State's Pohakuloa propagation project on Hawaii. The thirty-five birds were put in light-weight cardboard boxes and taken on a truck up to the rim of Haleakala Crater. Here the boxes were loaded on pack boards and were carried on the backs of 23 Boy Scout volunteers $8\frac{1}{2}$ miles down into the Crater and across to the release pen at Paliku on the other side.

The Paliku release pen encloses about an acre of good grass, on the edge of an ancient "aa" lava flow. The geese were released in the late afternoon of 26th July. As they were removed from the boxes, their clipped primaries were extracted so that new feathers would start growing in immediately. The birds were given constant care and supplied with native berries and scratch feed daily. They were also treated for coccidiosis and caecal worms, these parasites having been detected in the faecal droppings of the flock. There was much pecking and other signs of social adjustment for a week or so, but the birds soon settled down.

The geese began making short flights within the pen early in September. The first flights out of the pen were seen on 12th September, two Hawaiian-reared birds being the pioneers. The first Slimbridge bird did not fly out until 17th September. By the end of the month 27 of the 35 were flying a few hundred yards out of the pen, returning again at dusk. The Hawaiian and English birds, though remaining in distinct flocks within the pen, mixed very well outside it.

Earlier experience with four separate releases, of 87 birds in all, on the Island of Hawaii, made with similar release pens has shown that the geese will generally remain in the vicinity of the pen for several months. It is planned to make annual releases of Nene from the same pen in Haleakala Crater for at least two more years, a total of 100 birds being the aim.

This was a co-operative project, for which the Wildfowl Trust supplied the birds and met the expenses of the air-freight from England to Hawaii. The Trust is indebted to the Wildfowl Foundation, Inc. and to the World Wildlife Fund for substantial contributions towards the high costs of transport. It seems desirable to correct here the notion, mistakenly given currency in the Report to the American Ornithologists' Union by the Committee on Bird Protection, 1961 (*The Auk* 79 : 476. July, 1962) that the Hon. Director of the Trust is "offering about 20 full-grown goslings per year for sale for $22.50 per bird, with the suggestion that they be liberated on Haleakala on Maui." This is incorrect and arose from misunderstanding of a suggestion that interested persons might make contributions towards the cost of shipping the geese to Hawaii.

The Research Unit

It has been clear for some time that the increased research and educational activities of the Trust require additional accommodation, and plans for a fine building were drawn up in 1960. This will cost a great deal of money which cannot be met from current income. It is therefore extremely gratifying to report that the Trustees of the Wolfson Foundation have made a magnificent donation of £10,000 to enable the first phase of the building to be started, it is hoped, in the early summer of 1963. This will consist of an exhibition hall, library and seven work rooms in a two storey building looking over the Big Pen.

The running expenses of the Unit were again largely met out of the Nature Conservancy's Grant, £12,000 in the year from March, 1962. We are indeed grateful for this continued and essential support.

Dr. S. K. Eltringham, pilot-biologist, left in December, 1961, having completed the investigation of aerial survey methods, to take up a post as Lecturer in Zoology at King's College, London. J. C. Frith joined the staff in May, 1962 as assistant to the wildfowl count scheme and related activities. N. Phillips, laboratory assistant, left in February and was replaced by Miss S. Loader in July. Otherwise the Unit's personnel remained as in the previous year: Dr. G. V. T. Matthews, Assistant Director (Research), H. Boyd (ringing programme, goose surveys, wader netting), G. L. Atkinson-Willes (wildfowl counts, refuge selection), Dr. J. V. Beer (pathology, photography), P. J. S. Olney (viscera analyses, habitat improvement), Dr. Janet Kear (feeding behaviour, agricultural aspects), M. A. Ogilvie (ringing assistant), Miss E. Temple Carrington (secretarial assistant), W. A. Cook (Borough Fen decoyman).

Major General C. B. Wainwright, C.B. who operates the ringing station at Abberton was assisted by R. King and J. Whitford.

The basic routine research work of ringing and censusing continued unabated. The ringing stations had a good season, that at Slimbridge being the best in the Decoy's history. The wildfowl counts continued into their fifteenth year, with the monthly interim reports, issued about a fortnight after each count, proving as useful and popular as before. An analysis of the great mass of data on individual waters collected over past years began to take final form and should be published before the end of 1963 as a survey of the winter distribution of wildfowl in Great Britain in a Monograph of the Nature Conservancy (Number Three). The special goose counts were again made in November for Greylag and Pinkfeet and in April for Barnacle Geese, all the populations remaining a healthy size. Rocket netting for waders on the Wash was carried out in July and August. A novel departure, and one which we hope to see repeated, was the use of our equipment abroad. This was in Friesland at the invitation of Dutch research and conservation bodies. Although intense cold resulted in technical difficulties and small catches of Barnacle Geese, the gain in international co-operation was very well worth while. (The operating snags now appear to have been eliminated and a satisfactory catch of 316 Barnacles was made on the Solway in January, 1963).

Orientation research on the Mallard continued, taking advantage of the large numbers of birds available for dispersal. The 'nonsense' orientation of birds released in groups and of Mallard from different populations was investigated. A study was also begun on the astronomical clues interpreted by the birds and on the time-measuring device that is involved.

Viscera analysis was further restricted to those of species not previously represented in any number, and to those from special research areas. A number of papers on the results obtained in the past years have been prepared. A wide range of actual and potential wildfowl reserves have been visited and advice given on planting and other management activities. The ballast pits in the Darent Valley, near Sevenoaks, where much practical research has been done with the Kent Wildfowlers' Association, were designated a Wildfowl Trust Experimental Station in recognition of their importance.

A full investigation was carried out in Scotland of the relation of wildfowl to agriculture. This has enabled a balanced appreciation to be made on the extent to which damage may be caused in some circumstances, particularly by geese, and of the various factors that may offset or prevent this. A series of papers have been prepared on this subject about which much has been heard but little factual evidence collected hitherto. At the same time the basic research on feeding behaviour, bill structure and nutritional requirements has continued.

Routine post-mortems were made on material from the Collection and anatomical specimens salvaged for our own requirements and for those of workers in other institutes. The Trust's skin collection was greatly enriched by a gift of 73 skins of American ducks, in a handsome cabinet, from Lord William Percy. His recent death is a great loss to ornithology.

Mr. R. A. Avery, Department of Zoology, University of Bristol continued to use our facilities in his parasitological studies, and Dr. C. J. F. Coombs carried on his experiments on the control of gonad development and moult through day-length changes. Colonel and Mrs. D. S. McChesney, Research Associates of the Laboratory of Ornithology, Cornell spent two months recording the calls of over 90 of the species in the Collection. Their material will be analysed by the sound spectrogram method and correlated with tracheal structure. Miss A. Tiersch, a student of Prof. Dr. K. Lorenz at Seewiesen, studied pair formation (or rather the lack of it) in the recently acquired Flamingo flock in the spring of 1962.

The British Ornithologists' Union held its Annual Conference at Bath in March, 1962. The Trust provided several speakers and entertained members of the Conference at the New Grounds. The material for an illustrated brochure " The Story of the Wildfowl Trust " was put together and this publication is now on sale. An exhibit was prepared for the annual Game Fair which was held at Longleat, Wiltshire. Plans went forward for the production of a film on the Trust's activities which is now being shot by the British Transport Commission Film Unit.

The XIIIth International Ornithological Conference at Ithaca, New York in June, 1962 was attended by the Hon. Director, Dr. Matthews and Dr. Janet Kear. Subsequently Dr. Matthews visited a large number of research institutes in the United States and Canada, his tour being assisted by funds from American sources and from the Canadian Science Foundation. It was encouraging to find how widely known the Trust is and the valuable part played by the Annual Report in spreading the Trust's image.

Recent publications by members of the Wildfowl Trust Research Unit

MUCH of the work completed by the scientific staff is published in journals other than the Report. Abstracts of papers appearing between late 1961 and early 1963 are included here. Reprints of most of the papers can be obtained from the Trust headquarters.

(1) The incidence of *Aspergillus fumigatus* in the throats of wild geese and gulls. J. V. Beer.
from *Sabouraudia* 2 : 238-47. 1963.

Using an improved form of swab and selective cultural conditions *Aspergillus fumigatus* Fresenius was found in 86 of 1188 Pink-footed Geese *Anser brachyrhynchus*, in 4 of 61 Canada Geese *Branta c. canadensis* and 13 of 102 Herring Gulls *Larus a. argentatus* caught in Britain. The Pink-footed Geese, migrating from Iceland, appear to become infected shortly after arrival. A higher level of infection was found near the Solway Firth than elsewhere. The fungus was shown to be present in the natural habitats of these birds and it is suggested that infection usually occurs from a heavy but local growth of the fungus in a micro-habitat associated with the birds' food.

(2) Weights of Pink-footed Geese in autumn. J. V. Beer and H. Boyd.
from *Bird Study* 9 : 91-9. 1962.

2,844 Pink-footed Geese caught for ringing in Scotland and England in October and November between 1953 and 1959 were weighed. The mean weights were: adult males 2.77 kg. (6 lb. 1 oz.); adult females 2.52 kg. (5 lb. 8 oz.); and first-autumn males 2.39 kg. (5 lb. 4 oz.); and first-autumn females 2.17 kg. (4 lb. 12 oz.). Geese 3 and 4 years old weighed less than those 1 and 2 years old or those over 5. In one year out of four weights of adults and young were significantly reduced. This was in 1959, a year of poor breeding success. Weights of flightless adults in Spitsbergen in late summer were little less than British October weights (5.7% in males, 7.0% in females). There was no evidence of increases in weight through October and November in either adult or young geese, nor could any regional differences be found.

(3) An ovarian tumour in a Mallard. J. V. Beer and G. W. Storey.
from *Bull. Brit. Orn. Club* 81(9) : 153-6. 1961.

The tumour, 12 x 7 cm. and weighing 400 gms. was malignant and of the granulosa-cell type. Comparison is made with the occurrence of tumours in the chicken and in other captive or wild birds.

(4) Mortality and fertility of European Charadrii. H. Boyd.
from *Ibis* 104 : 368-88. 1962.

A review of published data on the mortality and fertility of 23 species of wading birds (Charadrii). Recoveries of ringed birds are the main sources of mortality estimates, though recaptures can sometimes also be used. Mortality in the first year after fledging is usually higher than in later years, though estimates tend to be biased by the preponderance of recoveries due to shooting. Adult death-rates in steady populations vary from about 15.7% (Oystercatchers) to 51.9% (Common Snipe), with most in the range 30-45%. Closely-related species tend to have similar death-rates. Large waders live much longer than small ones.

Studies of fertility have been scarce. Few waders are double-brooded, though many re-nest if necessary. In most thriving breeding colonies 66-96% of the eggs laid hatch. Survival of chicks from hatching to fledging, typically averages 40-80%, success often varying widely from year to year. Intensive long-term studies of breeding groups make the most effective contribution to knowledge of population dynamics. Such knowledge is urgently needed for sound conservation measures.

(5) The Whooper Swan in Great Britain. H. Boyd and S. K. Eltringham.
from *Bird Study* 9 : 217-41. 1962.

Co-operative surveys found at least 2,200 Whooper Swans in Scotland (1,840), England (320) and Wales (70) in November 1960; 1400-1600 from December 1960 to March 1961; and at least 3,100 in November, 1961. The true increase from 1960 to 1961 was less than that suggested by the November counts. An index based on counts at 75 Whooper haunts suggests that the wintering stock increased considerably from 1948 to 1952 and remained nearly constant from 1952 to 1960. There has been a general increase in wintering Whoopers over the last fifty years, especially in central Scotland and north-east England.

Peak numbers of Whoopers occur in November and some onward movement, presumably to Ireland, takes place during the winter. The gross annual mortality rate is of the order of 20%, though probably higher for young and lower for mature swans. In 1948-61 the average proportion of young birds in autumn was 20.4%, fluctuating from 6.3% to 25.7%. The average brood size in autumn was 2.66 and did not vary markedly from year to year. It appears that even in apparently favourable years between one-third and one half of the mature birds failed to bring young to Britain.

Most flocks of Whoopers were of less than ten birds and only 5% contained more than 50, yet in autumn these large groups contained nearly half the population. Early immigrants and late emigrants are nearly always in small groups, with unusually few young.

(6) The British population of the Mute Swan in 1961. S. K. Eltringham. from *Bird Study* 10 : 10-28. 1963.

A large scale investigation of the Mute Swans in Great Britain was made in 1961 in response to reports of widespread increase in numbers. The main purpose of the investigation was to determine if such an increase had occurred and, if so, to measure its extent by comparison with a census carried out in 1955 by the British Trust for Ornithology.

The major part of the work was a census conducted both from the air and from the ground in April and May, 1961. 8826 swans were recorded from the ground census in 14 English and 6 Scottish counties selected for their large swan populations. There were roughly twice as many non-breeders as breeders while 6% were holding territories but were without nests or young. In 19 counties (omitting Kent, inadequately searched in 1955), 7363 swans were recorded in 1955 and 7778 in 1961. A more accurate assessment, in which only areas with identical cover in both years were compared, showed no change in numbers. The aerial survey found 6005 swans in 14 English counties, where 6495 had been counted in 1955. In 6 counties where surveys were made both on the ground and from the air, 2322 swans were recorded from the ground in places where 2247 birds were seen from the air.

An analysis of winter counts showed that the population, which had been increasing rapidly in 1955, reached a peak in 1959 and has since declined to a level some 10% above the 1955 figure.*

Data on the breeding biology were extracted from the census forms. 57 completed clutches were reported with an average clutch size of 6.0 eggs. The average size of the young broods was 4.5 in England (447 broods) and 4.2 in Scotland (59 broods), a national average of 4.5. 49% of 1013 nest sites were near running water, 46% near standing water and 5% on or near the coast. Over 12% of nests were known to have failed. Flooding destroyed many nests early in the season but human predation, chiefly by youths and landowners, was responsible for most losses.

The nature and extent of damage attributed to swans were investigated. Complaints were received of swans grazing on spring grass and depriving fish of food and shelter by stripping the underwater vegetation. Such damage was found to occur in very few places. Allegations of attacks on other waterfowl have substance but do not appear to cause serious losses. Electrical failure due to the collision of swans with power cables is a nuisance but not an important economic problem.

(7) The moult migration of the Shelduck *Tadorna tadorna* (L.) to Bridgwater Bay, Somerset. S. K. Eltringham and H. Boyd. from *British Birds* 56 (in press).

Most British Shelduck migrate in July to sandbanks off the German North Sea coast, where they moult. Three subsidiary moulting areas are known, that in Bridgwater Bay being the only one in Britain. The movements of Shelduck in Bridgwater Bay and the upper reaches of the Bristol Channel were surveyed from aircraft in 1959 and 1960. The resident population in the Bay numbers only a few hundred. The first migrants, arriving in July, do not remain to moult. There is a second influx in August, another larger one in early September and a fourth in October. More ducks were seen in 1959 than in 1960, the September peaks being 3,400 and 2,000 respectively. The Shelducks living nearby in the Bristol Channel and Severn Estuary appear to migrate to Germany and do not moult in Bridgwater Bay. The birds moulting there probably come from Ireland and west Wales, but this will not be known until many have been ringed.

**The severe weather of January 1962 and December 1962—February 1963 has produced a further decrease.* (*Ed.*)

(8) Some congenital abnormalities in the beaks and skulls of wildfowl. Jeffery Harrison and Janet Kear.
from *The Veterinary Record* 74(22) : 632-3. 1962.

Six examples of congenital deformities were found in eggs that failed to hatch at Slimbridge. 3 concerned wild Mallard from a total of 723 embryos or ducklings examined, 1 Chiloe Wigeon (from 17 fertile eggs), 1 Southern Pochard (10) and 1 Greater Snow Goose (13). One brood of Mallard had a number of polydactylous ducklings.

(9) Early sexual maturity in Mallard. Janet Kear.
from *British Birds* 54 : 427-8. 1961.

Wild Mallard hatched in November and hand-reared produced fertile eggs when seven months old. It appears that Mallard under certain circumstances may produce two generations in one year.

(10) A list of the parasitic Protozoa, Helminths and Arthropoda recorded from species of the Family Anatidae (Ducks, Geese and Swans). G. Lapage.
from *Parasitology* 51 : 1-109. 1961.

The parasites known to occur in each species of wildfowl are listed, the information being derived from 692 original publications.

The full details, on which the list is based, are entered on punched cards which are available for consultation at the Wildfowl Trust.

(11) 'Nonsense' orientation as a population variant. G. V. T. Matthews.
from *Ibis* 105 : 185-97. 1963.

Slimbridge-caught Mallard headed off predominantly north-west on release from July right through to May. Birds caught at Borough Fen Decoy, Peakirk, had a similar 'nonsense' orientation from August to October and again in March, but in midwinter scattered virtually at random. Yet the individual birds at such times did not appear disorientated.

Mallard from St. James's Park, London had a southerly tendency from autumn to spring. The admixture of such birds with the Peakirk population present in autumn would produce an apparent random scatter. However London birds are unlikely to penetrate as far north as Peakirk.

An analysis of recoveries of Mallard ringed in this country and abroad revealed that immigrants from the Continent, and especially from the Baltic, arrived in November and were present through to February. Thus they coincided with the changes in orientation at Peakirk; moreover they were much more likely to occur in the east and north of England than in the Slimbridge area. The hypothesis that the mixing of populations with different directional tendencies produced mixed (apparently random) orientation was further strengthened by the finding that Baltic Mallard, caught at Stockholm, Sweden, flew south-east on release.

Mallard ducklings from Slimbridge and London were reared to flying in large aviaries at Slimbridge. Their first flights in full liberty were too abbreviated for conclusive results but gave indications of differences between the two stocks. It is therefore improbable that 'nonsense' orientations are learned in response to the topography encountered in a bird's early flights from feeding grounds to roost.

The finding that such orientations vary from population to population has made their explanation even more obscure than before. It also means that instances where different stocks of birds (e.g. pigeons) released at the same point have different and apparently *homeward* tendencies cannot in themselves be taken as proof of a full navigational ability.

(12) The astronomical bases of 'nonsense' orientation. G. V. T. Matthews.
from *Proceedings of the XIIIth International Ornithological Congress, Ithaca,* 1962 (in press).

A series of experiments confirmed that by day the north-westerly 'nonsense' orientation of Slimbridge Mallard was determined by reference to the sun's position. The orientation disappeared under heavy, continuous cloud cover and was switched 90°, to the NE, when cloud conditions produced a false sunset in the NW (instead of SW). Ducks were confined for several days in a room provided with an artificial day six or

twelve hours out of phase with normal. This had the effect of resetting their internal 'clocks'; those advanced 6 hours flew mainly SW, those retarded 6 hours went NE. These changes were in accord with their setting off at an angle to the sun's real position but appropriate to the false time. Birds with their clocks 12 hours out of phase had different directional tendencies according to the time at which they were released, SW mid-morning, NW at noon, NE mid-afternoon, SE in the late afternoon. This suggested that the angle-correcting mechanism 'unwound' during the birds' false night, as if they 'thought' the sun after setting ran backwards through the south (at midnight = actual noon) to rise again in the east.

At night under the stars well marked NW orientation was shown by Mallard equipped with small leg lamps (which became detached in water). The orientation was present throughout the season despite the shift of the stars and the emergence and disappearance of constellations. Heavy cloud again produced disorientation. Birds with their clocks 6 or 12 hours out of phase did not show the shifts in orientation they would have done by day. It was inferred that their direction-finding was with reference to the pattern of the constellations, not to the position in azimuth of any particular star or stars.

The moon did not apparently assist orientation when the stars were also visible. Clock-shifting which should have produced deviation if the moon position was being used did not do so, the information available from the star patterns apparently being preferred. When the latter were blotted out by stratus cloud however, there were indications that the birds could, as a last resort, use the moon for orientation.

(13) The food and feeding habits of Tufted Duck *Aythya fuligula*.

P. J. S. Olney.

from *Ibis* 105 : 55-62. 1963.

The food and feeding habits of Tufted Duck *Aythya fuligula* are described, based on field observations and on the analyses of the stomach contents of 95 birds, all but one of them having fed inland; 57 were collected from a gravel pit near London, 28 from Northern Ireland and 9 from a number of English inland waters, in the shooting seasons 1959-60 and 1960-61.

The London birds in both seasons had fed primarily on molluscs, mainly *Dreissena polymorpha*. Those from Northern Ireland, where *D. polymorpha* does not occur, had a more variable diet, again mainly molluscs, but with some crustaceans, insects and plant seeds. The English birds had a similarly variable diet with the emphasis on crustaceans (*Asellus* spp.) and with some molluscs, insects and plant seeds. Brief information is given on the food of young birds.

It is suggested that the spread of *D. polymorpha* may be one of the factors explaining the recent spread of the Tufted Duck in certain areas. It appears that where one particular food such as *D. polymorpha* is not plentiful a more variable diet is taken, though molluscs always figure prominently. The type of food taken depends on the type of habitat used, the availability and size of the food items and on the methods of feeding.

(14) The food and feeding habits of Teal *Anas crecca crecca* L.

P. J. S. Olney.

from *Proc. Zool. Soc. London* 140 : 169-210. 1963.

The food and feeding habits of Teal *Anas crecca crecca* are described. This study is based on the analysis of 456 viscera collected during the shooting seasons of 1956-60, and on field observations. The sample is sub-divided into those 340 birds which were found to be feeding in salt-marsh or brackish-water areas and to the 116 birds feeding in freshwater areas. The saltmarsh and brackish-water feeding birds were further divided into two sections: the 234 birds collected from the Greenborough and Milfordhope Islands in the River Medway, Kent, and the other 106 birds collected around the British coast.

Teal feeding on saltmarshes were found to be feeding mainly on the seeds of *Salicornia* but also on the seeds of almost any of the common saltmarsh flowering plants except *Spartina townsendii* agg. and *Halimione portulacoides*. In certain areas and at certain times of the year *Enteromorpha* and the mollusc *Sabanaea ulvae* are important items of food. In brackish-water areas, Teal were found to be feeding mainly on the seeds of *Scirpus maritimus*, *S. tabernaemontani* and *Eleocharis* spp. and to a lesser extent on the mollusc *Hydrobia jenkinsi*.

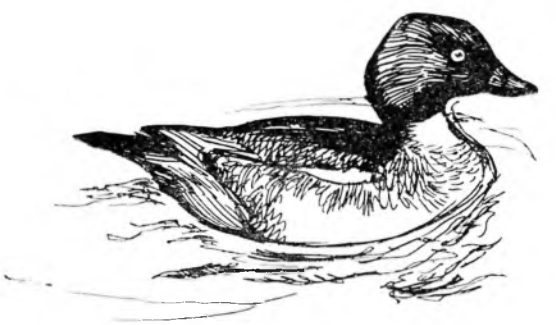
In freshwater areas almost any of the seed-bearing plants might be utilised, though there may be some limitation by size of seed. The most commonly occurring seeds within this sample were those of *Eleocharis palustris* and *Ranunculus repens*. Chironomid larvae were also taken, probably whenever available, and probably more so during the summer and early autumn months.

(15) The food and feeding habits of Goldeneye *Bucephala clangula*.
P. J. S. Olney and D. H. Mills.
from *Ibis* 105 (in press).

The food and feeding habits of Goldeneye *Bucephala clangula* are described, based on the analyses of 51 stomach contents and a brief review of the literature. The type of food taken depends on the type of habitat being used, the availability and size of the food items and on the methods of feeding—though animal material largely predominates.

In estuarine and coastal areas, small crustaceans and in particular *Carcinus maenas* figured highly in the diet, with some molluscs and small fish. In two brackish-water feeding birds, seeds formed the bulk of the food, some caddis-fly larvae also being taken. In freshwater feeding birds insects predominated, particularly Trichoptera larvae, chironomid larvae and the adults of *Corixa* spp. Some crustaceans (*Asellus, Gammarus*) and small molluscs were taken and occasionally small fish. A small amount of plant material was taken in the form of seeds, mainly *Potamogeton* spp.

The relations between Goldeneye and fishing interests are briefly discussed: fish normally form a small part of the diet and it is unlikely that any serious depredation of fish stocks is common.



Ringing, 1961-62

Ducks. The number of ducks ringed in 1961-62 was substantially more than the 3553 marked in 1960-61, thanks principally to a large catch of Teal at Abberton and to a record catch of Mallard at Slimbridge.

Ducks ringed 1961-62

Species	Abberton Essex	Borough Fen Northants	Slimbridge Glos.	Other England	Scotland	Total 1961-62
Shelduck	46					46
Pintail	2	4	26	12		44
Teal	2560	347	47	90	8	3052
Mallard	556	1823	1846	352	51	4628
Gadwall	10		1	5		16
Wigeon	45		1	7		53
Garganey	8					8
Shoveler	16	23	12	3	11	65
Eider					5	5
Pochard	8			2	1	11
Tufted Duck ..	25			4	5	34
Scaup	1				13	14
Goldeneye	1					1
	3278	2197	1933	475	94	7977

Major General C. B. Wainwright, at Abberton, retained his pre-eminence. The increase in the number of Shelduck ringed there corresponds to a building-up of this inland breeding colony. Other ringing stations in England not directly operated by the Trust were at Ludham, Norfolk; Abbotsbury, Dorset; and Deeping Lake, Lincolnshire. Trapping at How Hill, Ludham under the supervision of Messrs. C. A. and M. R. Boardman began in 1936, so that this is the oldest duck ringing station now in use in this country. In 1961-62 the catch at Ludham was 100 Mallard. At Abbotsbury, the famous decoy operated by Mr. F. Lexster for the Earl of Ilchester, the season's catch comprised 11 Pintail, 80 Teal, 37 Mallard, one Pochard (and one Bittern). The traps at Deeping Lake, used by Messrs. O. and H. Dandridge produced, as in previous years, a varied haul of seven species, though the total catch was below average.

In Scotland Miss E. A. Garden continued trapping at Newburgh, Aberdeenshire, despite her own ill-health and other serious difficulties and was rewarded particularly by catching 13 Scaup. Mr. D. R. Anderson again used a trap at Duddingston Loch, Midlothian, also beset by uncontrollable hazards. In June, 1962 a small number of ducklings, mostly Shoveler, were caught near Gartocharn, Dunbartonshire, with the co-operation of Mr. E. A. Maxwell.

Geese. In December, 1961 a Trust team took the rocket-netting equipment to Holland in an attempt to catch Barnacle Geese, at the invitation of Mr. J. A. Eygenraam, of the Institute for Applied Biological Research in Nature (I.T.B.O.N.), Arnhem. This was only a qualified success, two catches yielding 109 geese, and was of use chiefly in providing experience of operating in freezing temperatures. The Trust is greatly indebted to Messrs. T. Lebret, R. E. M. Pilcher and C. Sellick for their help in this work.

76 White-fronted Geese were caught at Slimbridge on 6th March, 1962.

Swans. Ringing of Mute Swans in Britain in 1961-62 was on a larger scale than ever. 3092 were ringed in 1961 and the total for 1962 though not known exactly at present was of the same order. About one Mute Swan in every four of the entire British population of 18,000 or so is now carrying a ring. The Trust's principal contributions to this ringing programme were to pay for all the rings used, and to give financial help to Dr. C. D. T. Minton for his intensive study in Staffordshire.

Waders. The rocket-netting equipment was used by the Wash Wader Ringing Group in July and August, 1962. 1426 birds, of eleven species, were caught, bringing the total caught in four summers to 7391. The 1962 catches were disappointing in that Dunlin (834), Redshank (221) and Knot (172) constituted most of the catch, no progress being made in catching Bar-tailed Godwits, Curlew and Grey Plover, as had been hoped for. 55 foreign- and British-ringed birds were recaptured, including the first Russian-ringed Dunlin to be found on the Wash. While the full value of this work will not be achieved for several years, it has already contributed to a better understanding of the movements of several species. (An account of the European movements of Redshank and Dunlin appears at p. 141).

Our ability to take part in wader ringing in 1962 was again greatly facilitated by a generous grant from Group Captain R. Smyth Pigott.

Wild Geese at the New Grounds, 1961-62

European White-fronted Goose *Anser albifrons albifrons*

The first four were seen on 24th September, 1961. There was a gradual accumulation from 6th October onwards, to 140 by the end of the month, 230 in mid-November and 470 in mid-December. Larger numbers arrived at Christmas-time, so that at the end of December there were 1800. In a spell of cold weather in early January, 1962, almost all the geese left but on 10th there were again 1860 and on 18th January 3500. Further additions brought the recorded figures to 3750 on 1st February, 4300 on 8th and 4400 on 12th, this being the largest number seen during the winter. There were still 3500 on 9th March; only 150 remained on 13th and 10 on 16th March. A few were heard, but not seen, on 24th March.

The proportion of young birds in the early arrivals was very high—46%, with an average brood-size of 3.7. In early January there were 28.7% young, with an average brood-size of 3.2. The latest immigrants raised the proportion to 34.7%, despite a drop in average brood to 3.1. These changes paralleled those in the season 1960-61, though with rather more young birds throughout. Thus 1961 must have been a very good breeding season and it seems as if the Whitefronts of Novaya Zemlya, Kolguev and the Kanin Peninsula were unscathed by the series of nuclear explosions on and over the north island of Novaya Zemlya that began in early September, 1961.

76 Whitefronts were caught with a rocket-net on 6th March, 1962.
No Greenland White-fronted Geese *A. albifrons flavirostris* were seen at Slimbridge in the winter of 1961-62.

Lesser White-fronted Goose *Anser erythropus*

Mr. K. D. Edwards saw one near Slimbridge on 27th February, 1962 (*per* Mr. D. D. Harber, Chairman of the Rarity Records Committee).

Pink-footed Goose *Anser brachyrhynchus*

The first autumn record was of eight on 13th October, rather a late date. Large scale arrivals took place in eastern Scotland from 12th to 14th October. On 20th October the total reached 33 and remained near that level for several weeks. The highest count was of 39 on 10th December. Shortly afterwards the number fell and none remained after 23rd December. One on 22nd January was the only record for the early months of 1962. The peak figure was the lowest recorded in the last thirty years, being closely approached only in 1959. 1959 had been a very bad breeding season for Pinkfeet, but 1961 was not, since 40% of young birds were found in Scotland and the total British population in November, 1961 was about 56,000.

Barnacle Goose *Branta leucopsis*

Several full-winged birds from the Trust collection were seen with the wild Whitefronts at various times in 1961-62, but a few wild Barnacles also occurred: one was noted on 9th January, 1962; four on 20th January and seven on 3rd and 12th February.

In sum, 1961-62 was a rather unexciting season for watchers at Slimbridge, with an unusually limited variety of species.

Year book for 1962

The World Wildlife Fund

We welcome the formation of the World Wildlife Fund, which is an international foundation with the object of raising money to save the world's wildlife and wild places. It covers a wide range of subjects from the extinction of species to the proper use of land, from concern about the disappearance of wilderness to concern about upsetting the delicate relationships between water, soil, plants, animals and man himself. It sees man in the role of trustee answerable to future generations for the continued existence of these priceless natural assets. It believes that conservation is *for* man, for his long term benefit, that enriching human life is no less important than alleviating human suffering, and that the ethical, aesthetic and even economic arguments are incontrovertible.

The Fund has been described as a new ark to save wildlife and wild places until the enlightened view of conservation is generally accepted by all mankind.

The Trust's Hon. Director has been much occupied with the early stages of establishing the Fund and is First Vice-President and Chairman of the International Trustees and also Chairman of the British National Appeal. He designed the Symbol of the Fund, a Giant Panda, which is one of the world's best-loved rare animals.

We feel that Members will wish to have a brief account of how the Fund has been set up, what it has so far achieved and what it plans to do.

Conservation is being promoted by many local and national bodies and on a world scale by the International Union for the Conservation of Nature and Natural Resources, an organisation with headquarters in Switzerland which has access to the best possible scientific advice. But conservation is hampered all over the world by lack of (comparatively speaking) quite small sums of money. Real progress could be made with a million pounds a year. This might be raised by campaigns mounted on a professional scale in those countries where substantial voluntary charitable monies are available. The World Wildlife Fund has been set up, based on an administrative plan by E. M. Nicholson, to collect voluntary money through a number of national appeals and channel it into conservation, wherever possible through existing organisations. The President is Prince Bernhard of the Netherlands and, like those of I.U.C.N., its headquarters are in Switzerland. W.W.F. was set up under Swiss Federal Law on 28th September, 1961 with the publication of a World Wildlife Charter for submission to the United Nations.

The British National Appeal of the World Wildlife Fund has Prince Philip as its president. It came into existence in the autumn of 1961 and raised about £100,000 in its first year. The provisional target in Britain is £180,000 a year. (Between them the R.S.P.C.A. and the People's Dispensary for Sick Animals have an annual income of nearly £1½ millions).

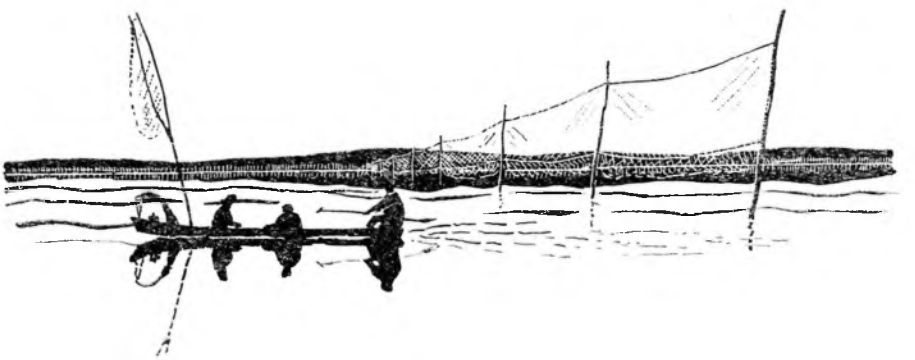
The World Wildlife Fund gets technical advice from I.U.C.N., and from the International Council for Bird Preservation; and it co-operates with the Fauna Preservation Society. Up to a third of the funds raised by National Appeals is at the disposal of the National Trustees for tasks at home, and the British National Appeal works closely with the Council for Nature and the County Naturalists' Trusts.

In its first year the W.W.F. financed wholly or in part twenty-six projects and a further thirty-nine are being dealt with as funds become available. The projects deal with a very wide variety of threatened animals places—from Rhinoceroses to Whooping Cranes, from Sumatra to Tristan da Cunha. Wildfowl are in a comparatively healthy state, but three of the projects completed or in hand directly affect ducks and geese. The W.W.F. contributed to the costs of returning the first consignment of Slimbridge-reared Ne-Nes to Hawaii (see pp. 17-18); and helped to extend arrangements for propagating the Koloa or Hawaiian Duck in captivity for later release in the wild, on the lines of the Ne-Ne operation.

The third W.W.F.—assisted scheme of wildfowl interest is on a vastly greater scale. This is the purchase, on the initiative of W.W.F., of large areas of the Marismas—the famous Spanish marshlands in the delta of the Guadalquivir. This scheme is in three parts. The first, the purchase of Las Nuevas (25 sq.miles) by the Spanish Government has already been completed. Stage two, the acquisition of the Coto Donana, another 25 sq.miles, is still in progress. The total sum required is 38 million pesetas (£226,189) of which the Spanish Government is producing 12 million pesetas, the remainder being found by a Spanish bank loan of 14 million pesetas, by a special loan arranged by Dr. L. Hoffmann (Hon. Director of the International Wildfowl Research Bureau) and by cash contributions. A further 11.6 sq.miles, in a part of the Marismas known as Hinojos, remain to be acquired. The successful completion of these purchases will ensure that the Marismas remain unchanged, the breeding place of a great variety and abundance of marsh birds and the wintering grounds of vast concentrations of ducks and geese. Contributions from British wildfowl enthusiasts are urgently needed in this cause.

Help can be given to the World Wildlife Fund in four ways: 1) by an outright gift of money; 2) by a covenanted gift spread over seven years or more (the British National Appeal is recognised as a charity for tax purposes); 3) by bequest; 4) by enlisting support among your friends. The address is:

The Secretary,
World Wildlife Fund (British National Appeal),
2, Caxton Street,
London, S.W.1.



Wildfowling in Northern Iran

Christopher Savage*

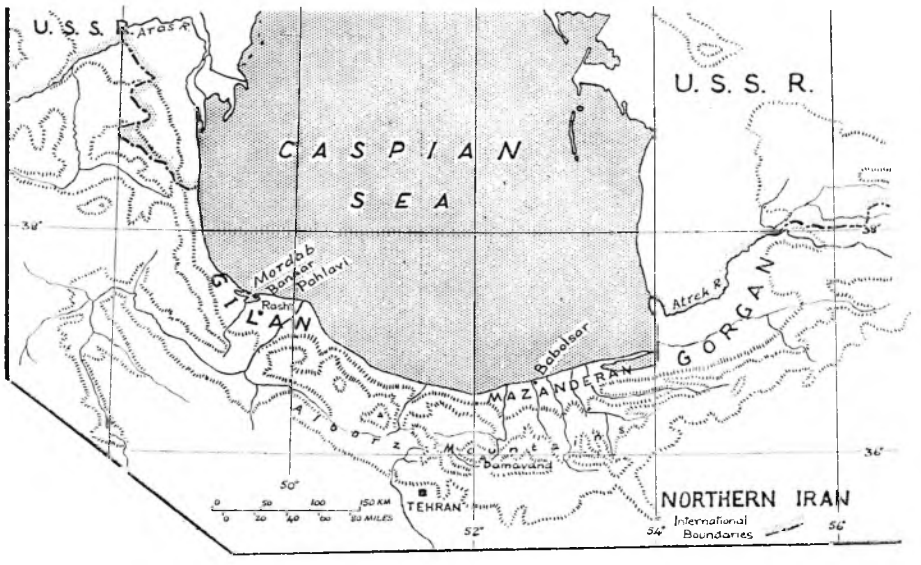
Summary

WILDFOWL are very abundant in winter in the marshes of northern Iran where there is an important wildfowling industry: over 1,200,000 ducks may be killed in an average season. Ducks are taken in a variety of ways, described here in detail, from personal investigations in 1957 and 1959. The principal method of capture is by means of a net, gong, and flare at night. Mist-nets and clap nets sited at pools to which wild ducks are attracted by trained decoy-ducks are also widely used. Long flight nets, and the calabash method, are of minor importance. Shooting, though increasing, accounts for only about 9% of the kill (110,000 ducks). The author suggests that the future welfare of the ducks will probably best be achieved by adherence to the traditional methods of capture, which require the maintenance of large tracts of carefully-preserved flooded land. It is important that recent increases in the disturbance of the wild geese should be halted.

The Caspian provinces of Gilan and Mazanderan are important wintering grounds of Palaearctic waterfowl, and it is not surprising to find there a well established wildfowling industry primarily for procurement of food. This I discovered early in 1957 when posted to Mazanderan in connection with irrigation investigations. It was not, however, until two years later that I had the opportunity of devoting two weeks' local leave to a general study of the wildfowling situation, and I was then extremely lucky to have the company of Christopher Sellick who came out to Iran at short notice with very little persuasion. He arrived in Tehran on 23rd January, 1959, and on 27th we drove over the snow covered Alborz Mountains down to Rasht. The following morning we soon covered the few remaining miles to Bandar Pahlavi which was to be the jumping off place for a visit to the famous lagoon and duck marshes known as the 'Mordab'. A boat had been arranged in advance, but things do not always go according to plan, and this was no exception. By mid-afternoon however, the Game Council representative, Mr. Dadeshi, had managed to find another boat and two stalwart boatmen, Sa'aban and Ebrahim. They were most reluctant to set out that day as they were doubtful of reaching the other side of the lagoon before nightfall. Their doubts, as we found later, were well founded, but we were determined to start at all costs! Eventually we set off about 4 p.m.

Our day had not been entirely wasted as we had been able to investigate the bazaar where in the poulterers' stalls we found numbers of Mallard,

*with illustrations by the author, including photographs of catching methods, at pp. 180-4.



Pochard, Pintail, Scaup, Wigeon, Tufted Ducks, Teal, a few Red-crested Pochards (one alive) and a female White-headed Duck *Oxyura leucocephala*. The last was of great interest but, alas, we saw no more.

Once out on the ' Mordab ' Sa'aban informed us that he had no compass and when the mists got up we would be marooned till dawn. I told him that as a good Moslem he should carry a compass, to which he retorted that he was not a practising one! Nevertheless we soon ran into heavy mist as night fell and it did indeed become extremely cold, damp and inhospitable. We could hear shouts of others lost in the mist but could never find a soul even though we followed the shouts. It was true also that navigation without a compass was well nigh impossible. So Christopher and I got into our sleeping bags and curled up on the bottom of the boat to keep as warm as we could, while outside it rained a drizzle. Every now and then the mist cleared a little, and by the light of a pressure lamp Sa'aban and Ebrahim eventually found some scattered reed beds which they recognised. Before we realised what had happened the boat had come to a gentle rest beside a little reed shelter on stilts and still almost unbelieving we climbed up a wobbly ladder and through a small entrance hole. This was what was known as a ' mordab kumah '—one of many such shelters for the wildfowlers we were shortly to meet. There was just room for us to lie crouched and still have one square foot for a charcoal fire in the middle. While we slept our two companions sipped tea till dawn when we made an early rise. While loading our boat two others passed by on their way to Bandar Pahlavi with loads of ducks; one with thirty and the other with about a hundred. All kinds seemed to be there, but we particularly noticed Mallard, Teal, Gadwall, Tufted Duck, Pochard, Pintail and Shoveler.

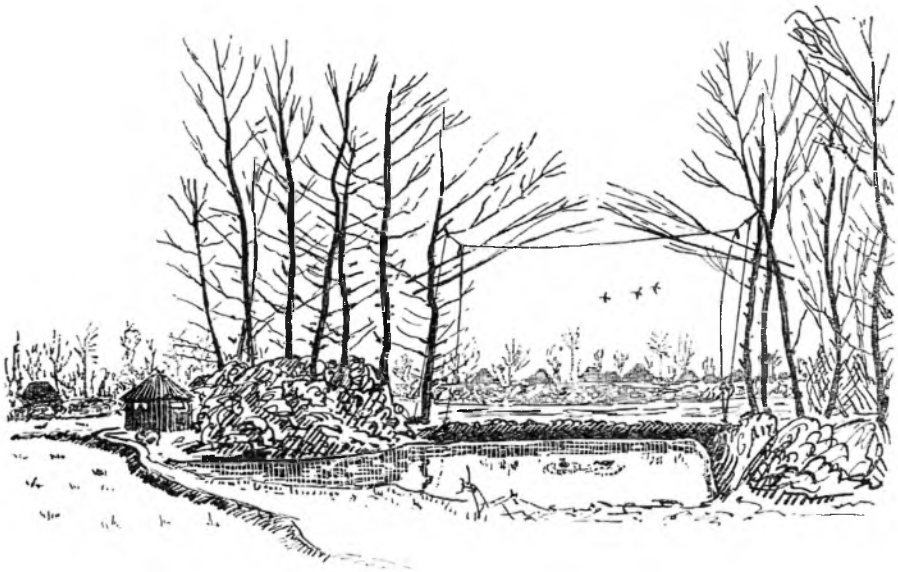
Once through the reed bed we followed a canal-like channel through bare flooded meadows with little wildfowlers' shelters on stilts scattered here and

there. It was very much as we visualised the ' pig-wallows ' described in ' Wild Chorus ' though we saw no signs of any pig ourselves. There were quantities of birds, mostly Teal, with plenty of herons, egrets and even some pelicans. Amongst them all wandered horses which splashed around in search of grazing. The channel took us to the village of Nagarestan where we saw numbers of boats rigged for wildfowling and even had a demonstration, but we pressed on for Siah Darvishan where we were expected by the ' katkhoda ' or headman of the village, Mahmud Mohammadi. We had come specially to see, and if possible film, wildfowling by means of net, gong and flare, but our hospitable host offered to show us something else first which proved extremely interesting.

The Decoy Ponds

A short walk from the house, across some very muddy paddy fields, was a group of trees growing on two sides of a rectangular pool about 20 feet wide and 40 feet long. At one end we almost walked into a fine mist net hanging in the gap between the trees. It measured some twenty feet square and its upper side was held by a taut cord strained between pulley blocks attached to the trees on either side. Moreover the overhanging branches of the trees were cleverly arranged to conceal the top of the net and, as it were, to provide a frame to the opening. A little to one side and well concealed in some low bushes was the decoyman's hide. Inside this was a basket-like rack in which he kept his ' fliers '—hand-reared Mallard which during the day were normally kept and fed on the decoy pond. These are thrown out of the hide to fly round the trees and into the pool when at dusk or dawn suitable flights of wild duck are spotted approaching from the lethal side of the net. The wild birds are enticed down into the pool which they are approaching at speed when they strike the net. At this moment, or a fraction of a second before, the decoyman pulls a vine rope which by an ingenious series of toggles and slip knots releases the net with the wild birds enmeshed. The net is quickly cleared and reset, and the traitorous Mallard decoy duck then return to the hide along a special little water channel. Encouragement can be given, if necessary, by splashing on the water a rope laid across the pool for the purpose. Within minutes the decoyman is ready to lure the next flight of duck to their doom.

Nearby was another kind of decoy pond known as ' nema '. There a section of paddy field about fifty metres square was kept flooded with water to a depth of a few inches and swimming around were some fifteen hand-reared Mallard duck and ten Greylag-type domestic geese. From the centre of the pond the decoyman produced from the water a pair of heavy string clap-nets which he proceeded to set. Then, with a couple of small boys, he rounded up the decoy birds and soon had all but seven or eight of them tethered by their legs around the catching area. The remaining birds were then taken to a low hide constructed in the middle of one side of the decoy pool from which the nets are operated, and were put in their baskets. This type of decoy pool is only used in the evening or at night, when the duck from the Mordab come searching for their feeding grounds. As in the previous type of decoy pond, the ' fliers ' are thrown out of the hide as the wild birds are seen approaching and, as often as not, down they come into the decoy pool. The tethered decoys struggling at their stakes cannot look reassuring to the visitors straight from the marsh, but perhaps their fears are overcome by the liberal baiting of the

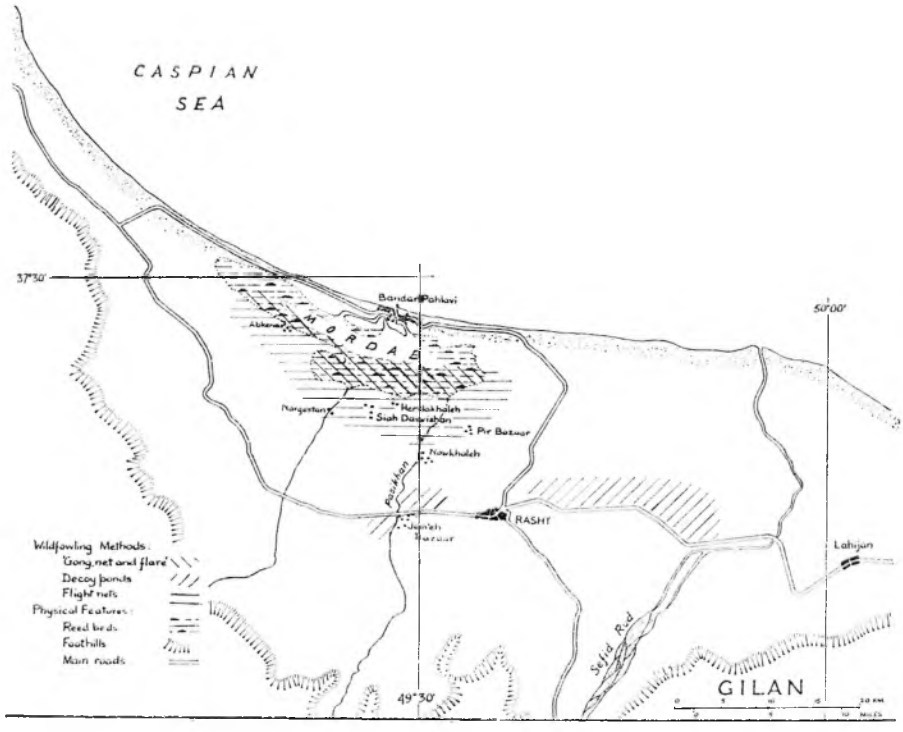


pool with rice, particularly near the clap-nets. Whatever the reason may be, this particular type of trap appears to be singularly successful for catching both duck and Greylag Geese. Once the wild birds are in the catching area the decoyman pulls over the nets as fast as he can. This is no easy matter as both nets and hauling ropes are under water and considerable resistance has to be overcome.

The ' nema ' decoy pond appears to be quite popular in Gilan for its distinctive pattern was discernible from aerial photographs at 42 locations. Although not very efficient or easy to operate, it is possibly the most suitable way of taking ducks in densely settled country. In winter the paddy fields are lying drained and idle so that by flooding only one section the attention of passing duck is focused on it. The previous type of decoy pond is also attractive in the same way but requires trees and space which cannot be used for any other purpose. In view of all this it is possible that in a good year with abundant waterfowl a great many more ' nema ' decoy ponds may be set up than were identified in the photographs. Domestic Mallard-type ducks are kept throughout Gilan and there can be no lack of suitable decoy birds.

A Net, a Gong and a Flare

When at last the sun had gone down our host took us over to the tea house at Hendakhaleh, a small village right on the edge of the marsh. Here we were taken over by Mohammad Javad, a very experienced duck catcher, and were at once plied with glasses of strong Persian tea with plenty of sugar. What at last we saw has been described at length by Peter Scott in ' Wild Chorus ' and more recently in ' The Eye of the Wind ', for in 1938 he visited the very same marsh. Since then the water level in the Caspian Sea and in the Mordab has been falling steadily. In 1938 the wildfowlers hunted " in specially preserved broads surrounded by trees and well grown with low vegetation



through which waterways have been cut". To-day these are largely high and dry and the waterways are cut in the reed beds which have grown up in the now shallow lagoon. The methods, however, do not seem to have changed much.

The wildfowlers go out in two boats. In the bow of the first on an earthen platform burns a flare, hooded behind with rush matting to maintain the rest of the boat in darkness. The flare is still usually of bulrush fluff soaked in kerosene which burns with a weak, flickering and very smoky flame. It is replenished as necessary from a stock of prepared fuel carried in the boat. Often however one sees in the Mordab a special oil lamp with two large one inch diameter cotton wicks which have much the same effect as the bulrush fluff. Although pressure lamps are widely used in houses in the Mordab, their use is scorned for catching duck as it is believed that the flickering flame has an important function in bewildering the ducks! Behind the flare stands the duck-catcher with a great elongated hand-net, and a companion in the stern propels the boat with a curious paddle which can be used as a paddle or pole as required. In the second boat close behind are two men, one in front poling or paddling and the other beating a small brass gong incessantly. It is part of the ritual that the gonging must not stop. By having the poler of the second boat in front, he can, if need be, assist the forward boat in dealing with a catch while the other continues gonging. The boats glide silently down the prepared channels and the duck-catcher deftly catches every bird that comes within reach. Mallard are the most susceptible to this method of hunting and almost invariably wait for the boat to approach within three or four yards.

When they leap into the air it is often possible to catch two at a time. On the other hand a bird which starts swimming away can usually be caught by a sweep of the net which just touches the water first and makes the bird jump. Once caught, the duck-catcher locks its wings, legs and head behind its back and throws it into the well of the boat. This method of catching ducks requires considerable skill, and having see it in action one can believe wildfowlers' claims of catches of as many as 600 or more in a single night when conditions are perfect.

Woodcock and Smugglers

After our night with the duck-catchers we were just about to leave when our host asked if we would like to see how they caught Woodcock. We were naturally very interested as Gilan and the Caucasus further north are famous for the enormous numbers of Woodcock which come there in winter. Behind the village was a large willow plantation and through this had been cut a ' ride ', widening out to about a hundred feet on the edge of the paddy fields. Across the end of the funnel so formed was erected a long narrow flight-net running on pulleys at one end. They explained that morning and evening a man stood at the end of the net with the net hanging slack and when a Woodcock came flying down the ride he would jerk the net tight and catch it. The daily average, however, was low compared with duck netting and the season's bag usually only amounted to a hundred or so.

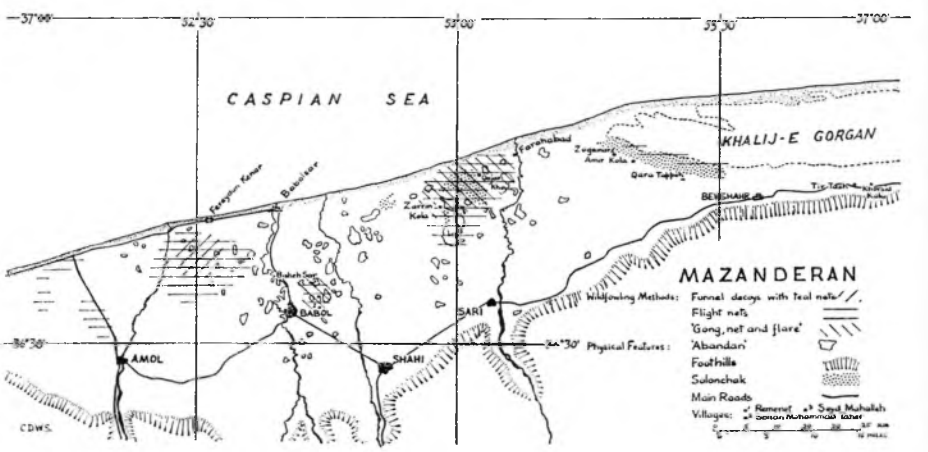
Similar nets known as ' dar dam ' are also used extensively around the Mordab villages but the catches are not so great as by other means. A more lethal set-up was seen over the open water of the Mordab, a great long heavy flight net of five to six hundred yards in length. This is the ' sel dam ' and is used for catching low flying ducks, particularly diving ducks, during heavy rain or stormy weather. At other times the net is too heavy and conspicuous for anything to fly into. These nets are rigged on tight wires leaving a bag at the bottom for the birds to fall into and be retained in till extracted. This type of net, which can be operated successfully only very occasionally, seems generally to be operated by fishermen, who have their shelter on stilts built near one end.

While studying all these fascinating aspects of the Mordab, we suddenly spied a large flat-bottomed boat approaching us with a beautiful triangular sail well filled with a following breeze. With a sudden break in the cloud and bright sunlight it was a splendid picture but our hopes of a photograph were soon shattered as Sa'aban advised us not to take photographs as the men were smuggling charcoal and seemed taken aback at finding us there at all. We therefore contented ourselves with exchanging greetings.

Mazanderan

After a few memorable days in the Mordab we drove eastwards along the coast road to Babolsar, where I had had my headquarters during 1957. We were joined there by Hessam Moini, an active young man who had helped us a lot during the irrigation surveys and who had accompanied me on a number of official and unofficial expeditions. Moini spoke little English but could understand my Persian and what is more translate replies to my questions into Persian I could understand. The local language was the Mazanderani dialect and that I never learnt to fathom.

The countryside of Mazanderan is quite different from Gilan. It is very



flat and open and, unlike Gilan, the rainfall and river discharge is often inadequate for the irrigated cultivation of rice in which both areas specialise. As a result the farmers have had to construct huge shallow reservoirs to conserve and regulate their water supplies. These are called ' abandans '. For reasons of topography and water supply those in the north-east tend to be largest and, in winter, shallowest and most suitable for dabbling ducks.

By virtue of the system of land-tenure, the pattern of villages and homesteads is different in the two districts. In Gilan the farmers' homesteads tend to be isolated like islands in the surrounding paddy fields, whereas in Mazanderan, at least until recently, the village has generally been the unit where a number of tenant farmers have lived in groups, all paying rent to the same landlord. As a result, during winter when no cultivation is taking place, and the fields are partially inundated with flood water, there are often large areas of open and relatively undisturbed paddy fields to attract duck, particularly at night. During the day, to avoid constant harassing from wildfowlers, they usually go out to sea where they can be seen resting in huge rafts. In stormy weather they come inland to the larger ' abandans '.

Variations in Gonging Technique

At the village of Bisheh Sar there is to be found a very special ' abandan '. It is fifty hectares (about 124 acres) in extent, has exceptionally fine reed beds and during the autumn and winter months is alive with duck. The village is owned by Mr. Ahmad Owsia and the tenant of the ' abandan ', at least during the duck season, is Mr. Abol Qasem 'Ala, whose family have had the hunting rights for nearly a hundred years. Mr. 'Ala tells that his grandfather evolved the method of catching ducks with net, gong and flare. As his equipment and technique is singular, possibly the Gilakis (as people of Gilan are called) got the idea from Bisheh Sar! At the beginning of autumn, just after the rice harvest, Mr. 'Ala invites a hundred men from the village to come and prepare the labyrinth of waterways he requires in the ' abandan '. The traditional reward for their labours is a generous chicken lunch. This done, the ' abandan ' is strictly preserved from disturbance and no shooting is allowed in the vicinity, for very shortly the duck start arriving. By 15th Aban (5th November)

there is usually a sufficient lead established to commence netting, and from then to 15th Esfand (6th March) the wildfowlers go out every evening when the moon is favourable. From the seventeenth to the twenty-fifth of the lunar month the catch is usually good. From the twenty-fifth to the seventh less good, and from the seventh to the seventeenth they find it not worth going out at all.

Mr. 'Ala has two boats. Unlike those in the Mordab they are large heavy dug-out canoes which can each take three or four people easily. His light is now a modern pressure lamp, though in the past he used bulrush fluff and kerosene. His nets are five metres long and constructed on a bamboo frame. They are far heavier than those used in Gilan. His gongs, most probably his grandfather's, are worn through in places and the holes by which they are suspended have often been redrilled. Their tone, as can be imagined, is quaint and high pitched, but as long as they hold together he will continue to use them! Mr. 'Ala does not often go out himself these days but he came out with us to demonstrate his particular variant in the art of catching ducks. As usual we started with many cups of strong sweet tea in a small thatched shelter beside the ' abandan '. We all sat round a glowing charcoal brazier while Moini and the others took turns with a hubble-bubble pipe. On these occasions time seems to drag and as the conversation exhausted my vocabulary we soon became drowsy. Mr. 'Ala must have seen this for at last he took us out to the boat moored alongside. The boat would only take four, so we had to make two sorties so that Christopher and I could each see the old man at work. Mr. 'Ala, after carefully priming and adjusting the lamp, took up position behind the hood, a little boy sat in the middle with the gong and the son stood in the stern to pole the boat. We being above the normal complement had to sit in the well of the boat, which very soon was to start filling with trussed-up Mallard. As we slid quietly into the ' abandan ' Mr. 'Ala took a net from a hiding place in the reeds and carefully soaked it for better effect. The little boy started gonging, first softly and then rising and falling to the instructions of the old man so that it took on an eerie ring which was at once mysterious and difficult to locate. Mallard came in sight ahead. First they looked one way and then the other as if uncertain as to what to do. When the boat was about seven or eight yards away the old man gently stamped his foot at which signal the boat surged forward and the Mallard leaped into the air. But already the heavy net was poised over them and as they flew into it, it turned slightly and they were caught. In seconds their wings were locked behind their backs and they were lying in the bottom of the boat. Occasionally a duck would not rise and passed within arm's reach still watching in amazement. Only when it heard the pole, or more probably saw movement of the boat, would it fly off, with little more than a bewildered ' quack '. Time and again Mallard would rise from the water to be taken silently with the huge net, and only for the moment that they were in the net would they call in alarm. Very few birds flew off out of range. What was the explanation? In the first place there were possibly twenty times as many Mallard there in the ' abandan ' as we actually saw and hardly a bird that touched the net escaped to be wiser next time. The sight and sound of the wildfowler were dazzling and bewildering, and resembled nothing which they had cause to fear. Thus while Mr. 'Ala could take his harvest the ' abandan ' could at the same time provide a refuge for wildfowl round about.

So with thirty or forty ducks in the bag we returned to the village for supper—wild duck served in six different ways!

Funnel Decoy Ponds and Teal Nets

The following day Mohandes Kia, a friend from Babol, very kindly arranged for us to visit another duck preserve near Fereydun Kenar. I knew the area quite well but this was a special visit. Mr. Hoseyn Bahrami and Mr. Seyd Hoseyn Hoseyni were waiting for us when we arrived just before dawn, with two very large dug-out boats. One was lined with a superb Persian carpet laid on straw which we soon found to be very comfortable. Each boat had a charcoal brazier to keep us warm on the journey, and one had a steaming 'samovar' to provide a constant supply of tea.

Fereydun Kenar is a small coastal town in the centre of the most valuable rice growing area in northern Iran. Moreover it is the market for some forty-seven villages all of which trap duck. The locals say that the two are not unrelated as the catching of duck necessitates almost sanctuary conditions and they believe that the thousands of waterfowl living there in winter help to retain the fertility of the soil. This certainly is the tradition and, as one can see very clearly from the air, the natural topography has been developed over the years for catching duck as well as for rice cultivation. As we moved inland up a narrow waterway we soon caught glimpses of belts of trees with rectangular notches in their silhouette. As dawn was breaking, flights of Teal came skimming low over our heads. One made straight for the gap in the trees. Just as it passed over, a net suddenly appeared and then as suddenly disappeared again. This was one of 180 or so Teal nets which we were shortly to see demonstrated. We disembarked up a small feeder channel which had brought us to the edge of one of the characteristic belts of trees. This we found to be in the form of a ring from six to eight hundred yards across. The paddy fields inside were kept flooded to a shallow depth and were teeming with duck of all kinds: Mallard, Teal, Wigeon, Shoveler, Gadwall, and Tufted Duck, with a few Red-crested Pochard and an occasional Ferruginous Duck. On the inner edge of the belt of trees were more than thirty decoy funnels—not like those in Europe with water below and netting above, but funnels left in the main belt of trees leading to small decoy ponds fitted with clap nets.* Behind these and within the cover provided by the trees were numbers of Teal Nets, usually one stand to every decoy funnel. As we arrived the decoymen were just taking their nets down but were persuaded to show us how they operated them.

In the morning and evening during the winter months large numbers of Teal move around over the paddy fields, skimming the ground or, if they have to cross one of the belts of trees, choosing the lowest parts. For generations the Mazanderanis have been catching them at these very places and their name for Teal 'charta'i' means 'four at a time' which is par for the course! The nets known as 'damrah' are about thirty metres long and two metres high, with about the equivalent of a two-and-a-half inch mesh and made of hemp twine dyed black with the skins of sugar beet. They are suspended by ropes running over pulleys, usually improvised from old glass lamp stands. They hang in pairs so that while one is being cleared the other can be ready for the next flight. As the birds approach the net is quickly and silently thrown

**see aerial photograph on p. 180*

in the path of the ducks and often catches three or four at a time. The idea was very similar to the Woodcock nets that we found in Gilan except that the elaborate arrangements of pulleys and the cutting of the path through the trees made the method efficient enough to catch wily Teal on a commercial scale.

Nearby we were shown a little thatched shelter which housed decoy ducks used to lure wild Mallard into the funnel type decoys or ' damgah '. The decoy birds are all hand-reared and kept in the farmyard for the first three years. The most valuable birds however are even older and are called ' dashti ', translated for me as ' Quisling ducks '. These are the most traitorous of all, for whereas the usual decoy duck is merely thrown out of a hide to fly back into the trapping pond where it is fed in winter, the ' dashti ' flies out into the paddy fields and joins the wild Mallard. After a minute or so he suddenly leaps into the air and chases some of the other decoy duck into the trapping pond. Most Mallard fall for this manoeuvre and follow the ' dashti ' into the trap. Once they are in, the decoyman jerks a wire to release a large clap net which falls and covers the whole pool. The interesting thing is that when he comes back to clear the net the wild birds all struggle and become partially entangled. The tame ones keep perfectly still and swim out to safety as soon as he lifts the net! There is however a small part of the pool which the net does not reach and the decoy birds learn to congregate there before the net falls.

Nearly twenty-five thousand duck pass through the hands of traders in Fereydun Kenar and many more are consumed in the villages where they are caught. The duck are sold for 70 to 80 Rials a pair (seven to eight shillings) for Mallard and 30 Rials (three shillings) for Teal. The down and contour feathers are collected and sold separately for prices ranging from 1800 Rials for 16½ kilograms of Mallard down to 2500 Rials for 16½ kilograms of Teal down (approximately £9 and £12. 10s. respectively). 1000 ducks are said to produce from 16½ to 24 kilograms of down.

Zarrin Kola

After our visit to Fereydun Kenar we visited a very different type of coastal area. To the east of Babolsar there have in the past been lagoons which have silted up and, as the level of the Caspian Sea has continued to fall, have become vast areas of poorly drained ' solonchak ' soils. These are important grazing grounds for sheep and goats which are brought down from the mountains in winter, but they are equally important as wintering grounds for Greylag and Lesser White-fronted Geese as well as for thousands of dabbling ducks. The predominant vegetation is *Salicornia* which thrives on salty conditions. Associated with this is a growth of Bermuda Grass *Cynodon dactylon* which only starts sprouting when the ground is flooded by the autumn rains and it is this which really seems to attract the geese.

The villages in this area are isolated in winter by flood water and miles of mud in all directions, so we went to visit them on foot. It was no easy matter, even though we were lucky enough to find a horse to carry our baggage. Moreover we had been unable to contact a friend who was to have given us introductions to the ' kathodas ' of the villages en route, so we had to rely on Moini. The hospitality we received was amazing, particularly as we arrived looking like tramps and splashed with mud from head to foot. As we

arrived at Zarrin Kola Pa'in (lower) we noticed that under the eaves of almost every house there hung a long hand net and we were slightly put out when we were asked to go on another mile and a half to Zarrin Kola Bala (upper) where the ' kathoda ' lived. There again we saw plenty of hand nets so we knew we had come to the right place. There was no shortage of informants, for a crowd gathered at once. We soon learnt that the villagers spent most of their winter months fishing or wildfowling, depending on which was likely to be the most fruitful. We had arrived after heavy rain and had already seen baskets of beautiful silver fish which had been netted or harpooned in streams nearby. Unfortunately there were not many duck about as it was late in the season but they agreed to take us out that night to demonstrate their techniques.

In 1957 I had been puzzled to see literally dozens of lights working over the saltings one autumn night. I had counted over forty lights and had wondered if they could be the lights of hunters but on finding the next time I passed that the place was just a huge mud flat I had rejected the idea. Now however I learnt that in early autumn on a suitable night sometimes nearly two hundred teams go out from the villages of Zarrin Kola, 'Abbas' Ali Kesh, Seyd Mahalleh and Qajar Kheyl, each with light, gong and hand net. On the saltings they hunt geese on foot, and on the flood water and ' abandans ' they hunt duck both from boats and on foot. Sometimes there are large numbers of Coots and these they harpoon with a trident-like weapon mostly used for fish. Unlike the duck-catchers in Gilan and the ' abandans ' at Bisheh Sar they hunt in the open and still report huge kills. Of the geese they can only catch Greylags: only in years when there are large numbers do they hunt them seriously.

That night we decided to take some film of the gonging operations. The plan however nearly ended in tragedy. Christopher planned the set and with our host and his sons I walked down to the boats by the light of a swinging pressure lamp. Christopher went ahead to film us coming through the trees but he had not gone far before we heard a splash and later a shout for help. He had fallen down a well—fortunately a fairly shallow one so we could pull him out without difficulty. The greatest tragedy was that his camera went in too and by the time it had been recovered the slightly brackish water had even permeated the lenses. Christopher took it all extremely well and could even see the funny side of it! Our village friends were very kind and helped him to dry out his clothes over a charcoal brazier.

The next day we left Zarrin Kola and took a boat for the first part of our journey which traversed a great series of ' abandans '. It was a glorious day with bright sun and clear sky such as one often has in Mazanderan after heavy rain. Near 'Abbas' Ali Kesh we suddenly came upon one of the most exciting sights of our trip—an ' abandan ' absolutely teeming with duck, mostly Mallard, Teal and Wigeon. These kept rising in waves as we pushed through the reeds and then came back skimming over our heads before pitching into another part of the ' abandan '. The most interesting part was that it transpired that we were only a few hundred yards from the village and there moored to the bank was a row of hooded dugout canoes! In fact they had not hunted the previous night as the landlord had asked them to prepare a good show of duck for the provincial governor or Ostandar who was due to visit the place in a few days' time. Nevertheless the difference between that ' abandan ' and the adjacent ones we had just passed through and where shooting was being

allowed, was most marked. From there we walked across the goose marshes to Qajar Kheyl. It was very slippery and quite heavy going but nevertheless from the number of wheel tracks we saw it was obviously passable to four-wheel-drive vehicles when a little bit drier. We were not surprised to hear from the 'kathoda' that during the winter months hunters come from Sari and Babol to hunt the geese from jeeps. They probably kill very few but undoubtedly caused untold disturbance. We were even less surprised when the 'kathoda' said that the numbers of geese coming to the marsh has decreased markedly in recent years. Nevertheless it had not occurred to him to connect the two ideas. This was distressing news as only two years before, on 24th January, I had seen several thousand Lesser Whitefronts on that very marsh and amongst them six Red-breasted Geese. The latter are well known (the local name is 'Arus Gaz or the Bride Goose) but have always been irregular visitors amongst the flocks of Lesser Whitefronts.

Moving eastwards, we next visited Qara Tappeh and Amir Kola, which are situated right out on the low-lying 'solonchak' plain near the great lagoon called the Khalij-e Gorgan. The soils are poor and generally too salty for more than scattered cultivation of subsistence crops. However, in spite of this, winter grazing for sheep is excellent and vast flocks of fat-tailed sheep compete with the geese. But there too, alas, we heard the same story of diminshing numbers and saw for ourselves the wheel tracks of hunters' jeeps.

Two years before I had seen countless thousands, whereas this time I had difficulty in finding a few hundred to show Christopher. It is not that there are probably any less geese visiting the Southern Caspian shores in winter than before but rather that they have been forced to move where they will be less disturbed. Not far east, on the borders of the Soviet Union, are the Atrek Marshes and the Gorgan Steppe. In these border areas disturbance is minimal and in certain places, such as near Lake Atagel, visited by Peter Scott in 1938, there is probably adequate grazing for large numbers. Nevertheless, as the rainfall during the autumn months is only a third of the corresponding rainfall in central Mazanderan,* it is unlikely that there is any extent of conditions similar to those described above where the autumn rains bring up a new growth of Bermuda Grass. This seems the key to the proper conservation of geese, certainly the Lesser Whitefront, in northern Iran. The danger lies in the conservatism of wild geese, for if they are forced by disturbance to change their feeding grounds the saltings of Mazanderan are unlikely ever to regain their former popularity, particularly as the area available to them is decreasing gradually due to reclamation projects.

Our host at Qara Tappeh was an elder of the village by name of Ahad Khan in whose house Peter Scott had stayed in 1938. He remembered him well as he had asked all the same questions! He knew the Red-breasted Goose well but had not seen one for several years. The people of the village did not hunt, except to a small extent on the shore with flight nets. We asked how this was done and the reply amused us. "First you must prepare a 'korsi', a charcoal brazier to sit by, as it is bitterly cold. Round this you build a shelter against the wind. Then you put up your net between poles, tie a string from one end of this to your big toe and go to sleep."

*Unpublished records for Babol Sar and Gorgan 260 mm and 81 mm for three months of autumn.

In the last thirty years the mean sea level of the Caspian has fallen nearly eight feet (from 26.0 to 28.3 metres below Black Sea level) and the Khalij-e Gorgan lagoon has receded about three kilometres near Qara Tappeh. The exposed mudflats and the shallow lagoon are very difficult to reach. Near Tir Tash however there can at times be large numbers of waterfowl, which include Scaup, Tufted Duck, Shoveler, Wigeon, Mallard, Common and Ruddy Shelduck, as well as occasional Smew and Red-breasted Merganser. It is possible that Goldeneye also occur as I have watched a party of thirty fishing in the sea near Farahabad. However hunting with and without firearms is not at all intensive in these parts compared with the hunting grounds further west which I have described above.

PROBLEMS OF CONSERVATION

In the Caspian Region wildfowl are hunted not only by sportsmen but also by the farmers of Gilan and Mazanderan, as we have seen above. To the farmers wildfowl are a crop to be harvested as assiduously as their cotton or beans. The total annual harvest in an average year is estimated at nearly one and a quarter million duck alone (see Appendix), worth nearly a hundred million Rials (£500,000). This is a fact that needs consideration in drafting conservation measures.

The problem of conservation of the wildfowl populations in Iran is different from that in Britain or the United States, as the numbers that remain to breed are almost negligible. Thus there is no means of increasing stocks by protection of breeding grounds. Conservation measures must therefore be limited to control of the kill and provision of refuges. The traditional methods of wildfowling without firearms depend essentially on refuge-like conditions and it is ironic that possibly the most effective means of improving the conditions of wildfowl in northern Iran is to encourage the industry as long as possible. In Japan, where until the end of the Second World War there existed a wildfowl industry of comparable scale, the annual harvest quickly fell from about a million to about two hundred thousand when the traditional hunting preserves were abused. To-day such preserves as remain are officially encouraged as their value as refuges is generally appreciated. Moreover where the farmer is directly and financially interested in the sanctity of the hunting preserve, his co-operation in maintaining it is assured. It should also be noted that the methods of hunting avoid the wounding of birds and other undue cruelty. Liming and angling, now fortunately banned in Japan, have never been employed in Iran for catching waterfowl.

A world-wide problem in relation to wild life is destruction of habitat. In Gilan the Mordab and its southern preserved reed beds are the crucial features. Fortunately, in addition to the wildfowling interests, it has been found that the lagoon is one of the principal breeding grounds of the ' mahi sefid ' or White Fish *Rutilus frisii kutum*, commercially one of the most important fish after the Sturgeon. Though it is feasible to drain and reclaim the Mordab, it is unlikely that any further lowering of the water level will be allowed on account of the serious effects this would have on the fisheries. In regard to the southern reed beds it is understood that the Game Council are very much aware of their value and have already taken measures to preserve them from shooting.

In Mazanderan, even fifty years ago, the greater part of the coastal plain was poorly drained semi-swamp forest. With the pacification of the Turko-

mans, development of the area has been rapid until now 86,000 hectares (213,000 acres) are under rice cultivation. The only obstacle to further reclamation is availability of water supplies for irrigation. The importance of this to wildfowl is that, because of the difficulties of water supplies, over 11,000 hectares (27,200 acres) of good land have to be used for some four hundred shallow reservoirs or 'abandans', many of which are ideally suited to their needs. If, as seems likely, at some time in the future dams are built to develop the irrigation potential of Mazanderan, then it is certain that most of these 'abandans' will have to be ploughed up, very much to the detriment of the wildfowl. This need not be catastrophic. As had been noted at Fereydun Kenar, the duck hunting preserves achieve considerable success by merely flooding selected paddies. The same can be done elsewhere, but the key to success would seem to be provision of refuges.

Appendix

Estimation of annual duck harvest in Mazanderan and Gilan

At the time of my enquiries during the period 1957-59 there were no official or unofficial records of duck taken in Mazanderan and Gilan. Moreover one must allow for the fact that when making enquiries in the countryside the peasant very often prefers to give the answer that he thinks is expected rather than admit to not knowing the answer; and this is not only limited to peasants. Thus in trying to evaluate the probable annual duck harvest it has been necessary to allow for this by a factor of personal judgment after applying every possible check. Time spent in field enquiries were necessarily limited but most areas were visited both in 1957 and 1959 with generally reasonable correlation of results.

GILAN

The main hunting ground is in the southern fringe of the great Mordab, south of Bandar Pahlavi. Allowance for trapping outside this area has been made by study of aerial photographs on which 'nema'-type decoy ponds can be distinguished. Most shooting takes place around Bandar Pahlavi, where is to be found the only gun shop in the Ostan (province). The estimate of shooting pressure has therefore been based on sales of cartridges and materials for making cartridges in Bandar Pahlavi and so virtually for the needs of Gilan. This is dealt with in detail below.

Hunting with net, gong and flare

There are twelve villages concerned with the catching of duck by this method: Pir Bazaar, Nowkhaleh, Hendakhaleh, Siah Darvishan, Nargestan, Sergestan, Chumeskhal, Kowleser, Chokver, Esfand, Qoraba, Abkenar. At Siah Darvishan it was estimated, I consider reliably, that there were two hundred and fifty boat teams operated by these villages. In addition there were some twenty-five boats operating from Bandar Pahlavi itself, mostly owned by shop-keepers.

The estimated catch was given as three to four thousand duck per boat per annum. In support of this very high figure it must be recorded that under ideal conditions one boat may catch as many as six hundred in a night! If the weather is windy a likely catch is 150-300 per boat, but if still, then only 50. The season lasts five months, though after the first three there are fewer birds about and catches are reduced accordingly. Nevertheless, the weather in Gilan is generally cloudy and the duck catchers only expect to lose five nights a month due to the phase of the moon coupled with poor cloud cover.

Additional evidence that these figures are of the right order was also obtained from Siah Darvishan. We were told that the rent for the hunting right for one pair of boats was Rials 120,000 (£570) and that for this outlay they expected average proceeds from the sale of birds of Rials 320,000 (£1,524). The local price of Mallard, their principal quarry, was Rials 80, from which one assumes that they expect to catch 4,000 birds. On the other hand, to break even as far as the rent is concerned, they would have to catch 1,500. Usually however Rials 10 are given to the men for every bird caught, so to make a profit more than 1,700 birds have to be caught.

Thus the catch is likely to be 4,000 in a good year. Like most sportsmen they probably like to consider a good year as an average year and 3,500 would appear to be a fair estimate for an average year. In regard to the number of boats 250 amongst twelve villages does not seem excessive considering that the area of hunting ground (reed beds) is about 15,000 hectares (over 37,000 acres) and that in Mazanderan 50 hectares was more than enough for one boat. The total catch is therefore likely to be of the order of 250 x 3,500, or 875,000.

Decoy Ponds

Forty-two decoy ponds were identified from aerial photographs. These were mostly located around Jo'meh Bazaar due west of Rasht near the Pasikhan River. There are also many others east of Rasht towards Kuch-e Isfahan. In the time available it was not possible to interview any of the owners. The probable catch at each pond is estimated as about 500, say 21,000 in all.

Long Flight Nets

Only three long flight nets were observed. These were operated by fishermen as a side line and only caught large numbers of birds under stormy conditions and then mainly diving ducks such as Pochard and Scaup. For the purposes of the estimate it is assumed that the annual catch is of the order of 750, or 2,250 in all. In a good year the catch is likely to be far greater than this. In addition to duck, large numbers of coots and waders are also caught, but these are not included in the estimate.

Flight Nets (small)

The small flight nets are not as skilfully operated in Gilan as they are in Mazanderan but with greater numbers of birds around and with more favourable lighting conditions it is assumed that the average catch is about the same. There were said to be approximately 150 nets in use in the twelve villages, so allowing 100-200 per net the annual catch would be about 30,000.

Calabash Method

This is only used at the very beginning of the season if the water is warm enough, and even then only on a casual basis. The annual bag is probably not more than 500, say 350.

Shooting

Shooting is limited to the side of the Mordab towards Bandar Pahlavi as the great areas of reedbeds to the south are reserved for hunters with net, gong and flare. Even so the shooting grounds are immense. There are more than 450 licence holders, besides many visiting hunters from Tehran and neighbouring areas. Hunting is done both by day and by night. In the daytime hunters in boats work the reedbeds on the northern side of the Mordab or stand waist deep in clumps of reeds while their boatmen drive the birds towards them. Hunting at night is done by the light of pressure lamps, usually in the early hours of the evening. In 1959 there were two high speed motor boats used for duck hunting but these were not satisfactory as the propellers were for ever becoming entangled with fishing nets. It is understood that they have in any case since been banned.

Shooting pressure can be judged from sales of shot. In the season 1958/59 the shop in Bandar Pahlavi sold 15 tonnes of lead shot. In a 'good' year the sales leap to 30 to 40 tonnes! The recommended load for a 12-bore is 32 gms, i.e. 30 cartridges per kilogramme. Thus if 1959 be taken as an average year the equivalent of 15,000 x 30, that is 450,000 home-loaded cartridges must have been made. In a 'good' year the equivalent figure would be 9000,000 to 1,200.000. In addition at least 6.000 ready-made cartridges are sold each year, on top of which one must allow for most visiting hunters from Tehran and elsewhere bringing their own. Shots fired therefore probably amount to 10% more than the amount calculated from sales of shot.

Judging by impressions in the market at Bandar Pahlavi and experience in the Mordab, possibly 50% of the bag are Coots and 2% are Pheasants. For a broad estimate 50% can be assumed to be ducks. Thus if one in three shots kill, and since most local hunters try to kill more than one bird at a time this is a conservative estimate, the total kill from this source would amount to one third of a half of (450.000 + 45,000) = 82,500 duck. In a 'good' year the equivalent figures indicate a kill of 165,000 to 220,000 duck.

MAZANDERAN

In Mazanderan conditions are very different. The feeding grounds are much more accessible to man and generally the birds have to go out to sea to rest during the day. Exceptions to this are certain areas where the professional duck catchers operate and where shallow reservoirs or specially flooded rice paddy fields are carefully protected from disturbance. Enquiries showed that this was more widespread than at first thought. As in Japan it has been found that where waterfowl are numerous enough trapping is the most efficient method of taking birds for the market. Shooting is certainly carried out but mostly on certain favourite 'abandans' or reservoirs, and mostly by individuals working on their own.

Decoy Ponds and associated Teal Nets

In the immediate hinterland of Fereydun Kenar there are some 80 to 90 highly specialised decoy ponds each with falling Teal Nets. Some 47 villages have these or similar nets and the total number of nets is estimated at 180. From these villages some 20-25,000 pass through the hands of dealers and traders in Fereydun Kenar.

The catch by the decoy ponds can be evaluated from the fact that though no rents are paid the right to a stand changes hands for Rials 20,000 to 50,000. At the local wholesale price of Rials 80 per pair this is equivalent to nearly 500 to 1,300 Mallard. Undoubtedly some of the stands are very much better than others, and also it must be remembered that the decoymen usually operate Teal Nets in conjunction with the decoy. The decoys are only operated when there are Mallard flying nearby or feeding in the immediate vicinity. Most throws are unproductive and a day's catch of 15 is good. The season lasts five months so it is conceivable that a good stand may take 500 to 600 Mallard a year. Poorer stands would possibly only average about 200 to 300. In an exceptional year with a rough sea the catch may be as much as 2,000. The general average is however estimated at 400.

Teal Nets are operated morning and evening throughout the season, though probably less regularly when not directly associated with the decoy ponds. The 80 to 90 associated with decoy ponds therefore probably average 300 to 400 Teal per annum and the remainder 100 to 300. The overall average is taken as 250. The total take may be estimated as follows:

80-90 decoy ponds (say 85) x 400 ducks	=	38,000 mostly Mallard
180 Teal Nets x 250 ducks	=	45,000 mostly Teal
Total		83,000

This figure includes the number of birds consumed locally and therefore does not unduly conflict with the generalisation that 20-25,000 pass through the hands of traders in Fereydun Kenar.

Shooting is only allowed in this area after 15th Esfand, by which time most of the birds have left. Occasionally royal visitors shoot over the decoy pond preserves but as this is not popular with the peasants and affects their livelihood, it happens very seldom. The first shoot after 15th Esfand is traditionally the landlords' privilege. I attended one of these and the bag only numbered about thirty as almost all the birds flew out to sea as soon as the first shot was fired. The take by this means is not likely to be significant.

Bisheh Sar

At Bisheh Sar a 50 hectare (120 acre) ' abandan ' is hunted by means of net, gong and flare during 15th Aban-15th Esfand (4th November-7th March). It is hunted by one family who use one or two boats. They pay a rent of Rials 40,000 (£190) and expect an average take of about 4,000 birds, mostly Mallard. These fetch 70 to 100 Rials each in Babol market, but usually Rials 80. In addition there are some 60-70 Teal Nets operated in the vicinity of the ' abandan ' which catch an average of 4-5 birds a day. The total catch is estimated to average about 300 a year, or about 20,000 in all. The inhabitants of the villages of Remenet and Soltan Mohammad Taher also hunt in a similar manner but no details are available. There is no shooting at Bisheh Sar before 15th Esfand and then little beyond the landlords' shoot. At one such I attended the bag amounted to about 25 Mallard, a few Teal and a large number of Coots. Such bags are not significant in comparison with the take by other means.

Zarrin Kola-Qajar Kheyl

Near the coast from Zarrin Kola to Qajar Kheyl the villagers use the net, gong and flare method extensively both for catching duck on the ' abandans ' and for catching geese early in the season on the extensive saltings. Under the eaves of almost every house one can find the characteristic hand-nets and if the estimate given for the number of boats is considered in terms of the number of family teams of hunters the figures can well be believed. Moreover I have personally seen and counted forty such teams hunting in one large shallow lagoon. The Headman of Zarrin Kola gave the following estimate of hunting teams:

Zarrin Kola Bala (upper)	12 boats (i.e. teams)	on flood waters
Zarrin Kola Pa'in (lower)	20 boats ,,	on ' abandan '
'Abbas 'Ali Kesh	30 boats ,,	on ' abandans ' and flood waters
Seyd Mahalleh	30 boats ,,	
Qajar Kheyl	100 boats ,,	

The duck hunting grounds are very large ' abandans ' and flood waters, which are not elaborately developed and preserved for duck catching like those at Bisheh Sar or even the swamps of the Mordab. Some of them, probably due to the salinity of the soil, have sparse or no reed beds and they are hunted both from boats and on foot.

The season at Zarrin Kola starts as soon as the birds arrive with the autumn and lasts through till the end of Bahman (20th February). They consider the best month to be Azar (21st November-20th December) and expect to be able to hunt every night except the 14th-18th of the lunar month. If it rains the catch is likely to be 100 duck per boat but the average is only 10 to 15. In the early part of the season, when the geese arrive, some effort is diverted to hunting these. Assuming therefore that the average number of nights hunting for a team after duck is 25 and the average catch is 12, the total average annual take is likely to be 190 x 25 x 12 = 57,000. The majority of these are certainly eaten locally but once a week during the season a duck market is held at the village of Ab Mal near Farahabad.

In some years hundreds of geese, mostly Greylag, are caught but in 1958-59 none were taken.

Flight Nets

In the same area as the net, gong and flare hunting referred to above there is extensive flight netting. People from the villages of 'Abbas 'Ali Kesh and Seyd Mahalleh work an estimated 100 flight nets mostly over seasonal flood water near the village of Towqdar. These are only operated during the three months of autumn and for the most part one man watches four or five nets. I was able to obtain no data on average catches but in view of the elaborate arrangements which are made for a comparatively short season, one can assume a take of about 100 per net or 10,000 in all. Flight nets are also used at Qajar Kheyl but probably only to a limited extent. The population is very small and most of this is fully occupied in keeping cattle and sheep. Elsewhere from Gilan to Qajar Kheyl the majority of the duck catchers are also fishermen and decide their quarry from day to day according to the relative prospects.

Shooting

Shooting, often with muzzle loaders, is widely indulged in. Birds so obtained are mostly for home consumption and are probably 50% Coots. As in the case of Gilan an estimate of shooting pressure can be judged from sales of shot and powder. Both Babol and Sari have gun shops but neither could give any general information on consumption from year to year. At Babol the consumption of shot was given as 1,000 kg per annum — equivalent to 30,000 cartridges. In Sari I was given the consumption of powder as 50 kg per month during the season, say 200 kg all told — equivalent to 125,000 cartridges. In addition a few thousand ready-made cartridges are also sold. Not many of the latter are used as almost all local people load their own, since this can be done for a fraction of the cost of imported cartridges. Assuming the bag factors to be the same as for Gilan, the estimated duck kill may therefore be 160,000 x 50% x 0.33 = 27,000.

Summary Estimate of Annual Harvest of Ducks in Mazanderan and Gilan

Location	Method	Remarks	Kill in Average Year
GILAN			
Mordab Villages	Net, gong and flare	250 boat teams x 3-4,000	875,000
Near Rasht	Decoy Ponds	42 x 500	21,000
Mordab Villages	Long flight nets	3 x 750	2,250
	Short flight nets	150 x 200	30,000
	Calabash method	No details say	350
Throughout	Shooting	Based on sales of lead shot	82,500
MAZANDERAN			
Fereydun Kenar	Decoy Ponds	85 x 400	38,000
	Teal Nets	180 x 250	45,000
Bisheh Sar	Net, gong and flare	Remenet and Soltan Mohammad Taher villages not included	4,000
	Teal Nets	60-70 x 300	20,000
Zarrin Kola-Qajar Kheyl	Net, gong and flare	190 x 300	57,000
	Flight Nets	100 x 100	10,000
Throughout	Shooting	Based on sales of lead shot at Babol and powder at Sari	27,000
			1,212,100

Basic data on the protection and utilisation of wild animals in the U. S. S. R.

V. S. Pokrovsky*

THE word " protection " as used in relation to any natural resources is at the present time understood by us as signifying both *protection and rational utilisation.* Rational utilisation is carried out according to definite rules, confirmed by the head institution which is conducting and planning the exploitation of the resources in question. All wild animals and birds, including wildfowl, which inhabit the territory of the U.S.S.R., either permanently or at certain times of the year, form the state hunting stock.

According to the existing hunting rules, all citizens of the U.S.S.R. who have attained the age of 18 (16 in the case of northern nationalities) and who have in their possession a certificate giving them the right to hunt (a hunting ticket) have the right to utilise the state hunting stock. In order to receive a hunting ticket it is necessary to pass a special examination establishing a minimum knowledge of hunting and to pay an entrance fee of one rouble, a state tax of one rouble and membership fees of three roubles. By a minimum knowledge of hunting is meant a definite total amount of knowledge about (1) the rules of hunting, (2) the rules of handling firearms and (3) some information about the biology of the animals which are hunted. In the hunting rules it is stated which species of animals may not be hunted in this or that part of the U.S.S.R.

Wildfowl the hunting of which is forbidden over the whole territory of the U.S.S.R. are: all swans (*Cygnus*), eiders (*Somateria*), the Snow Goose *Anser caerulescens* (L.), the Emperor Goose *Anser canagicus* Sevast., the Bar-headed Goose *Anser indicus* Lath., the Red-breasted Goose *Branta ruficollis* Pall. and the Brent Goose *Branta bernicla* (L.) and some others.

In a number of districts the males of the remaining species of wildfowl may be hunted in spring during a period of ten days after the time of their arrival. Autumn hunting is usually permitted from 7 p.m. on the second Saturday of August up to 30th November.

All localities inhabited by wild animals are termed hunting grounds. These are divided into: 1) hunting grounds reserved for state, co-operative and public organisations; 2) hunting grounds for general use and 3) grounds closed to hunters (reserves, sanctuaries).

In the hunting reserves there are hunting establishments which carry out various measures designed to increase the number of game animals. These measures are paid for by the organisations for which the hunting grounds are reserved. In these establishments hunting is allowed only on certain days—two or three days a week—and the number of game which can be shot is fixed.

In each republic hunting is managed by a state administration attached to the Council of Ministers of the republic. Thus, for example, in the R.S.F.S.R. this is the Chief Administration of Hunting and Reserves attached to the Council of Ministers of the Federation. Special state hunting inspectorates are set up in order to see that the rules of hunting are observed. They

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are also charged with the protection of species the hunting of which is prohibited. There are representatives of the inspectorate in each district. Besides the state inspectorate, the protection of animals is carried out by the special hunting service. by the state forest inspectorate, the public hunting inspectorate, the protection of hunting territories, the militia and by the village councils.

For the discovery of acts involving the illegal obtaining of animals a reward of 50% of the fine imposed on the offender is payable to any citizen. A resolution of the Council of Ministers forbids hunting on wintering grounds.

Scientific investigations into wildfowl are mainly centred at ornithological stations: the Oka Station, the Kandalaksha or Northern Station and the Far Eastern Station and also at a number of reserves, the Gasankuli, Astrakhan, Black Sea, Darwin, Ilmen, Azovo-Sivash, Naurzum, Kurgaldzhin and Kyzylagach and Zhuvintas Reserves. Separate investigations are carried out by the Zoological Institutes of the Academy of Sciences of the U.S.S.R. and their branches.

The ringing of swans, geese and ducks is very popular in scientific investigations. The central body in charge of matters relating to ringing is the " Ringing Centre " of the Commission for the Protection of Nature attached to the State Planning Board of the U.S.S.R. Swans and the Greylag Goose are ringed with aluminium rings of the " A " series. The remaining grey geese and black geese are ringed with " B " rings and ducks of various species with " C ", " D " or " E " rings.

Ring series	Ring dimensions		
	internal diameter	width	thickness
" A "	20.0 mm	12.0 mm	1.5 mm
" A "	17.0 mm	12.0 mm	1.5 mm
" B "	14.0 mm	12.0 mm	1.2 mm
" C "	12.0 mm	10.0 mm	1.2 mm
" D "	10.0 mm	10.0 mm	1.0 mm
" E "	8.0 mm	9.0 mm	1.0 mm

Wildfowl are ringed both during moult and as young birds. In the ringing returns the age of each bird ringed is recorded. The different age groups are ringed in approximately the same numbers. The total number of wildfowl ringed annually amounts to about 10-12,000. The percentage of recoveries averages from 6-8% to 12%. Nets into which the birds are driven are usually used for catching. In addition " shooting " nets* are used at the Oka Ornithological Station and also clap nets (two mounted nets of a diameter of 70-80 cm.).

The study of migration is also carried on by means of visual observations by individual ornithologists, scientific workers at the reserves who bring out every year the so called " Chronicle of Nature " (a phenological bulletin). An account of all the game obtained (including wildfowl) is kept in the hunting establishments with the object of rationally planning their numbers. Thus, for example, in 1960 in the R.S.F.S.R. 630,380 wildfowl were obtained (Materials of the Council of the Union of Hunting Societies of the R.S.F.S.R., Moscow, 1961).

At the present time in most of the republics of the Soviet Union laws for the protection of nature have been passed at sessions of the Supreme Councils.

*Presumably " cannon " or rocket-propelled nets (Ed.)

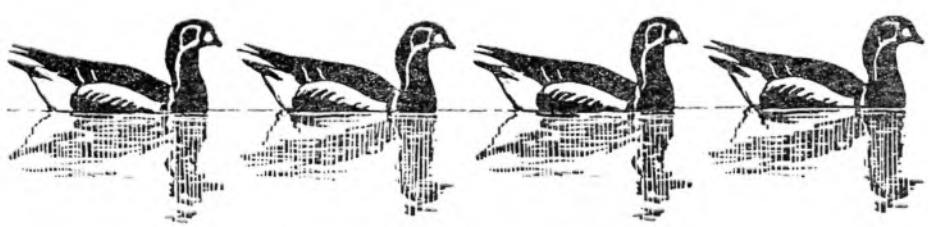
At the XXII Congress questions relating to the rational utilisation of natural resources, their protection and reproduction found a reflection in the Programme of the Communist Party of the Soviet Union. In the Criminal Code of the republic the penalties for violating some of the rules for the utilisation of natural resources have been increased. In agreement with the laws that have been passed steps are being taken to work out the most progressive rules for reserves, sanctuaries and nature memorials.

In school textbooks many themes are impregnated with the ideas of the protection of nature. A number of universities have special courses on the protection of nature.

The number of citizens joining voluntary societies for the protection of nature has increased considerably. Such societies are to be found not only in every republic of the U.S.S.R. but in most areas, districts and even regions.

In all republics there are commissions for the protection of nature, at the head of which stands the Commission for the Protection of Nature attached to the State Planning Board of the U.S.S.R. Every year these commissions convene all-union conferences at which further measures of nature protection are worked out. The reports of these conferences are published.

Thus in recent years much has been done for nature protection but much yet remains to be done. Cases of poaching still occur, including the poaching of wildfowl. This sort of thing is due to the difficulties of organising protection on such a huge territory as that of the U.S.S.R. and to survivals of the old predatory attitude towards the abundance of wild life in the country. At the present time enlightenment grows not daily but hourly and education and the pressure of public opinion will, without doubt, lead in the future to the complete liquidation of this evil.



Investigation and protection of waterfowl in Czechoslovakia

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UNTIL recently, no systematic investigation of waterfowl has been carried out by either professional or amateur ornithologists in Czechoslovakia. In the thirties of this century, ducks captured in the duck-decoy near Ladná (Rampersdorf — southern Moravia) were ringed; some of the results thus obtained were included in the "*Atlas des Vogelzuges*" by Schüz and Weigold (1931, and later addenda), and treated in detail by Legler (1936). At that same time, Farský analysed the stomach contents of ducks (mainly Mallard *Anas platyrhynchos*); however, no results have been published so far.

Certain further studies concerned with waterfowl were started after World War II. Veselovský (1951, 1952, 1953) treated, in a series of papers, of the postnatal development of different species of ducks, carried out a comparison of the ontogenesis of the genera *Aythya* and *Anas,* and analysed the diving movements in the genus *Aythya.* Also he gathered up the contemporary hunters' opinions and knowledge on waterfowl in a manual on waterfowl management (1954). From 1948 to 1957, Hudec (1960) studied passage migrations of waterfowl in water basins of various types in Moravia from the biocoenological point of view, thus carrying out an ecological analysis of resting-places of migrating water birds including the ducks. The numerical data, providing evidence for this paper of a rather general character, were published in a separate paper, together with the censuses made by Dr. Z. Kux (Kux and Hudec, 1956). The results of synchronous censuses of ducks obtained during their spring passage migration in ponds along Odra River and March River—the Odra-Danube way—have not yet been published (Hudec and Svoboda). Ferianc (1955) studied the passage migration of waterfowl in the inundation region of eastern Slovakia in the environs of Senné. Feriancová-Masárová (1958, 1959, 1962) contributed to the knowledge of ecology and occurrence of waterfowl in rice fields in southern Slovakia and in the Orava Dam basin. Kux (1950) studied in detail the phenology and breeding of the Greylag Goose *Anser anser* and the Red-crested Pochard *Netta rufina* in southern Moravia; and Figala and Hanák (1957) that of the Greylag in the Velký Tisý reserve in southern Bohemia. Experiments with artificial breeding sites of ducks were carried out by Hanzák in the research centre of the Czechoslovak Ornithological Society in that reserve, but no results have been published so far. Černý (1960) has followed, for a period of nearly twenty years, the population dynamics of the Tufted Duck *Aythya fuligula* in the ponds near Blatná (south-western Bohemia). Hachler (1957, 1958) studied the numbers of waterfowl by regular counts in the manner of the international wildfowl census on ponds near Lednice in southern Moravia and (1959) the passage and hibernation of geese in the same locality. Further short reports and remarks have dealt chiefly with the distribution of various species of ducks in Czechoslovakia.

Since 1959, investigations on waterfowl in Czechoslovakia have been organised by the Laboratory of Vertebrate Zoology, CAS, Brno (Dr. F. Balát, Ing. Č. Folk, Ing. J. Havlín, Dr. K. Hudec, Dr. M. Klíma) in collaboration with other institutions or individual ornithologists. The present status of investigations is roughly as follows:

Distribution in Czechoslovakia was studied in the western part of the state during 1960-1962; in the years to come, supplementary studies on distribution will be carried out in the eastern part of Czechoslovakia.

Breeding presents, at the time being, the most thoroughly studied part of the bionomics of the waterfowl. A part of the data obtained was evaluated for the appropriate volume of the "*Fauna of Czechoslovakia—Birds*", which is in preparation. Since 1959 breeding has been studied in detail in various habitats in the lowlands of southern Moravia and the highlands of western Moravia. Černý continues to study the population dynamics of ducks in ponds in southern Bohemia; Formánek is carrying out a detailed study on the breeding of waterfowl in several ponds in southern Bohemia.

Migrations. Systematical visual observations are being made in only a few localities (Prague: Urbánek and Král; Lednice: Bauer, etc.). Little ringing of either adult ducks or ducklings has yet been done, as the duck-decoys are inaccessible. In the past few years about 500 moulting ducks and 50 Greylags, captured in light transportable nets, have been ringed each year. Wing marks of the Swedish organisation "Svenska Jägareförbundet" and of the Vogelwarte Radolfzell are used to mark some 200 ducklings a year.

In recent years, censuses have been made of migrating and wintering geese in southern Moravia. In the winter of 1962-63, the censuses are being made, in collaboration with Hungarian ornithologists, in the entire Czechoslovakian and Hungarian part of the Danube. Wintering of ducks in southern Moravia has been regularly studied for several years.

Food of the Mallard is being studied by Toufar and Janda in the Forestry and Gamekeeping Research Institute, at Zbraslav n. Vlt. Also, investigations on food of the remaining species of our ducks are being started.

Morphology of waterfowl has been little studied so far. Klíma is studying the development of the sternum in the Mallard during ontogenesis; Janda, the development of gonads. In all species of ducks, detailed studies are made on changes in body weight during the year.

Ethology of waterfowl has likewise gained little attention so far. At present, a study on diurnal activity of different species and ethology of foraging is being started.

Parasitology of waterfowl is being studied in detail in several institutions (Institute of Virology, CAS, Bratislava; Institute of Parasitology, CAS, Prague; Institute of Helminthology, SAS, Košice) concerned with Helminths, ectoparasites, blood parasites including viruses, and nidicolous parasites. Especial attention is paid to the relations (chiefly epizootologic) between waterfowl and to large-scale breeding of domestic ducks in ponds.

Waterfowl hunting. Problems being studied include the effectiveness of the present ways of hunting, artificial hatching of duck eggs and releasing of ducklings in nature.

Protection of waterfowl in Czechoslovakia is chiefly the problem of protecting their habitats. A great majority of waters suitable to waterfowl are artificial ponds, chiefly utilised in freshwater fisheries, as bathing resorts, etc. For this reason, ecology of waterfowl is being investigated as affected by the various ways of utilising these ponds. The ducks are protected on artificial reservoirs; however large these waters may be, they are not very suitable habitats for ducks and almost valueless as breeding habitats. In the lowland

regions of southern Moravia and south and south-eastern Slovakia there are, in places, habitats suitable for the occurrence and breeding of waterfowl, including swamps, bogs and dead branches of rivers. However, the present extensive regulation of water regime in these regions is gradually reducing the natural opportunities for breeding and protection of waterfowl so that the latter are often confined only to the areas of natural reserves, few in numbers and small in acreage.

The direct legal protection of waterfowl and the regulation of hunting seasons (for ducks, 16th August to 31st December; for geese, 1st October to 31st December) are quite satisfactory. It is permitted to shoot geese, Mallard, Teal, Garganey and Pochard; the remaining species are protected.

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Final Report of the Council on the Recreational Use of Waterworks

1963. 22 pp. Published by The Institution of Water Engineers, Parliament Mansions, Abbey Orchard Street, London S.W.1. Price 5s. 0d.

In the last few years public demands for access to reservoirs have greatly increased, particularly as a result of the growth of interest in sailing. Since some of the activities involved may be incompatible with each other and with the primary function of drinking-water reservoirs, the Council of the Institution of Water Engineers appointed a Committee " To consider and report upon the recreational use of waterworks reservoirs of all kinds and the extent to which such reservoirs may be used to the public advantage without detriment to the public water supply." The Committee, with Mr. L. H. Brown, B.Sc., M.I.C.E., serving as Chairman, consisted of twelve Members and an observer on behalf of the Ministry of Housing and Local Government. Comments were invited from the Royal Yachting Association, the Salmon and Trout Association, the Wildfowlers' Association of Great Britain and Ireland, the Ramblers' Association, the Nature Conservancy and Mr. Peter Scott.

In presenting their views, the Wildfowlers' Association referred to G. L. Atkinson-Willes' paper on " The importance to Wildfowl of the Reservoirs in England and Wales " (Wildfowl Trust 12th Ann. Report : 29-33. 1961), supported its views and urged the granting of total protection to birds on all the reservoirs of major importance to wildfowl. Mr. Scott commented that one of the main advantages of bird-watching over other activities was that no direct access to the water was required or indeed desirable.

This report should be studied in full. Its general conclusions are that sailing, fishing and bird-watching can usually be permitted, if administered by responsible organisations. " Permits for bird-watching should be restricted to members of recognised ornithological societies, or other accredited persons." " Shooting, if allowed at all, should be very carefully controlled." Several activities are regarded as impermissible: water ski-ing (because of immersion of the skiers, use of noisy power-boats and interference with other activities), canoeing (because of the need for specialized training to make it safe), swimming (as a source of pollution, and a possible danger to the individual and hence a liability upon the water undertaking) and camping (unless on sites specially provided and equipped so that pollution of the water cannot occur). " It is unwise to provide for incompatible recreational uses at the same time and place, e.g. fishing and sailing. Different areas of a reservoir may be allocated for different sports, or different days may be set aside for each sport."

The Committee carried out a very thorough investigation and have reached carefully balanced conclusions. In our view they have performed what in future will be seen to have been a great service to the community.

The history of potato-eating by wildfowl in Britain

Janet Kear

Summary

The development of potato-eating and swede turnip-eating by wildfowl is linked to agricultural changes and climatic conditions in Britain. The tradition of taking waste potatoes from harvested fields began in Scotland among Mallard at least a century ago. A few Lancashire Pink-footed Geese acquired the habit about 30 years later, although potato-eating did not become widespread until the 1920's. On the other hand, Scottish Greylag Geese and some Whooper Swans have selected a regular diet of potatoes for only 20-30 years. Turnip-eating has been sporadic in bad weather among Whooper Swans in Aberdeenshire and became traditional after 1947 in the Greylag flocks on the Isle of Bute. The techniques used by the birds in dealing with roots are briefly described.

Land drainage and the shift of arable cultivation, so much a part of agricultural history in Britain, are not wholly inimical to wildfowl. Indeed the ease with which many species have accommodated themselves to new foods is both remarkable and worthy of detailed study in the context of conservation. An undisturbed roost, generally a body of water, remains essential but wildfowl have shown increasing readiness to forage many miles away. Further, the flooding of new reservoirs has enabled the birds to exploit areas in which hitherto they were seldom present.

Agricultural changes

There is little doubt that the first product of agriculture to be utilised by wildfowl was spilled grain from the stubbles of harvested cereal fields. This, and more recently field beans, provided an attractive autumn diet compared with the small seeds of indigenous plants. Likewise, geese must have found that young green shoots of winter cereals were more nutritious than grass, and clover and rye-grass, introduced as sown crops during the 1700's, provided excellent alternatives to rough pastures. Unfortunately, details of the early stages of the association between wildfowl and agriculture are unknown. The more recent addition of potatoes and turnips to the wildfowl diet is, on the other hand, partially documented and the history of their introduction is the subject of this paper.

Potatoes were brought into Britain about 1590, but to begin with there was little incentive to grow them except in Ireland where food and land were notoriously in short supply. They were taken to Scotland towards the end of the 17th Century but, like turnips, became widely cultivated only between 1750 and 1760. As in England, the adoption of potatoes and turnips as field crops was hindered by the current open-field farming which allowed common grazing of all arable land after the grain harvest and before most root crops could be taken in. This hindrance disappeared at the end of the 18th and beginning of the 19th Centuries, when sufficient capital was found to finance the enclosure of old open-fields, and drainage, and cultivation of virgin land (Buxton, 1948). In Scotland potatoes were grown at first in small units mainly by crofters in the highlands and islands. In the more fertile low-lying areas, around the east coast, the good grain crops which could already be produced made potatoes less necessary as a source of human food; however turnips, the great field rivals to potatoes at that time, were extensively grown there for stock food (Symon, 1959). Throughout the 19th Century potato growing increased and there is little difference in the figures for total acreage of 1882

and 1939. There were, however, changes in distribution and these were important ones for wildfowl. The production of new varieties with superior cropping qualities expanded the seed and maincrop potato industries in the Scottish lowlands in the 1890's, and there was a very substantial spread of potato-growing into Lincolnshire, the Isle of Ely and adjacent counties during the Great War. Thereafter, potato growing in the west of Britain declined, but the second World War again raised the acreage. By 1943 and 1944 it was up by over 70% on 1938 and this increased level has been maintained at about 700,000 acres throughout Great Britain.

Improved methods of cultivation have influenced the availability of agricultural food for wildfowl almost as much as changes in distribution of the crops. So long as potato growing was only for consumption in their own homes farmers were content to lift the tubers by hand and then turn pigs on to glean anything that remained. With the development of potato marketing, small fields were consolidated into large ones which needed mechanical harvesting. Larger fields are more likely to attract such wary birds as geese which are now to be found where before there were only ducks. Mechanical potato lifters (the " spinner " type introduced in 1870 and the " elevator " in 1920) produce more wastage than hand digging because some tubers are inevitably damaged and the smaller ones not always extracted. Pigs are now very seldom used to glean the fields, most being fattened under cover and the increased wastage has obviously encouraged wildfowl, often to the farmer's benefit, since ground-keepers harbour disease. Similarly, changes in the method of cultivating swede-turnips have increased the likelihood of visits by geese and swans to the fields. In earlier days they were generally unavailable because it was customary to lift and store most of the swedes in the autumn to meet the requirements of inside stock (and harvesting methods used for roots produce little wastage). Sheep were folded on to the very small areas remaining during late winter and spring. More recently, particularly in Caithness, Aberdeenshire and Bute, swede-turnips have been less and less stored for inside use and are lifted merely as required. Consequently in these areas roots are becoming readily available in the fields throughout the winter (Kear, 1962).

Arable cultivation replacing the grassland meant, of course, increased disturbance of feeding wildfowl. On the other hand, the speeding-up of work by mechanisation later reduced the number of men employed and restricted the disturbance to short periods of the year. Wildfowl can also forage at night, particularly by moonlight.

Climatic factors

Short term climatic extremes force birds suddenly to change their feeding regime in order to survive. Deep floods or a long spell of frost and snow may cause a temporary shortage of food and make new exploration essential. Hungry birds are often prepared to consume unusual items and this is particularly true of juveniles. For the first year of life, a young bird is continually coming across novel foods and it will of necessity be more adventurous in its choices than an adult which has already established a seasonal tradition in its diet. The immature individuals may occasionally reveal new sources of food, their actions are observed by the other birds and local enhancement occurs. If the food is nutritious enough and readily available the flock may " remember " to return next season without the pressure of

hard weather. The memory is, however, most likely to function when there are other pressures related to food shortage acting upon the population, such as those resulting from an increase in numbers or a decrease in the area of available habitat.

It appears that severe winters (characterised by a mean temperature below 34°F., and therefore marked by a predominance of snow rather than rain and a good deal of frost) tend to occur in irregular groups. Using this criterion Manley (1952) found a number of severe months between 1808-20, 1826-30, 1837-55, 1878-97, and 1940 onward. The trends are apparent both in English and Scottish records and are supported by those in Holland, Denmark, Norway and Sweden, countries which share a large part of their wildfowl populations with us. Very cold or snowy winters in the British Isles as a whole occurred in 1814, 1828, 1838, 1879, 1881, 1886, 1917, 1940, 1947, 1956 and now in 1963. However, as an inspection of many early books of ornithology and wildfowling indicates, certain parts of the country have suffered in other years so that, except in recent instances, it is often impossible to pinpoint the connection between any one bad winter and the start of a particular feeding habit.

Potato-eating

The first wildfowl to take potato as a staple item of diet in Britain were the ducks. Of these, the Mallard is the only species which feeds on potato regularly and in any quantity. The habit started and spread during the 19th Century and two factors in particular may have led to its development. The first was a succession of severe winters, and the second was the potato-blight, unknown in Europe until 1845, but a disease that continued to cause irregular failure of the crop for decades. Many early reports indicate that diseased and rotten potatoes were taken by the ducks and, indeed, there must often have been a considerable acreage available. The blighted tubers were seldom gathered but remained exposed upon the surface of the fields or lightly covered with earth in rank, decomposing heaps. The blight was most serious in wet, low-lying soils with a Mallard population probably already at hand. A shortage of other food would quickly bring about the discovery of this new and much appreciated supply. The first actual record of this type of feeding came from Scotland, where St. John (1863) found in Moray that Mallard already preferred the diseased tubers to corn. English authors (e.g. Shand, 1905) spoke of duck consuming decaying potatoes with enjoyment, thereby apparently rendering their flesh unpalatable! However, A Son of the Marshes (1895) suggested that their weakness for this rotting vegetable (he called the blight a luxury for ducks) could be taken advantage of, presumably by using potatoes as bait.

Regular flights inland to the harvested fields seem to have appeared first in Scotland and Ireland. St. John (1901) noted in his Scottish diary for 15th January, 1847, " I see that the Mallard duck feeds now very much in the last year's potato fields." Gray (1871) wrote of 40 to 50 Mallard visiting potato pits in Ayrshire, and Saxby (1874) of birds wandering over potato fields in Shetland. Florence (1912) found pieces of potato in a Mallard taken in Morayshire in November, 1909 and Ussher & Warren (1900) wrote of flights from the Irish coast to the stubbles and potatoes in autumn. A few English writers of the early 1900's mention the tuber as among the foods taken by the Mallard but

it was not generally recognised as part of the annual feeding cycle until the 1920's. Undoubtedly the habit spread rapidly during the Great War which increased the availability of harvested potato fields in eastern England. An increase after the war in the popularity of wildfowling produced reports that Mallard could be shot on old potato plough (e.g. Paton & Pike, 1929; Scott, 1935) or "fed" into ponds and marshes by scattering potatoes. The tubers were being used as bait in duck decoys in Norfolk, Lincolnshire and also in the Berkeley Old Decoy, Gloucestershire. They are, in fact, still regularly employed at Borough Fen Decoy. Potato-eating is now firmly established in certain Mallard populations throughout the country. The severe winter of 1947 provided at least one instance of another duck species taking rotten tubers. Gregory (1947) found that the pulpy potatoes in an unharvested field in Kent attracted good numbers of Pintail, as well as Mallard, and several stomachs of the former contained potato. Pitman (1947) makes several references to Wigeon feeding on potatoes (always apparently in company with Mallard) and R. E. M. Pilcher (personal communication) has noted this habit in both Wigeon and Teal.

The inclusion of potato in the diet of the Pink-footed Goose probably occurred as a result of their long established habit of grazing winter wheat. From the middle of the 19th Century, wheat was usually following potatoes in rotation. Whether blighted potatoes were ever taken is not known, but the first tubers eaten would certainly have been partly decayed, having been on the field from harvest until the wheat sprouted. Presumably the geese learnt to fly to the harvested fields earlier and earlier in the autumn until they arrived before the wheat was up, to eat nothing but waste potatoes. Some reports (e.g. Haigh, 1935) stressed that the tubers were soft and even now it is frequently assumed that the goose cannot take anything too solid. However, examinaion of stomach contents of birds shot during the last five years show that hard tubers are cut or bitten into pieces; indeed the lack of rotten potato in many stomachs suggests a preference for undecayed food. A degree of frost, while not immediately softening the potato, may increase its sweetness and palatibility. There is little evidence that unharvested tubers are dug up and eaten; normally wildfowl arrive too late in the autumn to attack unharvested fields.

The earliest report of potato-eating referred to the Pink-footed Geese of the Ribble estuary in Lancashire (Howard, quoted by Mitchell, 1892). The birds flew inland, especially under a light moon to feed on cultivated grasses, clover, young wheat, rotten potatoes and grain. The habit did not spread to other localities rapidly, probably due to differences in the distribution of the geese, on the one hand, and potatoes and/or winter-sown wheat on the other. When potatoes were first cultivated extensively on the Lincolnshire wolds in 1918 and 1919, Pinkfeet (J. H. Davey, pers. comm.) turned to them at once, suggesting perhaps some prior acquaintance with the food, although in that area grass, grain and winter wheat had hitherto been their main diet. Dawson (1931) wrote that before Christmas, 1924, large numbers of Pinkfeet came regularly at dawn from the Humber to a twelve acre potato field on the Yorkshire wolds. Potatoes were first grown on a large scale in the Holbeach area of Lincolnshire in the 1890's and at Wainfleet in the 1920's (R. E. M. Pilcher, pers. comm.), but here the geese did not appear until 1927 and 1932 respectively and by this time potato-eating was traditional in the flocks. The

Norfolk birds visiting Wells and Yarmouth prior to 1939, never flew to potato fields, the agricultural practice then being mainly centred around grass, and now, although there are plenty of potatoes, the geese no longer come: presumably they have joined or are represented by the Lincolnshire birds. In Scotland, Pinkfeet were found to be eating potatoes regularly in the 1920's. This change in habit was related to a change in their distribution which brought roosting flocks into Perthshire. The provision of stretches of water for reservoirs and curling ponds (e.g. Dupplin Loch and Carsebreck) had made this influx possible. J. Berry (personal communication) states that during the 1920's potatoes became a regular diet of Pinkfeet in north-east Fife.

Figure 1 shows the modern distribution of potato-growing in Britain as a whole, and Figure 2 in Scotland on a rather larger scale. Nowadays potatoes are a most important Pinkfoot food once the stubbles are cleared: only the Solway geese and the few that spend the early winter on the Severn do not take them regularly. Areas where potatoes are not grown are, in fact, often evacuated by Pinkfeet as soon as the spilled grain has been taken.

Potato-eating in the Greylag Goose has only recently become an established tradition (or, at least, has only recently been recognised as such). This is perhaps surprising since the bird is an opportunist and generally more adaptable than the Pinkfoot in its choice of both food and feeding habitat. It was also often seen feeding with Pinkfeet in Scotland and might have been expected to acquire the habit from them: in fact in February, 1935, McLean (1954) shot three Greylags with a number of Pinkfeet on an old potato field near Flanders Moss in Perthshire. Dalgety (1937) and Blockley (undated, but about 1937) say that the Greylag is not partial to potatoes as is the Pinkfoot and Pitman (1947) states that in his experience, mostly gained pre-war, the habit of eating potatoes is only found in the Pink-footed Goose. Undoubtedly, potatoes were taken at times, particularly in bad weather, and Alpheraky (1905) lists potato, turnips and garden vegetables as presumably occasional foods of the continental Greylag. However, the widespread utilisation of tubers does not appear to have occurred until the second World War. Probably today fewer Greylag, in proportion to the total population, take potato than do Pinkfeet. This is due to the former being less concentrated in potato-growing areas and not to any avoidance of potatoes if they are available. There has, incidentally, been a recent report of potato-eating by breeding Greylag in Iceland.

Potato-eating in the Mute Swan has nowhere become traditional although this omnivorous bird takes the tuber occasionally and there is one particularly early record for Ireland (Thompson, 1851). The Whooper Swan, which shows a stronger tendency to feed inland in small flocks, is now found regularly on potato fields in autumn in Perthshire and Angus. The associated habit of feeding on winter wheat is of longer standing (although it also applies only to very small numbers and to certain localities). The influx of swans into the Tay and Forth faunal areas (Boyd & Eltringham, 1962) during the last 50 years has relevance here, since these are the main potato-growing districts in Scotland. Potatoes have probably been taken sporadically from young wheat fields for the whole of this time, but only since the severe winters of the 1940's has the habit been noticeably regular. Baxter & Rintoul (1953) wrote of two Whooper Swans feeding on potatoes from a rubbish dump at Nigg, in Ross and Cromarty, and in 1961 potato-eating was recorded in Aberdeenshire. There is

Figure 1. Distribution of maincrop potatoes in Britain. One dot equals 1,000 acres of potatoes. After Hessayon & Fenemore (1961).

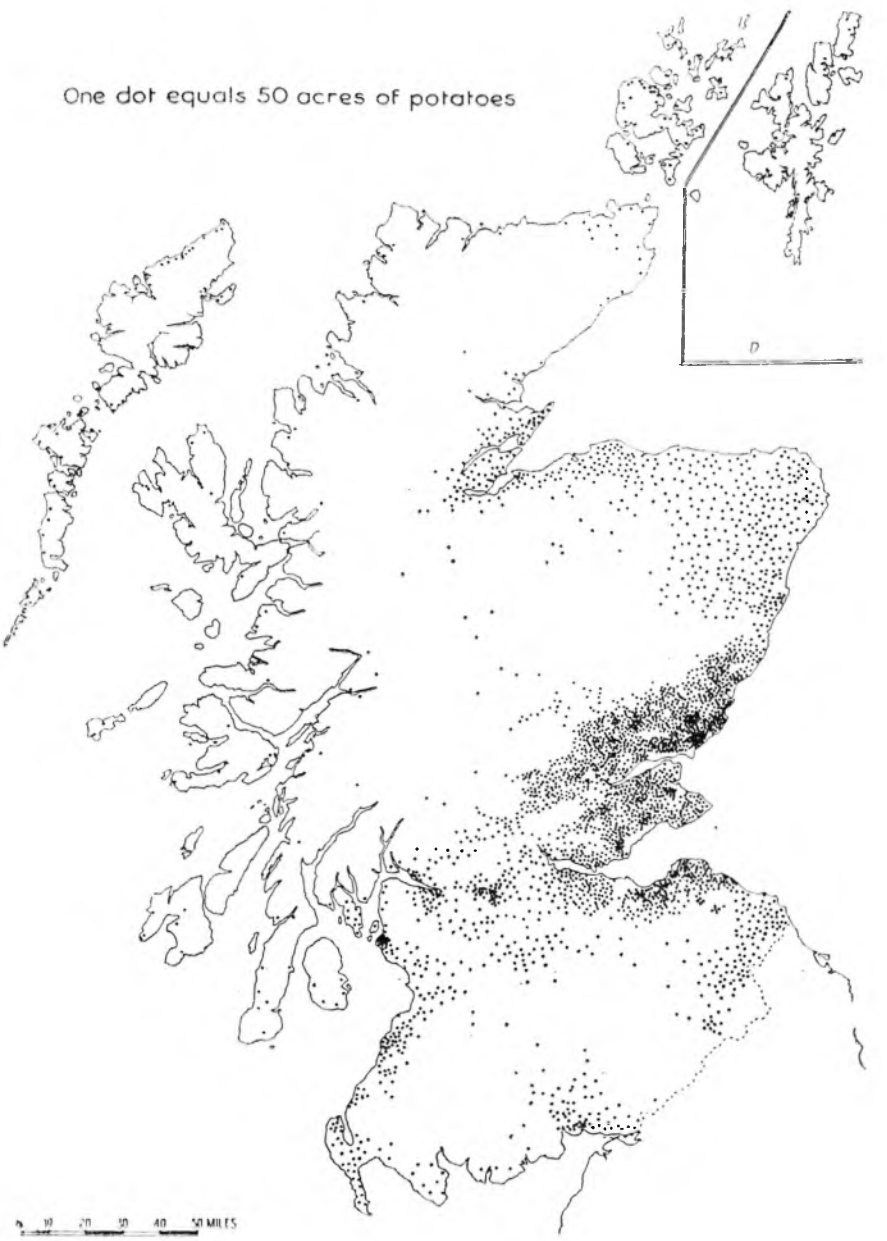

Figure 2. Distribution of potatoes in Scotland in 1955. From O'Dell & Walton (1962).

evidence (J. W. Campbell, personal communication) that in addition to clearing ground of waste potatoes, Whoopers also remove a lot of grass rhizomes, including those of couch grass.

Turnip-eating

It must be emphasised that, although swede turnip-eating by geese is harmful to agricultural interests, it occurs exceptionally and only in those areas of Scotland where roots are left in the field all winter. The habit undoubtedly started because the birds were attracted to the green tops during weather that made their normal feeding grounds unavailable. Other green brassica crops are seldom taken; kale and brussels sprouts are in small fields, often close to human habitation, and sugar and fodder beet are usually harvested before the birds arrive.

Ducks may acquire a temporary liking for brassicas, but do not take field roots, although one decoy has apparently been successfully baited with chopped turnips (Whitaker, 1918). During the very cold weather of 1947, both Mallard and Wigeon were seen on small fields of kale and brussels sprouts and this behaviour was repeated in 1963. In many cases, it was the depth of snow that allowed the ducks to reach the normally inaccessible kale leaves.

Greylags and Canada Geese take kale, etc., occasionally. Unlike the Pinkfoot, which normally moves away in adverse weather, the Greylag prefers to remain and resort temporarily to unusual foods. According to some writers of the last century, other geese have taken turnips and rape kale regularly; for instance, Folkard (1875) referred to the habit in Bean Geese and Borrer (1891) in Whitefronts. Possibly these observations were made during a series of hard winters, certainly nowadays neither species takes these crops consistently, although reports indicate that Whitefronts were taking kale in early 1963. Johns (1918) also wrote of Greylags appearing in turnip fields but the habit has become a regular one rather more recently than that. The winter of 1947 produced a number of unusual complaints from farmers, mainly referring to the activities of Greylags. Most cases of birds feeding on swede turnips occurred during that winter. The green tops, frosted roots and finally the sound turnips were eaten in Bute, Aberdeenshire and Wigtownshire, and in a few other places in Scotland Greylags were seen feeding on roots put out for cattle. The birds seldom continued to take swedes once their normal feeding grounds were free of snow. However, since 1947, the Bute geese have taken sound roots in increasing numbers and invade the crop as the weather deteriorates each winter. In 1963 there have been further cases of swede turnip eating in Wigtownshire, Dumfriesshire and Aberdeenshire in addition to Bute. Undoubtedly the habit will spread further if winters continue to be cold and the agricultural practice of leaving swedes on the fields until the spring becomes general. Figure 3 shows the modern distribution of 200,000 acres of turnips and swedes in Scotland. It is obvious that potentially these roots provide a source of food in all areas where there are wild geese.

Rogerson & Tunnicliffe (1947) have seen Canada Geese in Suffolk following a farm cart through the fields and eating mangolds intended for cows, in much the same way as Greylags do occasionally in Scotland. This is still, however, very unusual.

The Whooper is the only swan that takes sound swede turnips from fields in winter. Very few birds are involved and the practice has been observed only in Aberdeenshire where a few swans also eat loose turnips in the stock fields. The habit has been sporadic over the years and originated earlier than 1947. It is related to weather conditions and the availability of other types of food, occurring during most winters but never on an extensive scale (H. Robertson, pers. comm.).

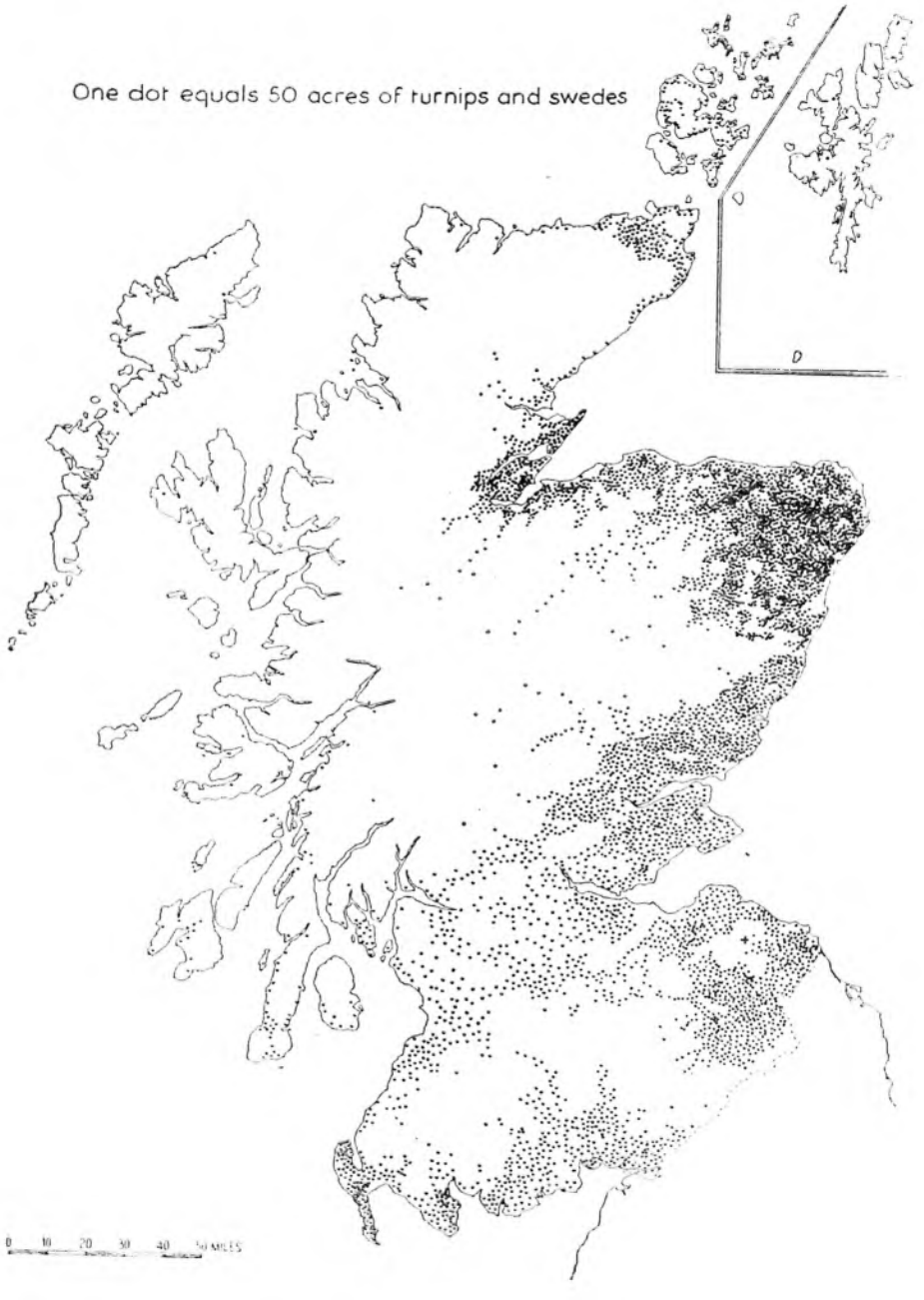

Figure 3. Distribution of turnips and swedes in Scotland in 1955. From O'Dell & Walton (1962).

Techniques used in dealing with roots and tubers

Differences between the species in the techniques used in taking potatoes or turnips are based on differences in the structure of their bills and on their normal feeding regime. The simplest way for any anatid to tackle a root is to nibble at it with the sharp edges of the nails on the ends of the mandible and maxilla. This is the only method employed by ducks and Mute Swans, which differ from the other wildfowl discussed here in that they seldom graze and, when they do, use only the nails to hold and cut the grass. The Whooper Swan and most geese graze sideways, shearing herbage with the lateral lamellae.

A number of duck species in addition to the Mallard appear to have bills strong enough and nails sharp enough to deal with roots, but apparently few actually try. The pieces nibbled off are never larger than the inner mould of the maxilla tip, less than 18 mm. across in the case of the Mallard and 30 mm. in the Mute Swan. Of course, larger pieces can be taken by Mallard, potatoes 20 mm. across and 27 mm. long are found in their gullets, but these are not bitten before being swallowed. The scoop-like marks left by Mallard or Mute Swans on potatoes can be readily seen and are recognisable by the absence of any tooth marks made with the lamellae.

Geese and Whooper Swans also break the skin of a turnip or potato with the maxillary and mandibular nails. The subsequent action has been described as gouging. The semi-circular cuts made by the mandible can be seen around the edge of a partly eaten root as well as the rows of tooth-marks which are made as the sliver of flesh is nipped off with the combined action of tongue and lateral lamellae along one side (see figure in Kear, 1962).

Discussion

Much of the extension and improvement in British agriculture over the last 300 years has been directly beneficial to several wildfowl species. As discussed elsewhere (Kear, 1963), migratory birds take mainly harvest wastage or graze grass and dormant cereals that recover completely. They can therefore be easily accommodated, often to agriculture's mutual advantage. Where there are direct conflicts with farming interests, it is possible that these can be overcome by a change in harvesting methods.

The benefits have been greatest to those species that are already amenable to change by virtue of their unspecialised bills, omnivorous diets and adaptable habits. Indeed two of them, the Mallard and the Greylag Goose, have paid the price of extreme adaptability and long ago became integrated with farming as domesticated animals. Of all the ducks, the Mallard stands out as the most versatile in its behaviour. It has profited the most by changes in cultivation and particularly by the introduction of the potato; the shooting man has in his turn taken advantage of these accessible farmland population. Among the geese, two indigenous and one introduced species can be described as adaptable, but they show important innate and traditional behaviour differences. The Greylag is less wary than its relatives, easier to kill and more difficult to frighten. It is less fastidious than the Pinkfoot in its selection of food and feeding habitat and tends to flight shorter distances from roost to feeding ground, often on to poorer farmland. Once the wintering flocks have arrived they tend to be rather sedentary. The Pinkfeet have been admirably suited by improvements in agriculture; they select only good farmland and are true nomads, moving out altogether if snow covers their usual feeding places. They

tend to be more strictly traditional (or predictable) than the Greylag and in travelling much greater distances (up to 30 miles) from the roost to feed, often pass over land that would seem excellent. In the case of the Wigeon which does much the same thing, Lebret (1959) suggested that a strong flighting urge induces the birds to search for new feeding grounds which may later be opened up. Pinkfeet do, in fact, fly shorter distances to feed at night and in foggy weather probably use feeding grounds reconnoitred during daylight.

The White-fronted Geese have neither the strongly omnivorous behaviour of the Greylag nor the ranging habits that have contributed to the success of the Pinkfeet. Both sub-species of Whitefront that winter in Britain are relatively independent of agriculture. Although pasture grass and, much less often, spilled grain and winter wheat are taken, potatoes and roots have never been exploited. This independence is even more marked in the Barnacle and Brent whose small bills are suited only to their particular food and feeding niche.

The feral Canada Goose is present in this country in small numbers and remains throughout the year. This fact, together with its adaptability, may make it a nuisance on some crops during the summer. The same might be said of the Mute Swan, but fortunately the majority of these birds show a natural disinclination to feed ashore, in fact, Britain appears to be the only country where the phenomenon has recently been observed. The Whooper Swan has always fed more on farmland than does the Mute, and like geese will fly some distance from water to feeding grounds. The habit is recorded in the early literature for both Britain and continental Europe, but the bird undoubtedly prefers an aquatic habitat if sufficient food is available.

The position at present would seem to be that several species of wildfowl are able to take care of themselves in this changing age and need little help from the conservationist other than the provision of secure roosts and a reasonable control of shooting pressure. At the same time their impact on farming is generally immaterial and such local trouble as arises from time to time can be handled relatively easily.

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The protection of crops from damage by wildfowl

Janet Kear

WILDFOWL still provide some of the grandest natural spectacles in Britain; skeins of geese with their haunting cries; flights of duck against the sunset; the ethereal beauty of swans. Wildfowlers, too, consider that geese and duck are the most exciting of quarry. Thus many people, for a variety of reasons, are rightly determined to conserve these species in at least their present numbers and any move to eliminate them would be strenuously opposed. Nevertheless, in a small crowded island like ours, where almost every available acre is pressed into cultivation, it is inevitable that wildfowl should feed to some extent on agricultural land. Fortunately, the bulk of wildfowl are migratory and do not arrive before the end of September or in October, too late to cause damage to unharvested crops and, again, most have left by the end of April. In the autumn ducks and geese concentrate on taking harvest wastage such as spilled grain from the stubbles or groundkeepers from old potato fields and so perform a useful cleaning function. Later the geese, and rarely swans, graze grass and winter wheat that in spring recover completely. The eating of swedes or growing beans in a few restricted localities and the grazing of spring bite grass or spring-sown cereals by swans and geese is rather a different matter. Occasionally, also, a flock roosting on autumn-sown fields, particularly if these are waterlogged, may puddle the soil. Unlike Wood-Pigeons, wildfowl present a very minor problem to the farming community as a whole and they cannot be considered pest-species but, at some times and in some places, it becomes necessary to discourage them. The prevention of damage might be tackled in a variety of ways: by the siting of the crop, physical protection, chemical protection, behavioural control, bird-scaring devices, and by the actual reduction of waterfowl numbers.

In the majority of cases, where normal rotation is followed, it is difficult to position a crop away from the source of attack. However, feeding sites commonly utilised by ducks, geese and swans are adjacent to water on which they roost and a farmer may be well advised not to put a valuable crop in such a field. On the other hand, meadows close to habitations and to thoroughfares are the least likely to suffer. Physical protection, by putting the crop under netting, is impracticable on a large scale, and the study of chemical protection against birds is still in its early stages. The application of a substance to a crop which will render it unattractive but not kill would be very advantageous but our knowledge of sensory physiology in birds is not yet sufficient to provide the basis for selecting a repellent. A variety of substances relying on the sense of taste has been tried unsuccessfully with ducks (Neff & Meanley, 1956). Whole barley soaked in gum turpentine and in kerosene was completely eaten and the commercial American repellent Pestex, dusted on to the grain, did not even slow down the birds' feeding rate.

The study of behaviour reveals that avian species react differently to the same stimuli and what deters one has no effect on another. For instance, geese recognise distant objects far better than ducks do (Engelmann, 1955), an important consideration in the placing of scaring devices. The Greylag is more difficult to frighten (and so more easily tamed) than most other geese. Some birds react violently to hawk-like objects or to alarm calls made by members of the same species. The imitation of avian predators, by helicopters

for instance, on a scale practical to farming seems unlikely in this country, but investigation might be made into the effect of alarm calls on waterfowl. One sub-species of goose, the Greenland Whitefront, hardly ever feeds in flocks of more than a few hundred and generally in much smaller groups. Comparative ethological studies might throw light on this behaviour and indicate how other species could be encouraged to do likewise.

Bird scarers

Scaring is the most popular and suitable method of preventing damage. Almost anything totally strange produces an avoidance response in birds for a while and if it is associated with unpleasant circumstances the response is enhanced. Bird-scarers on the market do no direct harm but normally rely for their effectiveness on the bird associating erratic noise or movement with death or injury by shooting. Scaring devices must be placed in the fields before the feeding birds become well established there and co-operative action among farmers will help split up large aggregations of birds. The following paragraphs give details of a variety of commercial and home-made scarers and make some assessment of their success.

Mechanical Carbide Bangers and Bird Scaring Ropes. A number of mechanical carbide detonators are produced which rely entirely on noise as the scaring agent. The apparatus consists of a carbide cylinder and water feed system with a trumpet to direct and amplify the sound produced.

Effectiveness is claimed for all birds and mammals over long periods, although one manufacturer recommends " an occasional shot from a gun to shows the birds the bang means business ". One banger is said to protect 50 acres and to be unaffected by wind, rain or snow. Initial outlay is high, but running costs are low, approximately 4-5 ozs. of carbide being used in a day. It is necessary to re-charge with water and carbide every few days and the device is more effective if moved frequently. Some of these detonators are fitted with automatic timing devices which switch them off at night. While this may be essential if they are sited near habitation, it renders them ineffective for ducks and geese feeding after dark.

Carbide bangers are recommended by the Pest Control Division against pigeons and Stephen (1961) in a paper on the use of acetylene exploders to control duck damage in Canada, reported a reduction in the number of insurance claims by farmers when one exploder was used per field. Carbide guns have been very successful when operated once every three weeks to keep Canada Geese off certain fields when the birds were able to find alternative grazing.

The Blanch Banger costs £16 or £25 with a 7-day timing unit; the Exid Thunderbird £19, and the Lon Scarer £16. 16. 0d., plus £7. 10. 10d. for an automatic timing device. Carbide costs from 14/- for a 7 lb. tin to £5. 10. 0d. for a 110 lb. keg from A. B. Blanch & Co. Ltd.

Ropes of bangers are commonly used against birds in various parts of the country, but are considered less successful than carbide bangers because the scaring effect wears off more quickly. The device, consisting of a fuse which is lit and along which twelve fireworks are strung at intervals, cannot be turned off at night and requires frequent renewal. It is possible to buy night ropes, which have twelve bangers, but a longer piece of twine to burn before the first

firework is reached. These are lit at dusk and should start banging at dawn, although the rate of burning is affected by wind speed. The Lepco scarer costs 29/6d. for a dozen day ropes and 32/6d. for a dozen night ones.

The "Red Man" and other Scarecrows. One mass-produced scarecrow consists of a two-dimensional man raising a stick as if to shoot, his jacket and hat being painted a fluorescent red and his trousers cut from black plastic. The manufacturers claim that this creates "the image of danger to marauding birds. In severe weather, when birds are willing to take risks, it should be used in conjunction with bird scaring ropes or carbide bangers". Erratic movement is supplied when the scarecrow swings with the wind and by the flapping of the trousers. Farmers speak highly of the value of its unnatural colour for keeping small birds and pigeons away from crops for short periods in the summer. Its disadvantages with geese in winter are its flimsiness in strong winds, that it needs to be kept upright and freely swinging and that its position must be changed frequently. The Maukin bird-scarer costs £5.

Many farmers say that nothing keeps the birds away as adequately as home-made scarecrows. These designs vary and it seems that what continues to frighten birds in one place quickly becomes useless elsewhere. A number of features are particularly recommended: (a) make the scarecrow larger than life, but otherwise make it as lifelike as possible, (b) some part of it should flap in the wind, (c) use some colouring, particularly red, (d) add a string of bangers, (e) change its position regularly, about every three days, and use one per five acres in fairly flat country. The highest points of a field, where geese usually alight, should be well supplied.

Many farmers use oil drums and barrels from which an occasional shot is fired and these may be excellent; again, the position in the field has to be changed frequently.

Electric Fencing and Lights. Electric fencing, about $1\frac{1}{4}$ feet from the ground, and operating at normal voltages, prevents Mute Swans walking on to fields adjacent to rivers and marshes and will be useful, rather nearer the ground, against ducks and geese in similar situations. The deterrent effect of walking into the wire a few times may be sufficient to keep swans from flying over it on to these fields and one in a field might frighten geese away. Revolving 1000-watt lights have also been used with some success in fields to keep night feeding waterfowl away (Stephen, 1959). In the Hebrides, crofters used to put lighted lamps in the fields at night before harvest (J. Campbell, pers. comm.).

Wind-blown Devices, Bodies and Feathers. Hochbaum *et al.* (1954) controlling duck depredations around Lake Manitoba, had considerable success with a bird-scaring bag swung from an angled pole. They used brightly coloured mesh vegetable bags filled with straw and tied to a 10 ft. pole placed at such an angle that the bag swung freely. At the top of the pole a few feet of metal stripping or a tin "flasher" were secured. Three or four placed where the ducks were feeding usually prevented further visits, but in one 60 acre field, where a feeding habit had been established over several days, they had to use 16 structures before the birds returned no more. One farmer has tried coloured balloons and found them successful. A heavy duty rubber is needed and gas filled ones will swing in the breeze most effectively. Revolving devices that work on a windmill principle are also useful.

The feathers from a dead bird plucked and scattered over a field keep pigeons away, and one farmer has used this method with geese with success.

A number of others use bodies and wings, nailed to posts or hanging from poles. Bodies laid on the ground where the birds normally land are also effective. Most farmers who use these methods are convinced that they work better than conventional scarecrows. Even these devices require regular moving and it is important that some part of the body is free to flap and look " unnatural ". The density required for these devices seems to be rather less than that needed for scarecrows; some farmers use only one per field if it is nailed to a post and freely swinging.

Dogs, Men and Aeroplanes. Dogs are the only scarers, apart from man and electric fences, which can be recommended for swans. Mute Swans can be very phlegmatic and even the wild Whooper Swans are considerably less easily disturbed than geese. They will not allow a dog to come very near, although it takes a determined and well trained animal to run at them. A sheepdog, which normally works at some distance from its master, should be able to do this quite easily. Helm (1951 unpublished) found dogs of great value in keeping Canada Geese away from crops in Manitoba. One Scottish farmer put a kennel, a bitch and her litter of puppies in the middle of a field and kept geese away successfully! In Eastern Germany, experiments with stuffed foxes in damaged fields have produced good results (G. Bergman, pers. comm.). Human beings are always effective in keeping birds away for a while. Three or four visits to a field every half hour after dawn may be necessary to keep geese off for a day and a blank fired into the midst of the flock certainly helps. In North America, where large scale and costly bird scaring is undertaken, aeroplanes and helicopters are employed to fly low and lift birds off the crops.

Shooting

In certain circumstances it may be necessary to shoot some of the birds, but it must be stressed that this method of control should be used as a last resort and then only in conjunction with other scaring methods. Hochbaum *et al.* (1954) were successful in regularly removing ducks from fields up to one-half mile away with the blast from a 12-gauge shot gun, blank shells being as effective as cartridges. They supposed this to indicate that ducks need not be killed for scaring to be effective. Unfortunately, since no study has been made of the scaring of a population of birds which no one else was shooting and killing, their theory has not been adequately tested and, in fact, reports indicate that birds become increasingly difficult to frighten with bangers after the end of the shooting season. It is sometimes maintained that, for pigeons at least, the whoosh of a rifle-bullet is more frightening than the report of a shot gun; however, the use of rifles in a farming community cannot be recommended.

The Protection of Birds Act, 1954 makes shooting the only means by which wildfowl may be killed; the destruction of eggs (except of Goosander and Red-breasted Merganser in Scotland) or of young and the use of traps, narcotics and poisons are illegal. The close season for geese and ducks starts inland on 1st February and ends on 31st August. However, the 1954 Act states that a person shall not be guilty of an offence if he kills a wild bird, other than one included in the First Schedule, during the close season, if he can show his action was necessary for preventing serious damage to crops (Section 4, Sub-section 2(a)). This means that the Mute Swan, Bean, Canada, White-

fronted, Pink-footed Geese and most species of duck may be shot at any time to prevent serious damage. (Birds shot during the close season cannot, of course, be sold).

The Greylag, which constitutes a special problem at the present time, may be shot during the shooting season, when it is on the Third Schedule, but may not be killed during the close season, when it is on the First Schedule (to protect birds breeding in north Scotland). The Whooper Swan, which may not be shot at all, as it is included in the First Schedule the year round, is the subject of a few complaints, but the numbers are small and they are relatively easy to deal with.

In some rare instances it may be necessary to attempt a significant reduction in wildfowl numbers by a deliberate shooting policy. This is not to be entered into lightly when dealing with a shifting population of migrants, since a wholly disproportionate number of birds might be killed to little effect. The relatively small flocks of feral geese, that is, those established by Man and breeding in the same area as that in which they winter, may however sometimes require thinning out.

Financial compensation for damage

In some parts of North America co-operative insurance against crop damage is taken out by all farmers in an area liable to attack. In such cases damage suffered will be mainly to unharvested grain crops where a loss can be fairly calculated in monetary terms. Similar considerations apply in Holland where each sportsman pays ten guilders into a central fund and farmers may claim a refund from this if they suffer damage which could not be prevented. It is doubtful if compensation schemes could be made effective in the conditions obtaining in Britain. Such damage as occurs is largely a matter of timing—early bite grass eaten just when it is wanted for lambing, and spring cereals checked by grazing. Such losses are extremely difficult to assess in concrete terms. Moreover the extent and nature of the damage will vary widely with the weather conditions both before and after as well as during the time damage is being done. Again there is the difficulty of proving that the damage was done by wildfowl when there are a number of other animals, especially hares, feeding on the same crops. Some landowners, concerned with the conservation of flocks of geese traditionally feeding on their land, have allowed a lower rental to their tenant farmers on the understanding that the birds will be left undisturbed. It is possible that a similar system could be made more widespread.

Discussion

The best commercial bird-scarer is the carbide exploder, which can be supplemented by an occasional shot from a gun. The best home-made devices are scarecrows and dead birds or feathers. Whatever method is used constant variation of site and an adequate density are essential, and it may eventually be necessary to change the type of scaring device. Bangers and perhaps electric fences should be used at night, although sometimes the damage is done before the farmer is aware of the birds' presence. The value of electric fences should be further investigated: they are cheap and many farmers already have them but do not normally use them in winter. It must be emphasised that none of these methods is successful for long unless the birds have somewhere else to

feed undisturbed and if the birds are to be allowed peace they may need special feeding areas set aside for them. The " management " system has progressed a long way in North America where crops are specially planted for waterfowl to draw them away from farmland (Givens & Atkeson, 1959); however, feeding refuges on the small scale suitable to our country sometimes create new problems in surrounding areas. Mr. Peter Scott has suggested that the setting aside of farmland where wild geese are tolerated might be as valuable for the World Wildlife Fund as a monetary gift. Fortunately in some ways, the system already functions in Scotland and England where landowners encourage the geese for their sporting or aesthetic interests, as the Berkeley Estates have done for centuries on the New Grounds at Slimbridge.

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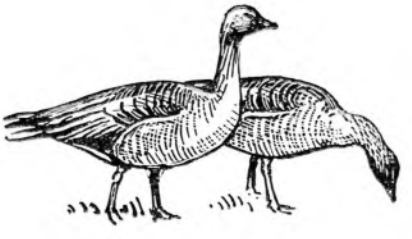

The agricultural importance of wild goose droppings

Janet Kear

Summary

PRODUCTION of manure per bird per day was estimated to range from 175 gms. for the English Canada Goose to 58 gms. for the Barnacle Goose. Droppings were analysed to determine their chemical composition. This was found to reflect the soil and crop on which the birds were feeding and perhaps to some extent their own physiological requirements. On a dry weight basis, content averaged 2.2% N_2, 1.0% P_2O_5 and 2.0% K_2O.Production at this rate and of this quality will not make any significant difference to the soil chemicals and is usually not additive. Rarely trace elements or phosphates may be brought in by geese to land deficient in them. The organic content may help in the maintenance of a good tilth. The accumulation of droppings at goose roosts on inland freshwater lakes is probably sufficient materially to affect the fertility of the water. "Fouling" and contamination by droppings are not important on present evidence.

An investigation of the relation of wild goose flocks to agriculture in Britain, recently undertaken by the Wildfowl Trust, surveyed not only the food removed by the birds but the manure they left behind. Very little information was available on the rate of production of faecal material or its composition. The present paper seeks to provide such information and to indicate whether there are any ways in which the manure is either of positive value or disadvantageous to the farmer.

The average weight of geese in wild flocks was calculated by assuming that the sexes are equal in numbers, and that juveniles constitute a third of the birds. Samples of droppings produced by a number of species when feeding on grass were collected. It will be seen from Table I that the ratio of dropping weight to body weight is very similar in all the species.

Table I. The relation of dropping weight to body weight

	Av. body wt.	Average dry wt. of 60 droppings	Dropping wt. as % of body weight
Barnacle Goose	1.80 Kg. (Boyd unpub.)	0.84g. (Solway)	.02
Pinkfeet	2.52 (Beer & Boyd 1962)	0.77g. (Slimbridge) 0.78g. (Solway)	.03
Russian Whitefront	2.23 Kg. (Beer & Boyd 1963)	0.87g. (Slimbridge)	.04
Greenland Whitefront	2.47	1.04g. (Tregaron)	.04
Greylag	3.14 Kg. (Elder 1955)	0.94g. (Solway)	.03
Mid-western Canada Goose ..	3.80 Kg. (Elder 1946)	1.54g. (Helm 1951)	.04
English Canada Goose	4.64 Kg. (Boyd unpub.)	1.90g. (Slimbridge)	.04

For three species of goose the number of droppings produced daily is known approximately. Penned, wild-caught Canada Geese produced 92 droppings per day in winter (Taylor, 1957). Hand-reared Pinkfeet defaecated at the average rate of 3.6 droppings per hour, that is about 86 per day, also in winter. The approximate rate at which droppings were produced by wild Whitefronts under natural conditions was estimated by sampling in a 19-acre grass field at Slimbridge frequented for only two or three days in two seasons by a known number of geese. In March, 1961 3300 geese in 23 daylight hours produced 3.7 droppings per yard square, in March, 1962 3500 in 51 daylight hours produced 8.9 per yard square. These give dropping rates per individual goose of 4.5 and 4.8 per daylight hour. When the geese roost on the river's

edge individual piles accumulate, containing about 10 droppings per bird per night. Allowing for droppings lost in transit and while the bird is bathing and gritting, the production for the complete day is around 80. For these birds, then, it is possible to calculate the weight of manure produced per day. As a percentage of their body weight this is 2.7 for the Pinkfoot, 3.2 for the Common Whitefront and 3.7 for the Mid-western Canada Goose. If it is assumed that a ratio of 3.2 *per cent* of the body weight holds for those species for which there are no data on dropping rate, figures for the weight of dry manure produced per bird per day can be obtained:—

English Canada Goose *Branta canadensis canadensis*	175 gm.
Mid-western Canada Goose *Branta canadensis interior* ..	142 gm.
Greylag Goose *Anser anser*	100 gm.
Greenland White-fronted Goose *Anser albifrons flavirostris*	79 gm.
White-fronted Goose *Anser albifrons albifrons*	70 gm.
Pink-footed Goose *Anser brachyrhynchus*	67 gm.
Barnacle Goose *Branta leucopsis*	58 gm.

These weights should be multiplied by a factor of 5 if a wet weight figure is required.

To obtain the chemical composition of goose manure, fresh samples, each of over 20 grams dry weight, were collected from birds feeding on a wide variety of crop fields. The results of the chemical analyses are set out in the Appendix. The composition of the droppings reflects rather closely the composition of the crop and of the soil on which it is growing. Thus sample 2, which is low in phosphates, was from an area where the soil is devoid of this mineral and sample 10, on the other hand, was taken from a richly fertilised soil. Sample 18 has a low water and potash content, characteristic of the oats on which the Greylags were feeding, and sample 19 has a high water content as would be expected from a diet of swedes. Nevertheless, samples from the same place at different times also show a variation, for instance 21 and 22. This may reflect a change in the condition of the crop or be due to a variation in the nitrogen requirements of the birds according to their physiological condition. While these variations and their causes would make an interesting study, the cost of analysis is high and for present purposes the data in the Appendix are sufficient to give a general indication of composition of wildfowl droppings. The average value for geese may be compared on a dry weight basis with the composition of manures produced by domestic animals as given by McConnell (1958). It will be seen that the wild goose manure is similar to that of cows and sheep but less rich than that of hens. The decomposition rate of goose droppings is relatively rapid. Within three weeks during March, 1961, even in dry weather, the nitrogen in Whitefront excreta had dropped from 4.1 to 1.6 *per cent* and the potash from 3.3 to 1.4 *per cent*.

Table II. Composition of various manures (original and after McConnell)

	% moisture	% N_2	% P_2O_5	% K_2O
Wild geese ..	83	2.2	1.0	2.0
Hens	55	3.3	3.3	1.9
Cows	77	1.7	0.6	1.7
Sheep	67	2.1	0.9	2.4

The amount of fertiliser applied to farmland by the agriculturalist of course varies widely according to conditions and crop. But as an example, the production of one ton of wheat grain and straw draws about 54 pounds of nitrogen per acre from the soil (Ministry of Agriculture, 1957). Now at Slimbridge, even with a resident winter flock in excess of 1000 Whitefronts,

repeatedly foraging over 2000 acres, a level of 1 dropping per square foot is considered high. Using the average composition of wild goose droppings this would provide only 1.9 lb. nitrogen, 1.7 lb. potash, 0.8 lb. phosphate and over 70 lbs. organic matter per acre. To lay 54 lbs. of nitrogen per acre would thus require 28 droppings per square foot or 244,880 goose hours (say 1000 geese for 245 hours or more than three weeks on the same acre of grass). Such a heavy goose usage is never encountered. In any case, such plant nutrients as the geese provide have come directly from the soil on which the birds feed and are not additions; of greater importance is the rapid turnover of organic matter in improving and conserving the soil. The droppings contain partly and completely digested compounds and, therefore, nutrients return faster than they would if left to decay or ploughed in. The rapid conversion of spilled grain on stubble fields is a case in point. Here it is an advantage that food passes through a goose quickly so that most of the manure produced is left on the land from which the bird is feeding.

In some cases geese may bring trace elements on to the land which they have obtained when " gritting " elsewhere. Ingram (1933) noted that cattle on the Isle of Gunna, off the Island of Coll, ate Barnacle Goose droppings and that these cattle were in better condition than those on the main island, of similar topography but where the geese were few. Rennie (1958) also observed this habit on Gunna but thought this might indicate a phosphate rather than a trace element deficiency. The phenomenon has not been observed in Islay, however, where there is a known lack of phosphate, but sheep on a farm in Perthshire are reported to eat goose droppings selectively from acid ground where some hundreds of geese roost.

While some goose flocks have temporary roosts on land, which they enrich to some extent, most roost on water. On tidal waters the manure will be so diluted as to be virtually useless; thus, Curry-Lindahl (1962) found that large concentrations of swans on the Baltic coasts caused little difference in the physico-chemical composition of the water. Vladykov (1959) however suggested that the very large (120,000) numbers of geese present for five months on the St. Lawrence shores in Canada must be producing a fertilising effect. On inland waters, an accumulation of fertilising compounds is more likely; Paloumpis & Starret (1960), investigating the situation at Lake Chatocqua, Illinois, calculated that 20 million duck-days a year spent on the 3562-acre lake left 12.8 pounds nitrogen and 17.1 pounds phosphate per acre.

Much work has been done investigating the effect of adding chemical fertilisers to raise the productivity of lakes for fishing (e.g. Holden, 1959). The quantity to be added to a loch to produce a significant effect on the development of freshwater algae depends to some extent on the depth of water, shallow lochs being more likely to benefit. To add a recommended 10 pounds of nitrogen per acre per annum (A. V. Holden, pers. comm.) would require some 10,000 goose-nights per acre, or 500 geese per acre for 20 nights, assuming that each bird leaves 20 droppings at the roost and these weigh 1 gram dry weight each. This usage falls within that known to exist on some major shallow water roosts.

As a preliminary investigation water samples were taken at two such roosts (known to be excellent fishing lochs) in April, 1962 after geese had been there since the previous September. The level of phosphate, which rarely exceeds 0.5 to 1.0 parts per million, was extremely high. In similar samples,

taken at the end of May when the geese had gone and there had been considerable plant growth, the phosphate was back to a normal level. The results are not in themselves conclusive but suggest that further research would be fruitful.

A complaint frequently made by farmers is that their cattle and sheep actively avoid land " fouled " by goose or swan droppings. Certainly avoidance of their own faeces is quickly learnt if not instinctive in young mammals (Taylor, 1954). Goose droppings however are not at all like mammalian faeces and, although Mute Swans' droppings look something like those of a dog, there is no unpleasant odour. No complaints were made by farmers about the droppings of Whooper Swans which, unlike those of the Mute, dry out whitish and hard and look relatively inoffensive. Mr. M. A. Ogilvie kindly tasted the droppings of captive geese, both fresh and about 15 minutes after they had been deposited. All contained grass remains only. Whitefront, Pinkfoot and Barnacle droppings were either tasteless or with a grassy flavour; Greylag and Canada Goose droppings were slightly bitter at first, and the bitterness increased, leaving an unpleasant after-taste. The Ministry of Agriculture & Fisheries (1937, quoted by Berry, 1939) referred to domestic geese thus, " owing to the grazing-habit of geese, however, many farmers, especially those living in highly cultivated districts, will not keep them. The objections usually advanced are that four-legged stock will not graze after them, and that they are destructive to the herbage of the pasture. These objections, however, do not appear to be well founded, and have usually arisen from attempts to keep the geese in small fields or in large numbers too closely associated with other stock. Horses, cattle and sheep have all been found to graze freely after geese." On present evidence any avoidance seems just as likely to be due to the fact that the grass where geese have been feeding will be shorter and less rewarding, even to sheep, than elsewhere. Alpheraky (1905) mentioned that Greylag Goose droppings " scorched " the grass on which they fell. No such effect has been recorded in this country. If it were found, it would be due to free ammonia in the droppings, and there is no evidence that this is high under normal conditions.

Suggestions are also made that geese carry weed seeds, potato root eelworm cysts and various disease organisms. Harmon & Keim (1934) and Cooper, Maxwell & Owens (1960) showed that of 32 varieties of weed seed fed to domestic hens only one could be recovered from the faeces still capable of germination. Possibly trampling of ground by geese in wet conditions would favour the dominance of weed plants, especially on poorly managed, over-grazed grassland. Eelworm cysts occur in the dry fibrous roots, not in the potato tubers which are eaten by the geese, and any risk of transport externally, on the feet for instance, would be slight in comparison with that by other agencies. Tuberculosis has never been found in a wild goose by the Wildfowl Trust and only once in a seven year study by Wilson (1960); in any case, avian tuberculosis is not a progressive disease in cattle. Foot and mouth disease is not acquired by geese through contact with infected cattle (Skinner, 1959) though the virus could be transmitted mechanically. Wilson & Matheson (1952) found no grounds for suggesting that birds migrating from northern countries introduce the disease into this country in the autumn.

It is possible that there may be accumulations of bacterial material on water roosts. Thus Paloumpis & Starret (1960) found a rise in coliform and

enterococcus counts from Lake Chantangua through the winter which they associated with a rise in the duck population. In the case of coastal waters such as those investigated in Sweden, Curry-Lindahl (1962) concluded that the slight tidal action prevented any demonstrable pollution correlated with swan density. Schlichting (1960) found that, although only a few faecal samples from ducks contained viable organisms, these birds played a major role in the dispersal of algae and protozoa between bodies of water.

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Appendix. **Composition of bird droppings.** Last four figures on dry weight basis.

	Species	Diet	Month	Locality	% Moisture	pH	% N_2	% K_2O	% P_2O_5	% NaCl
1.	Barnacle Goose, *Branta leucopsis*	Grass	Nov.	Solway	84.75	6.5	1.44	1.80	1.20	0.240
2.	,, ,, ,, ,,	Grass	Nov.	Islay	76.25	5.5	1.10	2.70	trace	0.380
3.	,, ,, ,, ,,	Grass	Dec.	Holland	88.50	5.0	1.44	2.70	1.56	0.021
4.	Canada Goose, *Branta canadensis*	Grass	April	Sevenoaks, Kent	87.63	6.5	1.62	3.31	1.86	0.145
From Helm (1951)	,, ,, ,, ,, (average of three samples)	Corn, vegetation and seeds	March and April	Missouri, U.S.A.	66.69	?	2.08	1.42	0.84	?
5.	Pink-footed Goose, *Anser brachyrhynchus*	Old grass	Nov.	Humber	86.60	6.0	1.12	2.35	1.12	0.050
6.	,, ,,	Barley stubble	Nov.	Corston, Angus	82.00	6.0	1.96	1.72	1.29	0.017
7.	,, ,,	Winter wheat	Dec.	Leuchars, Fife	81.80	5.5	1.52	0.51	0.42	0.050
8.	,, ,,	Young grass	Dec.	Leuchars, Fife	82.00	5.5	1.87	1.59	1.24	0.071
9.	,, ,,	Winter wheat	Dec.	Humber	?	5.5	3.98	1.58	1.64	0.201
10.	,, ,,	Winter wheat	Jan.	Hereford	89.41	6.5	1.58	3.78	2.08	trace
11.	,, ,,	Merse grass	Feb.	Wigtown	68.19	6.0	1.42	1.76	0.25	0.022
12.	,, ,,	Grass	March	Rockcliffe, Cumberland	79.39	5.5	2.40	2.43	0.83	0.087
13.	,, ,,	Young grass	April	Strathbeg	81.60	6.0	0.92	1.58	1.09	1.000 approx.
14.	Bean Goose. *Anser fabalis*	Young grass	Jan.	Castle Douglas	92.50	6.0	2.93	0.67	0.15	0.173
15.	Greylag Goose, *Anser anser*	Potatoes	Dec.	Caerlaverock, Solway	83.10	6.0	1.23	1.14	0.56	0.031
16.	,, ,, ,, ,,	Grass	Dec.	Coupar Angus, Perth	82.40	6.0	2.35	2.50	1.12	0.019
17.	,, ,, ,, ,,	Winter wheat	Jan.	Coupar Angus, Perth	86.61	5.5	1.30	1.94	0.22	trace
18.	,, ,, ,, ,,	Oat stubble	Jan.	Blackford, Perth	70.41	6.0	1.60	0.61	0.40	0.010
19.	,, ,, ,, ,,	Swede turnips	Feb.	Bute	90.03	8.5	1.80	2.80	1.10	0.200
20.	,, ,, ,, ,,	Merse grass	March	Wigtown	85.02	5.5	5.90	2.67	2.00	0.114
21.	White-fronted Goose, *Anser albifrons albifrons*	Grass	Nov.	Dumbles, Slimbridge	87.24	8.0	1.41	2.32	1.43	0.065
22.	,, ,, ,,	Grass	Jan.	Dumbles, Slimbridge	79.83	5.5	3.92	1.38	0.89	0.030
23.	,, ,, ,,	Marsh grass	Jan.	High Halstow, Kent	86.20	6.0	5.87	2.87	2.05	0.107
24.	Greenland White-fronted Goose, *Anser albifrons flavirostris*	Grass	Feb.	Tregaron, Wales	81.95	5.5	2.30	2.10	0.09	0.033
25.	,, ,, ,,	Grass	Feb.	Galloway	83.38	5.8	2.80	1.26	0.22	0.018
26.	Mute Swan, *Cygnus olor*	Winter wheat	Jan.	Hereford	87.99	6.0	1.03	3.75	1.58	0.120
27.	,, ,, ,, ,,	Grass, aquatic plants and bread	May	Patch, Slimbridge	89.20	5.5	2.13	3.34	1.67	0.185
28.	Whooper Swan, *Cygnus cygnus cygnus*	Winter wheat	April	Aberbothrie, Perth	?	6.5	1.15	0.79	0.42	0.210
29.	,, ,, ,,	Grass	April	Strathbeg	88.70	6.0	1.06	2.92	1.77	trace
30.	Wigeon, *Anas penelope*	Grass	Jan.	Dumbles, Slimbridge	84.95	5.8	2.70	2.40	0.20	0.133
31.	Partridge, *Perdix perdix*	Winter wheat	Jan.	Hereford	87.60	6.6	1.73	2.58	0.97	0.008

Note: Small traces of Calcium were detected throughout all samples. but are less than 0.001% as Ca++ except for sample 13 which contained considerable amounts of grit and some cinder, and Ca and Na were both high, Ca 2.7% approx.

Wetland wastage

P. J. S. Olney

For centuries man has been engaged in altering his environment and in particular those areas known as wetlands which can be drained or used merely as dumping grounds for waste products. As our population grows and the more materialistic approach to life advances, so the number of wetlands left, and especially those in the Northern Hemisphere, rapidly declines. Wetlands, which can be defined as those areas which are covered with shallow and sometimes temporary water, are particularly vulnerable to man's deliberate modifications. The belief that marshes and other wetland habitats are only wastelands is widespread, and little account has been taken of any values that the marsh may have in its natural state. There is a danger that this type of habitat may disappear altogether if the rate of exploitation goes on at the pace it has now.

A meeting sponsored by three international bodies, to discuss the problems involved in wetland conservation and management, was held in November 1962 at Saintes-Maries-de-la-Mer in the Camargue in the south of France. This was a most appropriate place in which to hold such a meeting, for the Camargue as part of the Rhone delta is one of the most famous large wetland areas left in Europe. An area of great intrinsic beauty, it is a place of inspiration for poets and painters, sun-worshippers and scientists, and has many problems of conservation and management. The importance of the conference was emphasised by the fact that over 80 delegates from at least 16 different countries attended, including 16 representatives from Great Britain. Most of the international and national conservation organisations were represented and in many cases by their chief officers—the Wildfowl Trust being represented by Peter Scott, Dr. G. V. T. Matthews and P. J. S. Olney. Much of the success of this conference was due to the untiring and efficient organisation of Dr. Lukas Hoffmann, Honorary Director of the Station Biologique de la Tour du Valat, and to the hospitality of Dr. Hoffmann and his wife.

The conference had three main purposes—to publicise the scientific, economic and moral importance of wetlands, to assemble and to reduce to a convenient form technical material which would then be available to all those concerned with the conservation of wetlands, and to compile a thoroughly documented list of wetland areas the conservation of which is of international importance. Some 50 papers were submitted by experts from Europe and North America and formed the basis of often lengthy and energetic, but rewarding discussion. Papers from the Wildfowl Trust included: " The development of a national plan for wildfowl refuges in Great Britain " and " The role of reservoirs in wildfowl conservation " by G. L. Atkinson-Willes, " Wildfowl and agriculture in Britain " by Janet Kear, " Artificial restoration of wildfowl populations " by H. Boyd and " Gravel pits as waterfowl reserves " by P. J. S. Olney.

It was emphasised by a number of speakers, and underlined by Peter Scott in his introductory remarks, that wetlands should be evaluated, and not necessarily always in terms of money, for their aesthetic qualities as well as their economic and scientific values. It was pointed out that we have a duty to leave alone areas of natural habitat where our descendants can see and appreciate the inherent splendour and interest of the landscape and of the animals and plants that live therein.

Attention was drawn to cases of ill-conceived drainage schemes, many of which have been abandoned after much money has been wasted and irredeemable damage has been done to the habitat and consequently to the animal and plant life of the area. The classic example is the well-documented case of Lake Hornborgasjon in central Sweden. For thousands of years it had been a shallow lake some 10 square miles in area, with a luxurious vegetation and a rich fauna. Attempts to drain it in 1803, 1850 and 1870 incurred " grave financial losses ", and yet in 1903 another drainage scheme was begun with the promise of a farming profit of nearly 200 per cent. During 1932-35 a further lowering of the water-level took place. Today, after the equivalent of nearly £600,000 has been spent in draining this shallow lake, it is still no more than a marsh. The gross profits from the first 25 years of operation amount to only one tenth of the capital investment. Even now the costs of maintenance are likely to be more than the agriculture profit. This disastrous piece of stubbornness has resulted in the loss of extensive fishing (which alone was equivalent to the expected agriculture profit), the loss of water power valued at £130,000, the loss of important wildfowl shooting resources, and not least the loss of the lake as an object of scientific research and general education. Possibly, this case is exceptional as an example of prolonged monomania, but there are many other instances of drainage projects which have been left unfinished with much money—often from public sources—forfeited and the loss of valuable habitat.

In America the abandoned drainage scheme for the 30,000 acre Mattamuskeet lake in North Carolina had the happy result of the whole area of 50,000 acres being bought by the United States Government and a National Wildlife Refuge being established. This was however only after twenty years of misguided plans and millions of wasted dollars. Now the area is one of the most important wildfowl refuges in the United States and annually attracts many thousands of visitors, both human and avian.

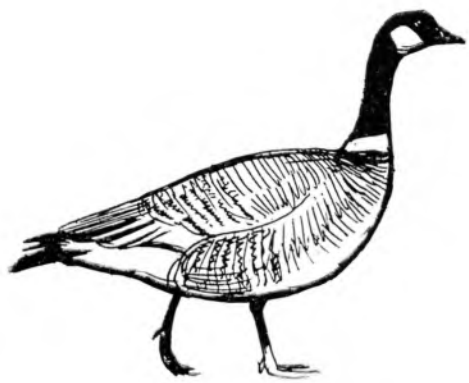
In Great Britain where the wetlands are comparatively small, there have been no failures of such magnitude, yet this does not mean we should be any less diligent in trying to preserve at least part of this vital type of habitat.

There are indications that some authorities are beginning to realise that wetlands may have more value by being left undrained. The Dutch Government, for instance, has recently decided to stop subsidising the reclamation of the few remaining inland marshes and peatfields. This may have been partly because there were at that time 10,000 tons of butter and cheese awaiting buyers but also because it is now appreciated that the remaining wetlands have a potentially high value for reed growing, fishing and shooting rents and for other recreational activities.

The conference closed with a number of recommendations being adopted. These included the recommendation that the International Union for the Conservation of Nature (I.U.C.N.) should compile a list of all European and North African wetlands of international importance which would be available for governments and all interested organisations; that I.U.C.N. should publish a leaflet in which the educational, scientific, cultural, economic and recreational values of wetlands would be explained; that I.U.C.N. should also publish a brief guide to the basic legal procedures and administrative methods used in setting up and managing reserves, and also a guide to the technical management of such reserves. The conference also recommended that governments and other

bodies responsible for the drainage of wetlands should consider the values of wetlands, both tangible and intangible, before carrying out such projects.

It is hoped that this conference will help initiate a number of projects which will cause governmental and other bodies who are responsible for wetlands, to realise that at least some of our wetlands must be preserved for posterity. Like so many things, our marshes and fens will not be missed until they are gone—and then it will be too late.



Buldir Island, site of a remnant breeding population of Aleutian Canada Geese

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Summary

RECENT observations of the once abundant Aleutian Canada Goose *Branta canadensis leucopareia* are reviewed. The introduction of Blue Foxes to the breeding grounds and increased hunting pressure are suggested as reasons for the decline of the race, with a note concerning the production potential of the Blue Fox. An expedition to Buldir Island, where no fox introduction had been made, is recounted along with a discussion of the island's topography, climate, avian and mammalian populations. Reestablishment of the Sea Otter at Buldir Island is noted. A breeding population of *B.c. leucopareia* was observed and the conditions of the habitat are discussed.

Ancestrally, a large population of a subspecies of small Canada Goose bred in the Aleutian Islands from about Yunaska Island at 52° 40′ N and 170° 40′ W to and including the islets off Attu, the westernmost of the Archipelago (Nelson, 1883; Turner, 1886; Murie, 1959). This sub-species has been designated by Delacour (1954) as the Aleutian Canada Goose *Branta canadensis leucopareia* (Brandt). Clark (1910) described the bird as abundant on Agattu, but Murie (1959, p. 67), in his account of observations made in 1936 and 1937, states that, "..., they had disappeared on most of the islands, and our total observations indicated that only a few pairs remained in the Aleutians." Recent observations support this gloomy view.

On 17th May, 1950 I observed a single goose alighting on Kirilof Point, Amchitka Island. Krog (1953) collected a specimen from a small flock on the islets in Constantine Harbor, Amchitka Island. Kenyon (1961) on 10th May, 1959 collected a specimen from a flock of seven on the same islets. On 27th June, 1961 five biologists working on Amchitka observed four Canada geese, all displaying the prominent white ring at the base of the stocking, in Constantine Harbor. Later, on 5th July, 1961, two of us observed two geese flying near Loran Island off Amchitka. At the same time two persons ashore on Loran Island photographed another goose resting with a group of common eider ducks. Though Amchitka was as carefully searched as possible through the summers of 1960, 1961 and 1962, these are the only recent reports from that area.

Murie (1959) noted the presence of these geese in 1936 and 1937 on Agattu, Buldir, and Chagulak Islands. Coats (1951, p. 3) writes of Buldir, " Numerous geese, probably the lesser Canada goose, breed on the island ". This observation was based on a four day visit in 1947.

Murie (1959) suggested that the decline of this race of geese was due to the introduction of Blue Foxes and to increased hunting pressure along the birds' migration route and on its wintering grounds. I can but agree. While the status of ancestral fox populations in the Aleutian Islands is obscure, we have records of Blue Fox introductions to almost every island in the Archipelago from Yunaska west, excluding Attu, which had an ancestral population of this dark phase of the Arctic Fox *Alopex lagopus* (Bancroft, 1886). These introductions occurred principally in the 1920's when fox furs commanded a high price. Some of these islands already had a population of Silver Foxes which in the central and western Aleutians were not very successful. They barely maintained, and in some cases still do, a minimal population. The Blue Foxes, however, rapidly produced and maintained large populations. For example, on Rat Island, to which Blue Foxes were introduced in 1922 and 1923, there is a population currently estimated at 250 individuals (Berns, 1962). This estimate is based on two years of tagging experiments. Rat Island, about 65 miles west of the 180th Meridian, is roughly 8 miles long with a greatest width of about two miles and includes 6.86 square miles. The central portion of the Island is mountainous and is not inhabited by foxes.

Observations during the last fourteen years have led us to conclude that there is little likelihood of finding a breeding population of Aleutian Canada Geese on any of the islands where Blue Foxes have been introduced and still persist. This being true, we devoted our efforts to reaching Buldir Island, one of the few islands in the Aleutians on which foxes were not introduced. Vernon D. Berns, Assistant Refuge Manager, Aleutian Islands National Wildlife Refuge, and I arrived off Buldir Island aboard the U.S. Coast Guard Cutter *Winona* on 25th June, 1962. Landing conditions were excellent and the necessary supplies and equipment were quickly set ashore.

Buldir Island, the most isolated in the Aleutian Archipelago, lies at approximately 52° 22′ N and 175° 55′ E, 53 nautical miles from Kiska and 66 from Shemya. It is dome-shaped, about 3.8 miles from east to west and 2.4 miles from north to south. It has an area of 6.64 square miles; and reaches an elevation slightly over 2,000 feet. The shores, except for the one sandy beach at the mouth of a small valley near Northwest Point, are cliffs either rising from the water's edge or backing narrow rock and sand beaches. Avalanches

are a principal characteristic of these cliffs and beaches. A chain of bold rocks and high, conspicuous islets extends 1.2 miles northwestward from the Island. The vegetation is luxuriant, remarkably so for the Aleutians.

The wind and sea were calm when we arrived at Buldir, and the ground swell from the North Pacific Ocean was as moderate as it is reasonable to expect. Advantage was taken of these conditions to make a passage in the dory around the Island. The boat was kept as close to the beach as conditions would permit, the chief limiting factor being a dense growth of kelp (*Alaria*). It was while struggling to remove a mass of kelp from the propeller that I observed a large male Sea Otter. It is to us a familiar animal, but it was so unexpected at Buldir that we approached closer for verification. It has been fifty years or more since Sea Otters have been reported at this point in the Aleutians. Despite the fact that we were searching the sky for geese we saw three more otters, all female and each carrying a pup. Later, on the beach, we saw Sea Otter droppings.

Buldir is inhabited, in summer at least, by immense numbers of pelagic birds. In the avalanches, sites are offered for the birds that nest in burrows and here one sees a steady arrival and departure of puffins and auklets. One large avalanche on the north side of the Island is inhabited by a small colony of Least Auklets (25,000-30,000). In this vicinity, flocks of the diminutive Alcids were constantly in flight, wheeling like so many sandpipers. At East Cape a large, mixed colony of Black-legged Kittiwakes and murres (some of which at least, are Thick-billed Marres) occupies the nearly vertical cliff that rises from the water's edge to form the Cape. Glaucous-winged Gulls in large numbers nest over the whole of the Island, from the beaches to the summit, superimposed over all the nesting areas. There are evidently vast numbers of nesting petrels which we did not see, but heard at night when the incessant calling of diurnal birds subsided. We saw one pair of Bald Eagles, apparently nesting, several pairs of Peale's Falcons, and 40-50 Parasitic Jaegers. There were also " dicky " birds present in large numbers, notably the Aleutian race of the Gray-crowned Rosy Finch, the Giant Song Sparrow, the Lapland Longspur, and the beach-dwelling Winter Wren.

This does not pretend to be a complete list of the birds of Buldir. It is rather an attempt to convey the impression of land, sea, and sky alive with birds in all of their activities. Such a concentration of birds produces an immense volume of sound. Add to this the grunting and roaring of about 10,000 Steller's Sea Lions *Eumetopias jubata* and one has the bedlam of Buldir.

It was amid these prospects that we set out around the Island on a search for Aleutian Canada Geese. The first four appeared almost at once and when the circuit was completed 56 had been counted. They flew from the comparatively level ground that surmounts the cliffs, or from the face of cliffs where the slope is suitable for vegetative cover to survive. They seemed curious about the sound of the engine, for they tended to fly near the boat, though high. Many of these geese, launching as they did from heights above 1,000 feet, flew at elevations I had seen Canada Geese use only when in migration. One flock, at what must have been about 2,200 feet elevation, flew over the summit of the Island.

We noted the locations of the geese and on the following morning set out afoot for the nearest of these. Difficulty was encountered in travelling because of the rank vegetative growth. There were two reasons: (1) the necessity of

physically opposing the vegetation, which was waist high in some areas; and (2) such a dense ground cover concealed the presence of holes. While crossing the interior portion of the island no geese were observed although we saw a moulting Mallard drake, Pintail drake, and two Common Teal drakes on a small pothole, As we approached the rim of the cliff, however, four geese rose at close range from the heavy vegetation. We were virtually upon these birds before they flew, and the cheeping of goslings became evident around us at once. Seven goslings (just tiny chicks at that time) were caught and released after making sure of their identity.

In this vicinity we saw fourteen flying geese where six had been seen from the dory the day before. Not all of these geese showed the conspicuous ring at the base of the stocking.

As far as we are aware, there are only two small ponds or potholes on Buldir, both somewhat removed from the areas in which geese were observed. That the geese have been able to adapt to this habitat is probably due in large measure to the polar maritime climate, characterized by high humidity, fog, rain, and small diurnal and annual range in temperature. At Adak, according to figures provided by the U.S. Navy Weather Service, the average temperature from 1943 through 1961 was 43.9°, 48.3°, and 51.2°F. for June, July, and August, respectively. The extreme minima were 36.0°, 39.3°, 41.5°, and the extreme maxima 56.2°, 62.8°, 64.9°. The soil on Buldir is quite friable and in the area where the geese were present we observed no standing water even in small depressions. Atmospheric conditions were dry, by Aleutian standards, at the time of our visit to the goose area. This is to say that the sky was partly clear, the overcast had lifted well above the Island's summit, and no precipitation occurred for several hours. The Aleutian climate is not properly described as one of heavy precipitation; rather, one in which precipitation on a small to moderate scale occurs a large percentage of the time. For example, the U.S. Navy Weather Service at Adak recorded precipitation on 78 days in June, July, and August, 1962. The amounts ranged from a trace on 27 days to a maximum of 0.78 inches on 9th August, for a total of 10.40 inches. In sum, this climate promotes a vegetation that is very succulent, and in walking through it where we found goslings on Buldir Island our clothes became wet from water produced on the plants by guttation.

We did not find geese in the valley near Northwest Point, nor did Murie (1959); we found them only near the summit of the sea cliff. Neither did we observe geese flying from or alighting in the Island's interior, though they did fly over it. This suggests that the goose habitat is peripheral, but as we have not yet examined a large part of the Island's interior this will require verification.

Murie (1959) reviewed reports of Northern Fur Seals *Callorhinus ursinus* on Buldir and concluded that they had once been there. We did not observe them, but the beaches were so littered with marine mammals, mostly Steller's Sea Lions and a few Harbor Seals *Phoca vitulina,* that determining the status of the Fur Seal on Buldir will require a special effort. Not only the beaches of Buldir but those of the adjacent islets and the rocks will require methodical examination.

Both Coats (1951) and Murie (1959) refer to Steller's Sea Lion rookeries on the offshore islets of Northwest Point. We found them not only on all the offshore islets but on all the beaches of Buldir as well. They were so prevalent

on the landing beach that we were obliged to haul the dory high above the beach lest she be wrecked by their activities. A large bull that had selected for his resting area the strip of beach across which we were hauling the dory, was so intent on returning that we felt it prudent to keep a loaded rifle within reach. All of which indicates a major change in the Sea Lion population on Buldir.

No evidence of terrestrial mammals was found.

Coats (1951, p. 2) states " It (Buldir) appears never to have been inhabited by Aleuts ". Murie (1959) presents evidence to the contrary, and we observed the bones and shells of an old village site, bared by the sea near the northwest end of the bight where landings are made. This is in the mouth of the single valley on the Island, and the alluvium of the valley-floor had covered the site. Most kitchen middens in the Aleutians are revealed by the luxurious vegetative cover that flourishes in the enriched soil of the site, but in this case alluvium had covered the organic mass and filled the holes left by decayed dwellings.

Mindful of the decisive influence of the sea upon our departure from Buldir, we did not tarry. The desired information had been secured and for the moment it was enough. When on the third day the *Winona* hove in view we launched the dory in light surf and re-embarked.

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Brent Goose population studies 1961-62

P. J. K. Burton

Summary

COUNTS of the proportion of young in wintering flocks of Brent Geese were made in the British Isles, Denmark, Holland and France and showed that a bad breeding season for Dark-bellied Brent had coincided with an even worse one for Greenland-bred Pale-bellied birds wintering in Ireland. The result must have been a reduction in the total population of Brent and limited evidence suggests that this might have been of the order of about 9% for a large part of the Dark-bellied population. Observations made on the island of Terschelling suggest a differential movement of birds with families and those without.

Introduction

Counts made during the winter of 1961-62 show clearly that the summer of 1961 was a poor one for both Dark-bellied Brent *Branta b. bernicla* breeding

in Siberia and for Pale-bellied Brent *B. b. hrota* breeding in Greenland. The response to the appeal for observers was again gratifying, though no special effort to obtain complete coverage was made, as in the preceding winter. Details of the observations made are given; all of them refer to the Dark-bellied race except for those from Ireland and Northumberland. Grateful thanks are offered to the observers named below and to all those who helped either by submitting negative reports or by collecting information from other people.

England

Hampshire and Sussex. Age-group counts made by B. W. Renyard in Langstone and Chichester Harbours during the winter amounted to 553 birds, of which 55 (10%) were first-winter. The numbers recorded in Langstone Harbour were the highest for ten years; the maximum for the two harbours combined was 1370 on 4th February, 1962.

Essex. Early season counts made at Foulness gave warning that there were few young in the flocks, and counts were limited to sufficient from other areas to confirm this. The total sample was 748, of which 24 (3%) were first-winter birds. Numbers in the county were again high, though not reaching the heights of the previous winter. The maximum was reached in mid-December, 1961 when 9065 were found along the entire Essex coast, 6600 at Foulness and Wakering (R. V. A. Marshall).

Norfolk. The maximum recorded from Scolt was 600 (R. Chestney). Of 369 birds examined, 48 (13%) were first-winter. A count made by M. Smart on 28th February, 1962 at Hunstanton included 3 young out of 72 (4%).

Wash. Numbers on the Wash were the highest since wildfowl counts have been made. The maximum, however, seems to have been reached comparatively early, suggesting dispersal to other areas later. At least 5000 appear to have been present in mid-November, 1961, and 3000 were present in the Benington area until at least 7th January, 1962 (A. E. Vine).

Northumberland. About 500 were present off Holy Island during the latter half of the winter (F. Stabler). The birds wintering in this area are principally Pale-bellied birds, believed to be from the Spitsbergen breeding population.

Denmark

Jørgen Fog, Game Biology Station, Kalø, reports that the largest count at Jordsand was 4300 on 29th September, 1961. On 4th October there were over 5000 Brent at Jordsand and in other parts of West Jutland south of Blavundshuk. 20 Dark-bellied Brent and one light-bellied (the only one seen) were caught and ringed in autumn 1961.

Holland

On Terschelling, the maximum number recorded was 1800 in December, 1961. Large proportions of young were seen early in the winter, falling later. In November, 1961 53% young were counted with 1200 birds present: by January this had fallen to 29% with 1650 birds present (J. Tanis). Counts made in the Westerchelde and Zandkreek estuaries by T. Lebret totalled 512, of which 22 (4%) were young birds.

France

Detailed counts were made throughout the winter in Morbihan by the Abbé R. Bozec. The total count was 1243, of which only 55 were birds of the year (4.5%).

Ireland

The Pale-bellied Brent wintering in Ireland are considered to represent most, if not all, of the Greenland-breeding part of the population. Counts made by Major R. F. Ruttledge in Co. Dublin and Co. Wexford totalled 770, but only one of these was a first-year bird. D. B. Cabot and H. Boyd found 12 first-winter birds in 200 in Tralee Bay on 18th December, 1961, but none in 400 in Barrow Harbour (Co. Kerry) on the same day, nor any among 600 in Wexford Harbour on 21st December. This is evidence of a more serious breeding failure even than that of the Dark-bellied birds. A census of the Irish population on 25th-26th November, 1961 found just over 12,000 birds, almost the same as in November, 1960 (*Ninth Irish Bird Report*, 1961, p. 9).

Discussion

Although the considerable breeding success of 1960 must have increased the proportion of sexually-immature birds in adult plumage in the winter of 1961-62, the 1961 season must still be regarded as a very poor one and have resulted in a decrease in the numbers of Dark-bellied Brent. Some idea of the size of the decrease can be obtained by comparing counts in the various areas for which good figures are available for the winters of both 1960-61 and 1961-62. The total of Brent wintering in Essex, the Wash, Hampshire, Sussex, Norfolk, Zeeland and Terschelling shows a reduction on the previous winter of about 9%. This is consistent with the belief that the annual mortality of Brent averages about 17%, allowing for a proportion of first-winter birds which appears to have been about 7-8% in the wintering population of these areas considered as a whole.

Table I shows the first-winter percentages for Essex alone since the start of sampling in 1954.

Table I: Proportion of first-winter birds in sample counts of Dark-bellied Brent in Essex, 1954-55 to 1961-62.

Season	sample	No. of first-winter birds	Percentage first-winter
1954-55	776	314	40
1955-56	2020	522	26
1956-57	1484	97	7
1957-58	1810	955	53
1958-59	Hardly any young observed		
1959-60	1664	379	23
1960-61	3742	1683	45
1961-62	748	24	3

The observations made by J. Tanis on Terschelling during 1961-62 are of particular interest. The proportion of young seen was very much higher than elsewhere, especially early in the season. This strongly suggests a differential movement of adults with families and those without. It will be interesting to see whether this phenomenon will be repeated.

The Greenland-bred population wintering in Ireland has shown a similar pattern to the Dark-bellied birds in the last two winters, though it is not suggested that this is more than coincidence. However, data from Ireland will make possible a more thorough re-examination of the relationship of breeding ground meteorology to breeding success.

The numbers of wild geese in Great Britain

Hugh Boyd

Summary

About 125,000 wild geese have been counted in Scotland, England and Wales in 1960-62. The Pink-footed Goose is much the most numerous (about 53,000), followed by the Greylag (34,000), Dark-bellied Brent (14,400), Barnacle (12,400), European Whitefront (6,700) and Bean Goose (150-350). There are probably 3-4000 Greenland Whitefronts. There are also about 4000 feral Canada Geese and 2000 feral Greylags, so that in autumn about 135,000 free-flying geese can be seen. The Barnacles breeding in Spitsbergen and wintering on the Solway Firth have increased markedly since 1953. Greylags and Brent have also increased recently. The numbers of the others have changed little, despite marked local fluctuations.

Introduction

Increasing knowledge of the distribution of geese in the British Isles has made it possible to make inventories of most species in recent years. The purpose of this short paper is to provide a summary of the results obtained, without attempting to explain in detail how the figures were arrived at, or why the numbers have fluctuated in the ways observed. The methods of inventory have varied and are described separately under each species. In general, the aim has been to secure simultaneous observations of all the major flocks of any species at a time when it is likely to be at its most numerous in this country. Nearly two hundred people have helped in this task in the last five years and their essential contributions are gratefully acknowledged.

Bean Goose *Anser fabalis*

There are only three localities in Britain where Bean Geese now occur annually although stragglers and small flocks are reported from other widely-scattered places each year. As many of the irregular records are open to some doubt, because of uncertainty of identification, it seems safer as well as simpler to ignore them in arriving at estimates of the numbers visiting Britain. Table 1 records the highest numbers counted in each winter at the regular haunts in Norfolk, Kirkcudbright and Dunbartonshire, for varying periods since 1948. The Norfolk figures are due principally to R. H. Harrison, most of the Kirkcudbright counts have been made by A. Donald Watson, and those from Dunbarton by E. A. Maxwell. The largest numbers in all three areas are usually seen in January or February. There is no evidence of movement between these 'major' haunts and in most years the numbers at each stay close to the peak for several weeks, so that the sum of the three figures can be used as a minimal estimate for the 'British' winter population, with perhaps 20-50, or exceptionally 100 (in early 1961) elsewhere. It is not yet clear whether these birds come from a common breeding area, though the fact that the numbers in Norfolk and Kirkcudbright fluctuate fairly closely in parallel supports such a view. Nor is it clear whether the British visitors are part of the larger group visiting Holland (1500-3500 at peak in recent winters) or isolated from them. The regular visitors seem to belong to the race *fabalis*, although the vagrants include examples of *rossicus* and perhaps *johanseni*, a form intermediate between those two, individuals of which may not be identifiable.

Table I. Maximum numbers of Bean Geese seen in three regular haunts in England and Scotland, 1948-49 to 1962-63.

	Norfolk	Kirkcudbright	Dunbartonshire/ Stirling
1948-49	150		
1949-50	54		14
1950-51	120		
1951-52	0		
1952-53	75	200	
1953-54	0	200	
1954-55	0	240	
1955-56	101	215	
1956-57	54	152	25
1957-58	78	190	
1958-59	102	150	
1959-60	80	95	18
1960-61	30	68	12
1961-62	52	130	5
1962-63	47	147	17

Pink-footed Goose *Anser brachyrhynchus*

The first attempt at an inventory of this species was made in November, 1957. Other nearly complete checks have been made in November, 1960, 1961 and 1962. These have been obtained by counts or estimates of the geese at or near all the known roosts of this species which are in use in autumn. The reliability of the counts has varied considerably with place and occasion, due to differences in the abundance and behaviour of the geese, weather conditions and observer's skill. The culmative error is likely to be of the order of 15% in the four years when nearly complete inventories were obtained and 25-30% in 1958 and 1959 when simultaneous cover was not achieved. Thus the figures in Table II, varying from 47,000 to 58,000, suggest that the population has fluctuated very little in the six years 1957-62. Counts in earlier years were much less complete. Attempts to estimate the annual autumn population by capture-recapture methods (Boyd, 1956) are too unreliable for effective comparisons between individual years, but indicate that the average October population in the nine years 1950-58 was about 47,000. Thus there is some indication of a very recent increase in numbers. This seems to be associated with a relative increase in the number of Pinkfeet found in Scotland rather than in England in mid-November. (Later in the winter the distribution may be very different).

These figures relate to the population breeding in Iceland and Greenland and wintering in Great Britain.

Table II. Numbers of Pink-footed Geese in Scotland and England in mid-November, 1957 to 1962.

	Scotland	England	Sum
1957	31,180	18,520	49,700
1958	*28,300*	*20,000*	*48,300*
1959	*39,500*	*12,500*	*52,000*
1960	32,540	14,460	47,000
1961	42,830	12,850	55,680
1962	44,760	13,120	57,880

Italic figures include some interpolated numbers

White-fronted Goose *Anser albifrons*

Two subspecies of Whitefront winter regularly and in substantial numbers in Great Britain. The typical form *A. a. albifrons* occurs almost entirely in

southern England and Wales. Its status in this country in 1947-56 was reviewed by Boyd (1957). More recently the status of *albifrons* in north-west Europe has been discussed at length by Philippona and Mulder (1960,1962). Recording of the numbers of *albifrons* in England and Wales has been relatively poor, due to lack of observers at some haunts and to the difficulty of making satisfactory counts at others. The situation has been aggravated by a recent tendency for the largest numbers to be present for only a very short time, somewhere in the interval from the beginning of February to the second week in March. For these reasons the figures given in Table III are insufficiently precise to show whether there have been significant variations from year to year.

In 1956 it seemed as if the numbers visiting Britain (5-8,000) represented at least a quarter of the wintering population in north-western Europe. Intensive counting in the Netherlands in the last few years has shown that there are very many more Whitefronts than had been realised and that the British visitors are accordingly much less important than had seemed to be the case. Peak numbers occur in England and in the Netherlands at much the same time. The population in north-west Europe also includes about 5000 others in Belgium, France, Germany and possibly Poland: and it is not wholly

Table III. Estimates of maximum numbers of European White-fronted Geese in England and Wales, 1955-56 to 1961-62, compared with maximum counts in the Netherlands. Dutch data from Philippona and Mulder (1960, 1962). All maxima in February or early March.

Winter	England and Wales	Netherlands
1955-56	8,400	29,000
1956-57	5,900	15,600
1957-58	8,100	48,000
1958-59	6,900	42,000
1959-60	6,300	59,000
1960-61	6,000	65,000
1961-62	7,400	?

distinct from the population wintering in Hungary, Jugoslavia, Greece and Italy. One of the most striking facts about the distribution of this race which has been brought out by ringing in Holland and at Slimbridge is the importance of Mecklenberg, east Germany, as a Whitefront resort from November to January in recent years. Unfortunately no counts are known to have been made there and it is not clear whether any substantial numbers are liable to be found in Germany and Poland in late February, though it is rather unlikely that they should be. A rise in the number of Whitefronts staying in east Germany until January has run parallel to a decrease in west Germany and to the great increase in Holland in the late winter. There has not been any corresponding increase in the numbers reaching England.

The Greenland White-fronted Goose *A. albifrons flavirostris* winters regularly only in the British Isles, but it has not yet proved possible to carry out a thorough enumeration. The great majority (12,000 or so) winter in Ireland (Ruttledge & Hall Watt, 1958). Nearly half the Irish population is concentrated on the North and South Slobs near Wexford: the remainder are scattered very widely in places often difficult of access on the ground, and the dispersed habits of these geese make it impracticable to search for them from the air with a sufficient probability of detecting nearly all the birds present to justify the extensive and expensive surveys that would be necessary. Several

thousands occur in Scotland, principally in Argyll (especially on Islay) and other western counties. There is one regular haunt in Wales and small numbers occur annually in north-west England and erratically elsewhere. The combined total in Great Britain is of the order of 3-4000. The meagre records available do not suggest any obvious changes in abundance in recent years.

Greylag Goose *Anser anser*

There are 1-2000 native Greylags in the Outer Hebrides and the north and north-west mainland of Scotland and a rather larger number of feral geese in various parts of Scotland and England, particularly in Wigtown. These have not been counted at all precisely. Far larger numbers of Greylags occur in winter, when the whole Icelandic breeding stock moves to Scotland, England and to a much smaller extent to Ireland and Wales. The first attempts at inventories of the immigrant population were made in 1957 and 1958 (Boyd, 1959). Annual counts, simultaneous with those of the Pinkfeet noted above, were made in November, 1960-62. The coverage of known haunts in these years was very nearly complete. For 1959 and 1952 to 1956 the records, though extensive, are far less complete. The estimate for these years included in Table IV are based on the method of paired comparisons. Using November, 1961 as the datum, counts from all roosts inspected in that month in both 1961 and the year in question have been summed to give an index of abundance in that year, this being converted to an estimate of total numbers by multiplying the index by 36,300, the count in 1961. As in the Pinkfeet results, the accuracy of the counts in 1960-62 is of the order of ± 15%. The estimates for earlier years are less reliable, in particular those for 1954, 1955 and 1959 which are subject to errors of up to 33%. It seems likely that the numbers in 1961 and 1962 were substantially above those in the preceding eight years.

Table IV. Numbers of Icelandic Greylag Geese in Scotland and England in November, 1952-62.

year	number	year	number
1952	*25,000*	1958	20,000
1953	*29,000*	1959	*20,000*
1954	*25,000*	1960	30,000
1955	*21,000*	1961	36,000
1956	*24,000*	1962	38,000
1957	21,000		

Figures in roman are based on simultaneous counts. Those in italic include estimates and interpolations.

Barnacle Goose *Branta leucopsis*

Barnacle Geese breed in east Greenland, Spitsbergen, Novaya Zemlya and Vaigach Island and winter in the British Isles, the Netherlands and Germany. From recoveries of ringed birds and comparisons of age-group ratios in different flocks, Boyd (1961) suggested that the geese from Greenland wintered in Ireland and the islands of western Scotland, those from Spitsbergen on the Solway Firth and those from the Siberian islands in Germany and Holland. Recent ringing and observations have greatly strengthened the evidence for this grouping (Marris and Ogilvie, 1961, Morzer Bruijns, 1961, Timmerman, 1962, Cabot, 1963, Norderhaug, 1963 and unpublished observations by Boyd).

The wide dispersal in winter of the Greenland stock on usually inaccessible Irish and Scottish islands means that the only practicable method of counting

these geese is from a low-flying aircraft. The first aerial survey, made in February, 1957, was confined to Scotland (Boyd and Radford, 1958). Surveys of the entire range have been made in late November and early December, 1959 (Boyd, 1961), March, 1961 and early April, 1962. The results are summarised in Table V. As was stated in the report on the 1959 census, there is a possibility that the given total for Scotland at that time was substantially too low, due to counting difficulties in the principal Scottish haunt. There is very close agreement between the totals in March, 1961 and April, 1962.

Table V. Numbers of Greenland Barnacle Geese in western Scotland and Ireland, 1959-62.

	western Scotland	Ireland	total
December, 1959	5,280	2,800	8,080
March, 1961	9,670	4,140	13,810
April, 1962	9,330	4,400	13,730

The Barnacle Geese from Spitsbergen concentrate in winter on what is now the Caerlaverock National Nature Reserve, Dumfries, though also visiting the Cumberland shores of the Solway Firth and south-east Kirkcudbright. The size of this stock has been well documented since the Reserve was declared in 1957, thanks very largely to E. L. Roberts, the Reserve Warden. The remarkable and gratifying increase from 1957 to 1961 (Table VI) has been temporarily checked, probably due to poor breeding success in two successive years. It is less easy to arrive at figures for the years before 1957, since at that time the geese were more often dispersed and using places where they were rarely counted. Thus the earlier estimates in Table VI must be treated with reserve. Even so, there can be little doubt of a major resurgence in the numbers of Barnacle Geese on the Solway Firth since 1953, this stock being now more numerous than for at least thirty years.

Table VI. Highest recorded numbers of Spitsbergen Barnacle Geese on the Solway Firth, 1946-63.

season	maximum	season	maximum
1946-47	400	1957-58	1,150
1949-50	700	1958-59	1,300
1950-51	420	1959-60	1,650
1951-52	600	1960-61	2,500
1952-53	720	1961-62	2,800
1953-54	1,000	1962-63	3,000
1954-55	1,500		
1955-56	500		
1956-57	1,000		

The totals prior to 1957 are less reliable than those in recent years; that for 1955-56 is especially uncertain.

It may be remarked that the number of Siberian Barnacle Geese seems to have increased even more spectacularly (Timmerman, 1962), the Dutch population reaching the record level of 23,500 in mid-December, 1962 (J. Philippona, *in litt.*).

Brent Goose *Branta bernicla*

All the regular haunts of large flocks of Brent Geese in Great Britain are now confined to the east and south coasts of England. Nearly all the wintering birds are of the dark-bellied race *Branta b. bernicla,* breeding in Arctic Russia

and Siberia. The English birds form a variable component of the total population of *bernicla* (about 24,000 in 1961-62) which also winters on the coasts of north-west Europe. Reasonably complete counts of the regular English haunts have been made since 1954. Table VII shows that the seasonal maxima have tended to increase, despite setbacks apparently due chiefly to poor breeding success in several years, as shown by the age-composition of the population, studied particularly by Burton (1962, 1963). Some of the increase is presumably due to a reduction in " shooting pressure " by the total legal protection given to Brent in Great Britain since 1955, although shooting still continues in Denmark, Germany and France.

Table VII. Maximum numbers of Dark-bellied Brent Geese found in England, 1954-55 to 1961-62, with proportions of first-winter birds in Essex.

Season	Maximum	% young	Season	Maximum	% young
1954-55	10,800	40	1958-59	12,200	0.4
1955-56	10,000	26	1959-60	8,300	23
1956-57	8,500	7	1960-61	14,800	45
1957-58	10,600	53	1961-62	13,900	3

Light-bellied Brent *B. b. hrota* do not at present visit Great Britain regularly or in any numbers. Small parties occur in several Welsh harbours and seem to be reappearing in Scotland, where this race was formerly abundant in several places. Flocks of several hundred appear erratically on Fenham Flats, Northumberland, for short periods from January to March and smaller numbers are seen at times on the north Norfolk coast and in the Wash. The Irish population of this race has been counted carefully in two recent winters (1960-61 and 1961-62) and found to comprise about 12,000 birds (*Irish Bird Reports* for 1960 and 1961).

Canada Goose *Branta canadensis*

The resident population of Canada Geese is entirely feral. A census in July, 1953 (Blurton Jones, 1956) put the total population between 2200 and 4000. Since that time the number has probably increased, though no thorough re-investigation has been made. Drastic artificial changes in distribution have been effected, primarily because some colonies had grown so large as to become a nuisance to agriculture. Surplus geese from several of these colonies have been released in many new localities, resulting in a number of new breeding groups (Ruxton, 1962).

General Remarks

The two points of greatest interest about the numbers of geese to be found in Great Britain are, first, the abundance of different species and races and, second, the rates of change at present affecting the various populations. In recent winters there have been about 125,000 wild geese in Great Britain, more than two-fifths of them Pinkfeet. Bean Geese are much the rarest of our annual visitors and it is perhaps surprising that they continue to occur at all, since in some years very few have been seen. The more plentiful species all seem to have remained remarkably constant in numbers on a national scale despite many changes in distribution and very many fluctuations in local abundance. The reliability of the counting methods available is too low to enable much to be confidently inferred from the relatively small apparent

changes in peak numbers from one year to the next. Nevertheless it is clear that none of the stocks of wild geese coming to Britain has diminished during the last five years. Brent Geese and Barnacle Geese on the mainland of Scotland (in practice, the Spitsbergen stock) have been afforded full legal protection since 1955 and both have increased. So too have the Greylag and, less certainly, the Pinkfoot and Greenland Barnacle, which remain open to shooting. It remains to be seen whether the exceptionally hard winter of early 1963, which led to unusual dispersion of several species, has resulted in casualties heavy enough to alter the encouraging situation prevailing in 1962.

Table VIII. Abundance of wild geese in Great Britain, 1960-62

	mean peak number		% of total
Bean	170		0.001
Pink-footed	53,500		*43*
White-fronted from Siberia 6,700	10,200	*5*	8
from Greenland 3,500		*3*	
Greylag	34,000		*27*
Barnacle from Greenland 9,500	12,400	*8*	*10*
from Spitsbergen 2,900 ..		*2*	
Brent from Siberia	14,400		*12*
Total	about 125,000		

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Goose observations from Scoresby Land, 1962

A. B. Hall

Introduction

THROUGHOUT the two months which the Oxford University East Greenland Expedition spent in the field, data on Barnacle Geese *Branta leucopsis* and Pink-footed Geese *Anser brachyrhynchus* were collected. The majority of the observations were from the Syd Kap area of southern Scoresby Land (71° 21′ N., 24° 51′ W.) as it was here that the expedition was based from 26th July until 5th September, 1962. Geese were also recorded on the north coast of Scoresby Land (72° 15′ N., 23° 50′ W.), near Mesters Vig, and near Revdal in the Schuchert valley. In September, Pink-footed Geese were observed migrating down Hurry Fjord across the mouth of Scoresbysund. These observations extend and supplement the findings of the goose-ringing expedition in Jameson Land in 1961 (Marris and Ogilvie, 1962). Details of birds other than geese seen in 1962 are not given here but can be found in a report by Hall (unpublished). I would like to acknowledge the assistance of other members of the Expedition who collected information on geese.

Distribution

Northern Scoresby Land

Labben peninsula near the Mesters Vig airstrip. On 18th July, geese of both species were seen accompanied by young: Barnacle Geese—10 adults with 15 goslings; Pink-footed Geese—6 adults with 3 goslings.

The staff at the Danish radio station reported that geese had nested and produced ' many geeslings ' in the ' canyon ' which is the river valley between the airstrip and lead mine. A visit up the lower reaches of this river revealed nothing, but by this time of year—mid July—it was perhaps too late to expect geese to be in their nesting area. The geese seen were all near the sea.

Schuchert Flod

On its way from Mesters Vig to Syd Kap the expedition walked down the west side of the wide Schuchert Flod. South of the Bjørnbos river was an extensive area between the main river and the vertical limestone cliffs of the Karstrygge where there was a chain of ponds. On at least two of these Barnacle Geese were seen at a distance; perhaps 20 on each. Near Revdal, by the mountain wall, a camp was pitched on 25th July, by a pond where there were 26 Barnacles with 9 goslings. By the following morning there were only 18 adults present.

Southern Scoresby Land

Konglomeratelv, Nordost Bugt. It was soon obvious that the place chosen by the expedition for its main base was a good goose area. The parachutes had been neatly dropped on the west side of Konglomeratelv near a series of fine ponds. These were midway between the estuary of the river at Nordost Bugt, where there were several acres of merse, and a large lake—one of two—the Holger Danskes Briller. The outlet of this lake widened into a shallow expanse of water with islands in it. Southwards were more ponds on an upland plateau, as well as round the coast towards Syd Kap. To the north was a low flat area with more small ponds.

The most accurate counts were made soon after the expedition arrived. These are summarised in Tables I and II. By the beginning of August, the flightless moult period was ending and the area was no longer undisturbed.

Table I. Geese seen south of Base Camp at Konglomeratelv, Nordost Bugt, 28th and 29th July 1962

	Adults	Pulli	Total
Barnacle Geese (all 28th July)			
Parachute Ponds (North)	28	26	54
Parachute Ponds (North)—flying ..	16	—	16
Parachute Ponds (South)	*c.*20	—	*c.*20
Konglomeratelv	*c.*50	—	*c.*50
Merse	19	16	35
Sea	65	—	65
Estuary	35	—	35
Total	*c.*233	42	*c.*275
Pink-footed Geese			
Parachute Ponds (South) 28th July ..	*c.*136	—	*c.*136
Sea, 28th July	14	—	14
Total, 28th July	*c.*150	0	*c.*150
Parachute Ponds (South), 29th July ..	162	0	162

Table II. Geese seen north of Base Camp, 30th July 1962.

	Adults	Pulli	Total
Barnacle Geese			
Holger Danskes Briller	2	3	5
Pink-footed Geese			
Loon Lake	*c.*175	—	*c.*175
Holger Danskes Briller	25	—	25
	*c.*200	0	*c.*200

Breeding

As in Britain, the spring of 1962 came late in East Greenland, with 40% snow cover remaining in early July at Mesters Vig. Both Barnacle and Pink-footed Geese had, however, nested here and reared young, and as already mentioned, parties of each species were observed on 18th July. Mesters Vig was the only place where young Pinkfeet were seen by the expedition, although adults were numerous further south.

Barnacle goslings were seen before the end of July in three areas: Northern Scoresby Land 15; Schuchert Flod 9; Southern Scoresby Land 45; 69 in all.

On three occasions it was possible to count the number of goslings in each family of Barnacle Geese:

	number of broods of				total
	1	2	3	4	young
18th July ..		1	3	1	15
28th July ..	2	2	2	1	16
30th July ..			1		3
total	2	3	6	2	34

mean brood size 2.6

Predators

The shells of four Barnacle Goose eggs were collected. Three were found near Konglomeratelv and one in Gurreholmsdal. These are thought to have

been robbed by Long-tailed Skuas (*Stercorarius longicaudus*).

Cases of 16 bore cartridges, probably dating from the time when Syd Kap was occupied in the summer by Eskimos from Scoresbysund, were picked up by some of the ponds in the Konglomeratelv valley.

Moulting

The largest lakes in the Konglomeratelv area—Holger Danskes Briller—held the fewest geese. Their rocky shores, which rose steeply to the scree and crags of the surrounding mountains, left little room for vegetation, so that there was a shortage of feed for geese during the flightless moult period. Two other lakes—Loon Lake[1] and one of the Parachute ponds[1]—were large enough and provided easy access to adequate grazing for substantial numbers of moulting geese. There were 150-200 non-breeding Pinkfeet on each of these. At the end of July most of the Pinkfeet could fly when pressed but still sought the safety of the water.

The non-breeding Barnacle Geese, which were in smaller flocks than the Pinkfeet, could also fly when disturbed. In a party of 35 seen on 28th July, which swam out to sea, all but six eventually took off.

Geese of both species were seen throughout August feeding by the small ponds or flying to or from the estuary. As the large flocks gradually moved away, it was impossible to add to the total population recorded, even when seen in different areas. Feathers and droppings were found by several of the upland ponds where flocks of Pinkfeet which could fly—15, 21 and 36—were seen in the middle of the month. The most westerly record was on 26th August, when three Pinkfeet flew down Nordvest Fjord over the camp by the mouth of the Uranus glacier river.

Migration

Both Pinkfeet and Barnacle Geese were still near Syd Kap at the beginning of September when the expedition was housed there. Between here and Konglomeratelv about 100 Pinkfeet and 30 Barnacles were reported on 3rd September. A Barnacle with a damaged wing spent 1st September near the house.

A quick visit was paid to the entrance of Hurry Fjord on 7th September. Here two skeins of about 37 and of 21 Pinkfeet were seen flying south down the east side of the Fjord, over Kap Hope and out across the ice-filled Sound towards Kap Brewster, which is due north of North-west Iceland.

Breeding success in 1961 and 1962

There was little overlap in the areas of observations in 1961 and 1962 apart from the region around Mesters Vig, the 1961 expedition operating to the north and east of that in 1962. It is, nevertheless, of some interest to compare the apparent breeding performance of Barnacle Geese and Pink-footed Geese in the two years. The data are shown in Table III.

Table III. Breeding success in Jameson Land and Scoresby Land in 1961 and 1962. 1961 data from Marris and Ogilvie (1962).

	Barnacle Goose			Pink-footed Goose		
	Adults	Pulli	% young	Adults	Pulli	% young
seen, 1961 ..	1640	144	8.1	1408	29	2.0
caught, 1961 ..	556	133	19.3	—	—	
seen, 1962 ..	235	45	16.1	360	0	0

[1]These are unofficial names.

In both years appreciable numbers of Barnacle goslings were seen. The disparity in the proportions seen and caught in 1961 results partly from the fact that adults without families were less easy to catch than those with goslings, because they completed their flightless period earlier, but is also a consequence of marked differences in the composition of flocks in different areas. Thus it is not possible to say from these observations that Barnacle breeding success was better or worse in 1962 than it had been in 1961. In this connection it is relevant to note some observations by H. Boyd on Islay in autumn. Islay is the principal wintering place of Barnacle Geese breeding in Greenland (Boyd, 1961) and many marked in Jameson Land have been seen there. In November, 1961 the Islay population included 10.7% juveniles. In November, 1962 there were 7.6%, appreciably fewer. The mean November brood size in 1961 was 2.1 and in 1962 2.5—compared with 2.6 in July. These results suggest that in 1962 the Barnacle Geese of Scoresby Land were more successful than those in many other parts of East Greenland.

The scarcity of young Pinkfeet in both years seems to bear out the view that the Scoresby Land area is chiefly frequented by non-breeders, probably including " immigrants " from Iceland (Taylor, 1953).

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The ringing of Barnacle Geese in Spitsbergen, 1962

T. Larsen & M. Norderhaug

Summary

DURING the summer of 1962 an expedition consisting of seven students from Oslo University visited the Hornsund area of West Spitsbergen. Ringing and other ornithological field studies were undertaken. Due to unfavourable weather conditions in the area, 1962 was a poor breeding season, and can be described as a partial non-breeding year for the Anatidae and the Laridae. One of the projects accomplished, the trapping and ringing of Barnacle Geese, is fully discussed. Of the estimated population of 1100 Barnacles, 685 adult individuals were ringed during four days. This is the first large-scale marking of the species in West Spitsbergen. The terrain, trapping equipment and methods used are described in detail. Observations on the populations of Pinkfooted, Barnacle and Brent Geese in the Hornsund area are included.

Introduction

The Norwegian Ornithological Spitsbergen Expedition (N.O.S.E.) 1962 was organised by seven students from Oslo University and was the first Norwegian student expedition to arctic regions. It was made possible by the generous support of a number of institutions, chiefly the Norwegian Polar Institute and the Nansen Fund. The expedition was planned to function in three teams consisting of two students each, which would work separately, but combine when necessary. Two teams were to undertake field studies, the third was to film, and one man held in reserve to step in wherever extra help was needed. The teams were composed as follows:

Nils Gullestad	—	Magnar Norderhaug
Anne Larsen	—	Thor Larsen
Carl Jacob Frimann Clausen	—	Arve Helling (Film team)
Christofer Bang (reserve)		

One of the main projects was the ringing of several species of birds, including geese, auks and gulls. Colour-ringing and plumage-dyeing was also planned. Among other biological investigations were studies of the biology of the Little Auk *Plautus alle*, the nutrition of the Glaucous Gull *Larus hyperboreus* and the collection of parasites from various species. A study of the parasites on Char *Salvelinus alpinus* was also planned.

The first ringing of geese in West Spitsbergen took place in Gipsdalen during the summer of 1952 when an expedition from Sherborne School marked 42 well-developed goslings of Pinkfooted Geese *Anser brachyrhynchus* and in 1954 a joint Sherborne/Cambridge expedition ringed 568 Pinkfeet, 74 Brent *Branta bernicla hrota* and 23 Barnacles *Branta leucopsis* (Goodhart, Webbe and Wright, 1955). This ringing was undertaken for Stavanger Museum, Norway. The results of these expeditions have been most interesting, with 172 recoveries so far (Holgersen, 1956, 1962).

One of N.O.S.E. 1962's projects was the continued ringing of Pinkfeet. The trapping methods were the same as those used previously on West Spitsbergen and Iceland (Scott/Fisher method). The rings were provided by the Norwegian State Game Research Institute and Stavanger Museum, with the addition of yellow colour-rings. A number of northern European countries were informed of the proposed ringing.

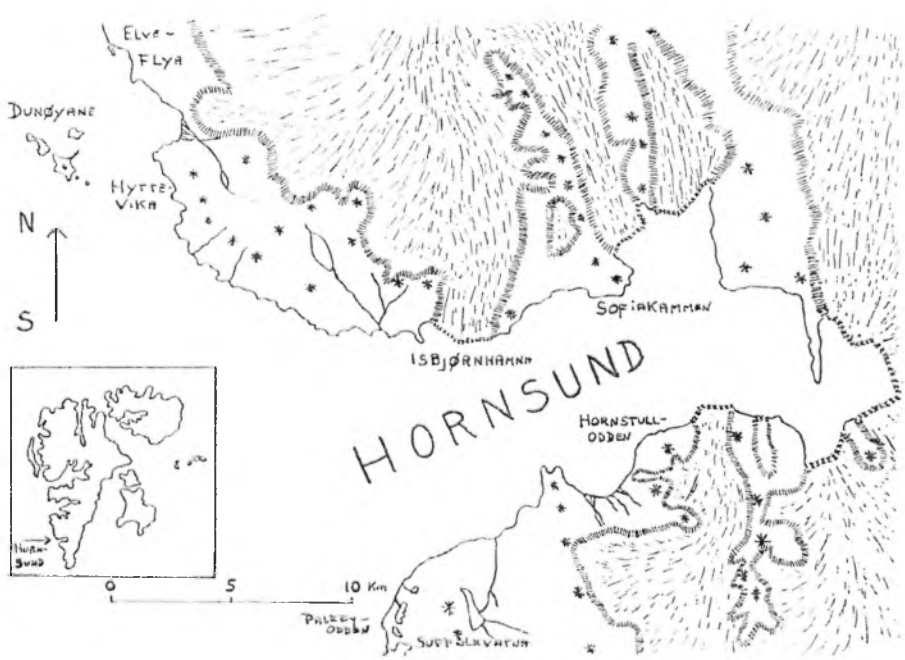
Conditions in Hornsund, 1962

The fjord Hornsund in West Spitsbergen was chosen as the working area on the recommendation of Dr. H. L. Lövenskiold who had worked there for some years (see Lövenskiold, 1954). The expedition travelled from Norway on the seal-catcher "Signalhorn", but because of unusually difficult ice-conditions landing was not effected at Hornsund until 11th July, at least a fortnight later than expected.

During the summer of 1962 ice conditions around the Spitsbergen coast were unusually severe. At times drift-ice lay in a tightly-packed belt up to 40 nautical miles offshore. Summer weather and the thaw came much later than usual and these factors undoubtedly played vital roles in the extensive non-breeding noted among the birds of Hornsund. This was most marked among the Anatidae and Laridae, few eggs were laid and of these even fewer hatched. In one colony of Arctic Terns *Sterna macrura* only five young were reared out of a total of 40 eggs laid.

Goose populations in Hornsund, 1962

From previous information it seemed that only the Pink-footed Goose had a population large enough to warrant ringing operations. However, the first week's reconnaissance gave different results. The following notes are based on observations made while the expedition was in the area "Northern region" which comprises the coast from Sofiakammen to Elveflya, including the Dunöyane islands. "Southern region" stretches from Hornstullodden to Rafenodden, 8 km. south of Pallfyodden (Figure 1).

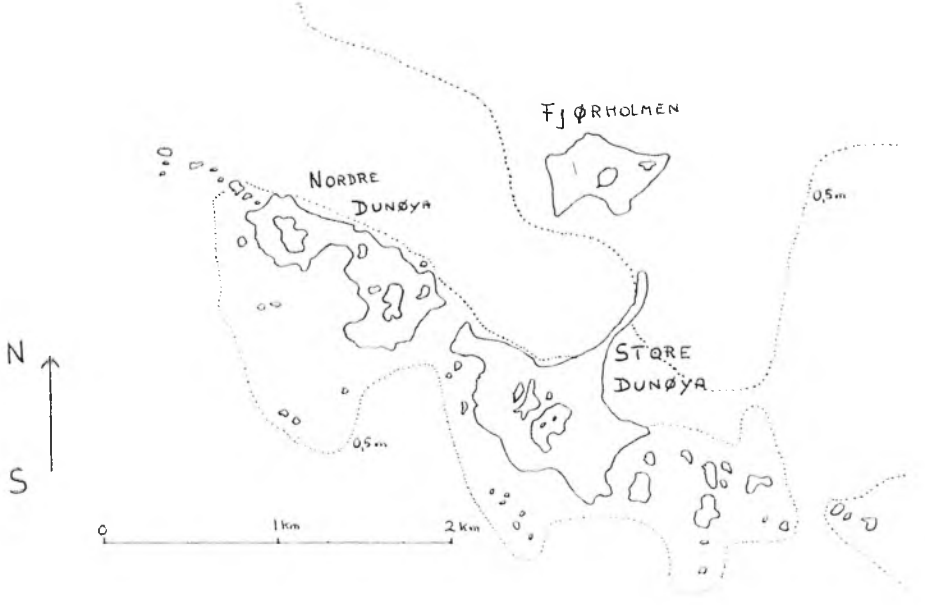


Pink-footed Goose: The population was smaller than expected and did not exceed 150 individuals (all adults) in the southern region, and about 100 (including young) in the northern region. Breeding appeared confined to the northern region where families with 3-4 goslings were often seen. The birds were very scattered and sizeable flocks were rare. The largest flock seen was on Suffolk-vatnet on 5th August and consisted of about 80 adults, of which half could fly.

Brent Goose: This species had previously bred on Dunöyane, but only small numbers, well scattered, were seen in 1962. 8-10 birds were found moulting on Dunöyane and a flock of 31 was recorded at Rafenodden on 9th August. The total population in the area was probably under 50 individuals. Breeding was not proved and is unlikely to have taken place.

Barnacle Goose: This species had also been known to breed in small numbers on Dunöyane, but in 1962 the population was surprisingly large. It was visually estimated at about 1100 individuals in the Hornsund area. Almost all the birds were found on Dunöyane and the straits between the islets, where moulting took place during the last half of July. Nearly the entire population was non-breeding and probably included Barnacles from large areas of West Spitsbergen. Only three pairs showed territorial behaviour and of these only one was observed with young. This pair had a territory on the mainland, near Kvartsittpynten, Hyttevika and a brood of three goslings.

It seems clear that 1962 was a partial non-breeding year for most of Hornsund's geese. Contrary to expectation the Pinkfeet were too scarce for any wide ringing operations and it became necessary to alter the trapping plans. It was decided to concentrate instead on the Barnacles, whose large numbers presented far more worth-while opportunities for ringing.



Trapping and ringing of Barnacle Geese

Dunöyane, where almost all the Barnacles had congregated to moult, lies three kilometres north-west of the mouth of Hornsund. The group consists of three main islands, Store Dunöya, Nordre Dunöya and Fjörholmen, and a number of rocks and skerries (Figure 2). The coastal waters are very shallow and difficult to navigate, and at times the islands were cut off by drift-ice. The main islands are all less than one square kilometre, they are low and grass-covered with small, shallow ponds. In the past, they were a well-known breeding locality for Spitsbergen Eiders *Somateria mollissima borealis,* but nest robbing has greatly reduced the population. In 1962, two Arctic Foxes were present on Fjörholmen; their effect on the non-breeding noted is uncertain.

The expedition paid its first visit to the islands on 17th July, and found flocks of about 300 and 70 Barnacles on the ponds on Store and Nordre Dunöy respectively. The geese were grazing on the grassy slopes and stayed on or near the pools. When startled they took refuge on the ponds, or retreated to the narrow channels between the islands where they were very effectively protected between the drift-ice and the coast.

All the materials for a trap of the Scott/Fisher type were brought from Norway and assembled at Hornsund after the first reconnaissance on 17th July. The trap was constructed of hemp " cod " netting (20 cm. mesh) and especially made T-shaped aluminium poles. Two walls were set up, 44 and 47 m. long and 90 cm. high, and were threaded with thin rope. The poles were tied to the walls about 3.5 m. apart. They were 125 cm. long and sharpened to a point for driving into the ground. One man could carry the walls on a back-frame, and as they were folded together from pole to pole (not rolled) he could pull them out to their full lengths in only a few seconds. This proved extremely effective. The trap was wedge-shaped, the inner part forming the collecting cage.

After the first drive (see below) the trap was improved by the addition of a separate collecting cage made of chicken wire (1″ mesh). It was one metre high and had a " gate " made of the same material. This cage could be placed inside the top of the wedge at varying distances according to the size of the catch. The cage and gate were also fastened to T-poles which could be pushed into the ground, while the cage itself was further strengthened by thin guy-ropes. Two men, each with a back frame, were needed to carry the new trap, which was relatively heavy. Luckily, it was seldom necessary to walk more than one or two kilometres to the trapping areas so the extra weight had little significance. The prepared trap could be set up by two men in 20-30 minutes and was very strong and effective.

Each member of the expedition was equipped with a walkie-talkie radio, but these proved too heavy and unreliable. On the other hand, the one or two small rubber dinghies, each manoeuvred by one man, were absolutely invaluable, and without them little or nothing could have been achieved.

After we had decided to concentrate our goose-ringing efforts on the moulting Barnacles on Dunöyane, we had to alter our trapping methods. Instead of the expected wide valleys and rolling plains we were forced to make our captures on low, flat islands of limited size, where the birds had to be driven off small ponds. The modified plans were as follows: having chosen one of the islands as a catching area, extreme caution had to be the rule when landing. We had to switch off the boat engine and row the last few hundred

yards. We found it paid to be as silent as possible as the geese were extremely wary and dashed off to sea at the slightest alarm. We planned to use walkie-talkies to keep contact with each other and to make sure that no-one showed themselves until everyone was at their stations surrounding the island. One man was to give the orders and the drive was to begin only at his agreed signal. The " beaters " were to show themselves simultaneously, driving the geese slowly on to the pond and holding them there quietly. While the others held the flock " in check " two men were to set up the trap with the walls leading down into the water. Finally, with the help of rubber dinghies and the men on shore, the birds were to be driven into the trap and the gate closed when they had entered the collecting cage. Each goose was released separately immediately after ringing. As we found no families with young on Dunöyane it was not necessary to release the whole flock together.

When we first visited Dunöyane on 17th July we landed on Store Dunöy where we found a flock of about 300 Barnacles on the largest pool. We did not disturb the birds, but returned to the boat and explored Fjörholmen and Nordre Dunöy. On the latter island another flock was discovered and we decided to encircle it to see if this could be done without causing panic. The trial was a success, the geese remained quietly on the water and by waving our arms and moving about on the banks we could drive them in any direction.

First drive. On 19th July our first drive took place on Nordre Dunöy. A flock of about 195 Barnacles were feeding on the grassy banks, but went on to the pond as soon as we appeared and they realised they were surrounded. During the next twenty minutes the trap was erected at the northern end of the pool, where the ground was soft and the poles could be driven in easily. When all was ready the drive began. We were directed by radio, and with one man in a rubber dinghy the geese were driven up to the net. All went well until they reached the bank when the first birds showed a definite reluctance to go ashore. However, the pressure soon became too great and they rushed up and into the collecting cage. At once it became only too obvious that the cage was not strong enough and several birds escaped. In addition, the mesh was too wide and many became entangled in the netting. Panic broke out and the rest of the flock turned to flee, but this was prevented by two of the beaters at the last moment. During this drive a relatively high proportion of geese escaped, about 89 individuals. We also had difficulties in extricating those birds which had become caught up in the netting. The same evening we made a new collecting cage of fine mesh chicken wire.

Second Drive. The next drive took place on 20th July on Store Dunöy. It was difficult to surround the flock because the island was both larger and more open than Nordre Dunöy. We had to be even more cautious in order not to startle the birds. This flock was also feeding on shore when the drive began, but went on to the pond when they saw us. A breakdown in the radio connections added to our difficulties; we only had contact during the last part of the drive. At one point the whole flock came ashore and almost escaped, but was driven back at the last moment. This time both rubber dinghies were needed owing to the size and shape of the pool. When the flock neared the bank, it split in two, and half the birds went up into the trap while the others remained on the water. Four men ringed the first batch while the others guarded the rest of the flock and later drove them into the trap for ringing.

During this drive we discovered that there was less chance of panic among

the geese if we kept a certain distance from them and did not go too near the edge of the pond. As long as we kept about 100 metres away, the flock showed no signs of going ashore. If this distance was reduced the birds became restless and panic resulted.

Third Drive. On 23rd July the third drive took place on Fjörholmen without difficulties of any kind. The pool there was so small that only one dinghy was needed.

It was striking that even at the second drive on Store Dunöy we had a retrap percentage of about 5.4%; on Fjörholmen this rose to 16.1%. The geese which had been ringed earlier seemed to show a steadily growing reluctance to being driven, with the result that the flock as a whole became more awkward to move ashore. When the flock ran into the collecting cage we noticed that the ringed birds hung behind the others.

Fourth Drive. The final drive took place on Nordre Dunöy on 24th July, with no complications. The retrap percentage was considerable, about 39%.

The rings used on the Barnacle Geese were issued by the Norwegian State Game Research Institute and by Stavanger Museum, Norway. The yellow plastic colour-rings planned for use on Pinkfeet could not be used on the Barnacles a) because colour-ringing was not announced for this species and b) it might collide with previous colour-ringing schemes. We estimated the population of Barnacles in the Dunöyane area at about 1100 individuals in the summer of 1962. This figure was reached by direct counting of the moulting flocks.

The number of adult geese ringed per drive is shown below:

	newly ringed	retrapped	total catch
Nordre Dunöy, 19th ..	106	0	195*
Store Dunöy, 20th ..	244	14	258
Fjörholmen, 23rd ..	172	33	205
Nordre Dunöy, 24th ..	163	98	261
total	685	145	919

*89 escaped.

No geese were seriously wounded or killed during the trapping operations. During the first drive a few of the birds which had become entangled in the netting suffered superficial flesh wounds. After this, with the new collecting cage of finer netting, no birds were injured.

The ringed Barnacles were not sexed, weighed or measured. In this connection we would like to stress that goose-ringing was not the expedition's sole project. It was only part of the ringing undertaken, beside a number of other biological investigations, and it was therefore impossible to handle all the material as thoroughly as we wished. Norderhaug (1963) has published an account of the other ornithological work done.

Acknowledgements

We would like to take this opportunity to thank all those institutions and persons who helped to make the expedition a reality. First and foremost we thank the Norwegian Polar Institute and its Director T. Gjelsvik, Hydrographer K.Z. Lundquist and cand. real. N. Heintz. Without their help we would have found it impossible to carry through the expedition. We are also grateful to the Nansen Fund and the Norwegian State Game Research

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Barnacle Geese in Ireland

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THE Irish population of Barnacle Geese *Branta leucopsis* is concentrated on islands off the coasts of Donegal, Sligo, Mayo, Galway and Clare. The total number of birds wintering in Ireland is between 4,000-4,500 (*Irish Bird Report,* 1961) and has remained relatively stable around this level since the survey covering the period 1946-56 which gave an estimate of 4,470-4,650 (Ruttledge & Hall Watt, 1958). The remainder of the Barnacles breeding in Greenland, some 12,000, winter on islands off the west coast of Scotland (Boyd, 1961).

By far the most important wintering area in Ireland is the Iniskea Islands, Co. Mayo, which holds over half the total Irish population (Cabot, 1962a). Here the geese are relatively undisturbed and are supported by grasses growing in the *Plantago* sward covering the islands which is characteristic of extremely exposed situations on the west coast of Ireland (Praeger, 1934). There is ample grazing provided by about 800 acres of sward. With the present population of 2,500 birds this allows three geese per acre. However, there is grazing competition from a wintering stock of cattle and sheep. In most winters there are about 30 head of cattle and 30 sheep on the islands. Rabbits are few and are not significant competitors. Geese have been visiting the islands in increasing numbers since the remaining islanders were evacuated by the Irish Government in 1932 following an unfortunate drowning disaster.

During 1961 and 1962 I visited these uninhabited islands to study the Barnacle Geese. In 1961 Michael Greer-Walker and I were resident on the islands from 19th March to 22nd April. The object of the visit was to count the geese, which had never been critically examined before. The Barnacle Goose population on the islands during this period was 2,300 $\pm$ 100 birds.

We were able to witness the departure of the bulk of the population towards the end of April. A few days before departure there was considerable restless flying around the islands and on the day of departure many of the geese had started to utter excited, higher pitched calls, somewhat resembling

the shriek of the White-fronted Goose *Anser albifrons*. A large flock of about 500 was seen leaving to the north, low over the water at 1600 hrs. on 18th April. The wind was south-east, force 2-3, with excellent visibility. The bulk of the geese departed two days later, on 20th April, with a south wind, force 3, excellent visibility.

The purpose of the 1962 expedition was to examine the geese for coloured neck bands and rings put on the geese in East Greenland by an expedition to Jameson Land in 1961 (Marris & Ogilvie, 1962). This expedition ringed a total of 450 adult and 119 juvenile Barnacle Geese in July and August. All the birds caught were given numbered aluminium rings, coloured plastic rings and P.V.C. neck bands of three different colours (31 birds were not given neck bands). The purpose of the neck bands was to aid field identification in winter haunts and to distinguish the different breeding stocks in Jameson Land. There had been one other Barnacle-ringing expedition to Greenland led by Dr. Marris in 1955, when 299 geese were ringed.

In 1962 I was resident on the islands from 10th to 18th March watching the geese more or less all day long. At this time the total population of geese was 2,500 birds. As many as possible of the birds were examined for coloured neckbands, rings, juveniles (1st winter birds), and family parties. Numerous samples were taken from all over the islands throughout the week. Some of the observations were overlapping, as the birds were continually moving around the islands.

a) *Coloured neck bands.* 273 yellow, 250 red, and 48 green neck bands were put on the geese in Greenland. Only yellow and red bands were seen on the islands. It was immediately obvious that many of the geese had lost their bands: birds wearing a spiral red ring on the right leg with a numbered aluminium on the left were seen on several occasions. In Greenland these had also been given green neck bands. At least six different yellow neck bands were seen and at least two red. There was no evidence to suggest that the neck bands were upsetting the geese in any way. Geese from the different ringing localities in Greenland (all quite close together) were evidently wintering together with free mixing and not remaining in discrete wintering areas.

b) *Ringed birds.* 34 samples including 4,821 birds were taken at different points on the islands during the week. The total number of ringed birds seen was 92, or 1.91%. One bird was wearing a much worn spiral orange ring on the left leg without an aluminium ring. This was probably a survivor of the geese marked by the 1955 Greenland expedition, which used rings of this type and colour.

c) *1st winter birds.* 1961 was a poor breeding season for Barnacle Geese in Jameson Land (Marris & Ogilvie, 1962). There were only 144 juveniles in 1650 (8.73%) geese examined in nine flocks in Greenland. Seven months later on Iniskea only 116 1st winter birds were found in 28 samples totalling 2125 geese (7.81%). This gives some indication of the relative mortality of young and old geese between the end of the breeding season in Greenland and almost the end of the wintering period in Ireland. Other samples from different localities in Ireland earlier in the winter gave higher proportions: 12.4% (14/133) at Lissadell, Co. Sligo, and 12.8% (6/47) on North Slob, Co. Wexford, but the numbers sampled were so small that the discrepancies are not necessarily important. On Islay in western Scotland (where the Barnacles are

also of Greenland stock) the proportion of 1st winter birds was 10.7% in early November 1961. This apparently poor breeding season in Greenland in 1961 was not paralleled in Spitsbergen or Siberia. There were 22.3% first-winter birds in flocks on the Solway Firth (Spitsbergen stock) and 25.5% in Holland (Siberian stock).

d) *Family parties.* Twelve different family parties were observed in which the brood size ranged from one to four young, with an average of 2.6.

Other observations on the geese. Most of the Barnacle Geese started to feed at the first light of dawn continuing throughout the day with little rest until dusk. Fast grazing flocks were composed of adults only while the family parties tended to stay together and grazed with less speed by themselves.

A Brent Goose *Branta b. hrota* was present on the islands grazing with the Barnacles all day long and was never seen in the water. A Pink-footed Goose *Anser brachyrhynchus* was also seen. This is a rare goose in the west of Ireland and this was the first certain record for Mayo. Both these vagrants were photographed in the course of filming the Barnacle Geese. The geese on the Iniskee Islands will be the subject of an intensive study conducted by myself over the next six years.

Acknowledgements

I would like to thank Lord Moyne for a generous grant towards the costs of the 1961 expedition and the Wildfowl Trust for making possible the 1962 expedition; also Michael Greer-Walker and Penny Cabot for help and encouragement. Hugh Boyd provided information on age-ratios in Scotland and Holland and made many helpful suggestions.

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Ringing Whooper Swans in Iceland, 1962

Leo Kinlen

Summary

A PARTY of four spent two weeks in the Arnavatnsheidi (65° 55′ N, 20° 25′ W), north of Eiríksjökull in western Iceland in August 1962 learning how to catch Whooper Swans for ringing during the period when the adults are flightless due to the moult. Most of the techniques tried failed, owing to the wariness of the swans, their speed in running and their reluctance to leave water in the presence of danger. By chasing or wading into lakes, equipped with swan hooks, we were able to ring and weigh 49 cygnets and 6 adults. Adult weights ranged from 7.4 to 10.3 kg., three breeding birds being heavier and longer-billed than three non-breeders. Cygnet weights ranged from 3.1 to 6.0 kg., average 5.0 kg. The difference in weight between lightest and heaviest members of a brood was greatest in large broods. Brood sizes varied from 1 to 6, averaging 2.8. Two ringed cygnets have so far been recovered: in Co. Down in December 1962 and in Stirling in January 1963. An area of 15 sq.miles held at least 40 pairs of Whoopers and 400 non-breeders.

Introduction

Eight years ago Dr. Finnur Gudmundsson pointed out in the course of a conversation how little was known about Whooper Swan *Cygnus cygnus* movements and suggested that an expedition devoted to swan ringing would be worthwhile. The capture of geese during the flightless period of their moult had already been given glamour by Peter Scott's vivid accounts of round-ups of Pink-footed Geese in Þjorsarver below Hosjökull. Furthermore, a precedent for a successful small scale project had been set by the work of a Sherborne School group in Spitsbergen. It was easy then to become enthusiastic and exciting to plan a similar expedition directed at flightless swans. The main question was whether a small but mobile party could catch a sufficient number of moulting swans to justify the time and effort which would certainly be involved.

Little is known about the origin of Whooper Swans wintering in Britain or about the movements of any of the known breeding populations. Only a single ringed bird had been recovered to indicate the source of our wintering Whoopers: a cygnet ringed in Iceland on 24th July 1944 and found dead at Grogary in South Uist in January 1948.

There were other noticeable gaps in our knowledge of this species. Why was it that swans wintered on the Northumberland coast while others remained on more sheltered lakes provided that these were not frozen? Perhaps this contrast in habitat reflected some difference (in age or stock?) between the two groups. Again, we accept that Bewick's Swans visit these islands from Siberia so it is not inconceivable that some of our Whoopers may also originate there.

In 1959 we made an attempt to trap some Whoopers at night on Grindon Lough. This was a complete failure and the memories of wading arm-pit deep in the darkness did not encourage us to continue that particular method.

The summer of 1962 seemed clear for an Icelandic visit. The place had already been decided by Dr. Finnur Gudmundsson's assertion that the Arnavatnsheidi, north of Eiríksjökull, held one of Iceland's largest concentrations of swans. The time must clearly be in late July or in August, the period in which flightless swans had mainly been reported. What was in doubt was exactly how the birds were to be caught. The goose-catching expedition of Scott, Fisher and Gudmundsson in 1951 (*Wildfowl Trust 5th Ann. Rep.* : 79-115, 1952) wing-tagged about twenty swans, but we were uncertain how much they were helped by having ponies. In the armchair security of our ignorance it seemed likely that a few men could cut off parties of grazing

swans from the water by sprinting down to the lake from some well chosen points. This then was provisionally to be our main plan of campaign. For family parties on small lakes rubber dinghies seemed indicated, though we took them in the face of Hugh Boyd's pessimism as to their value. We also made some swan hooks copied from those used in the upping ceremonies on the Thames.

Three of us — A. J. Clissold, D. T. M. Lloyd and myself — flew from Prestwick to Reykjavik on 2nd August, to be joined two days later by the fourth member of the group, I. T. Miller. Our departure for the Arnavatnsheidi was delayed four days owing to difficulty in hiring a suitable vehicle for the final stage of our journey. It was August Bank Holiday weekend, a time when most of Reykjavik leaves town for nearby resorts. Disappointing though this was, it was offset by the hospitality of Jón Sigurdsson who helped us in more ways than we could easily recount. Not only did he deal with the elaborate red-tape attached to retrieving our stores and equipment from the shipping company's warehouse, but found us accommodation, escorted us round Reykjavik and arranged the hire of a Land Rover. Finally he offered to accompany us out to our destination so that he could then return the borrowed vehicle.

We left Reykjavik for the Arnavatnsheidi on the morning of 7th August and in the evening we reached Kalmanstunga, the last farm on the edge of the Arnavatnsheidi, where we were able to collect more fuel for the Rover and, through Jón Sigurdsson, learn from the farmer Kristofer Olafsson the best route to Úlfsvatn, the large lake we had chosen as our base. This ran north-east roughly parallel with the Nordhlingafljot over ground that was so uneven and boulder-strewn that it took us five hours to reach Ulfsvatn only 15 miles away. From a gentle rise overlooking the lake we were able to see over 300 swans feeding in the half-light at one end of the lake. It was impossible to take our vehicle any further and at this point we set up our base camp. We had not expected such large numbers and as we set Jón Sigurdsson on his way back to Reyjavik with the Land Rover, there were signs that the proverb about chicken counting was capable of a certain twist!

Arnavatnsheidi

In the fortnight which followed our arrival in the Arnavatnsheidi we covered an area lying mainly within two lines which might be drawn running from the Nordhlingafljot due south of our camp, diverging to include Ulfsvatn and beyond it a sector of the extensive lake-filled tract lying to the north. To the south and dominating the whole region was an outlier from the much larger Langjökull glacier, Eiríksjökull. This ice-cap surmounted a mountain which rose steeply from a basal laval plain, its sugar-icing like top contrasting sharply with its near black walls. The lava field, the Hallmundarhraun, extended up to the Nordhlingafljót which flowed south-west carrying melt-water from some of the northern tongues of Langjökull. This river separated the lava from the greener terrain of the Arnavatnsheidi with its countless lakes. Among these Ulfsvatn was the largest being over 4 km. long, though Arnavatn Stóra to the east was probably nearly as big. Surrounding Ulfsvatn but particularly to its north were innumerable smaller lakes separated by gently undulating ground. Barren stone-covered rises sloped down to stretches of more varied vegetation round the lakes where sodden sedge and cotton grass patches made walking rather tedious. Nearly all of the region lay over 1400 ft.

Birds of the area

The most widely distributed bird in the area was probably the Golden Plover. There were Dunlin near some of the lakes and odd pairs of Whimbrel, but only a few Redshank and Purple Sandpiper were seen. A flock of over forty Red-necked Phalaropes were seen on several occasions feeding on a moderate sized lake, displaying their customary tameness.

The deeper lakes supported Scaup, Long-tailed Duck and Red-breasted Merganser while in some of the marshes there were a few Mallard and Teal. Both Great Northern and Red-throated Divers were common and among our best recollections will always be their calls in the fading light. On the only river of any size, the Nordhlingafljót, we saw a family of Harlequins. A few small flocks of Greylag Geese were seen in flight, but Ptarmigan and Raven were seen rather more regularly. Meadow Pipits were common and several flocks of Snow Buntings were noted but not many Wheatears. Among the predators, Gyrfalcons and Merlins passed over several times, though less regularly than Arctic Skuas. On 8th August we watched a spectacular chase of a Meadow Pipit by two Arctic Skuas working together in which they spiralled almost out of sight.

Catching methods

The night after our arrival Ian Miller and I set off to put into operation our 'Method Number 1' for swan catching, involving the 'heading off' of grazing birds from the water's edge. Under cover of the two hours of darkness, we erected a tent in a sheltered spot near the place where we had seen a good number of swans feeding early the day before. Hundreds of large white feathers lay on the ground round about, together with clusters of the bulky swan droppings. Initially all seemed to be well and swans could be heard calling from the water nearby, but they never came ashore and we had our first premonition that the Whoopers were perhaps more cautious than we had thought. This was the first of many attempts to intercept grazing swans from the water—and most of them were equally futile. With the country so open, the birds so wary and the ground quite unsuited for running over, we quickly grew used to seeing the swans running down to the lake comfortably ahead of us! Even in our rather breathless and dispirited state at such times, it was always impressive to see a large flock on the move—their wings held up like sails and calling as they covered the marshy ground with surprising speed. In spite of the fact that there were over 400 swans, all in adult plumage and apparently non-breeding, our repeated failures persuaded us to turn our efforts to family parties scattered on adjoining smaller lakes. Our plan here was for two men in dinghies to move across the water with the object of forcing the swans up on to the land at the far side, where the other two members of the party would be hidden and ready to capture them. The two men on the water were connected by a line to which balloons had been tied, producing a 'barrier effect'. Tony Clissold and David Lloyd manned the dinghies on our first trial of Catching Method No. 2, on a small lake occupied by two flightless adults. In the dinghies, which were of an ex-R.A.F. one-man type, it was quite impossible to overtake a swimming swan, but helped by the improvised barrier, they effectively moved the birds into one corner of the lake. Everything appeared to be going according to plan with the birds showing all the restiveness one would expect before actually leaving the water when suddenly both birds turned about, flapped over the flimsy barrier and gained the safety

of the middle of the lake. Further drives across the lake were made but without success and it was clear that, though swans regularly leave the water to feed, they are most reluctant, even when pressed, to do so in the presence of danger.

This failure came as a more acute disappointment than our more gradual realisation that our first method was largely ineffective. It was intriguing however that the impulse which directed them during the moult to what would normally be the safety of the water was still dominant even when the threat came from the water itself. This was not invariably true and later we saw several instances in which parties of Whoopers on our approach would desert a small lake for a nearby large one. The deciding factors seemed to be the size of the occupied lake and the proximity of any adjoining larger ones. In this case it was probably significant that there was no other lake in the immediate vicinity.

Following these failures our next move was to prospect on foot as much of the area as possible to assess the density of breeding swans and also to utilise any opportunities of catching swans that might present themselves. This brought early success with the unexpected encounter on clearing a rise of a pair of Whoopers followed by five cygnets in the act of moving from one lake to another. The adults were too fast for us but a sprint enabled us to breathlessly secure the five young. Elated at our good luck, we were still admiring them when a shout from one of the party attracted the rest of us to another family party on the move. An extra spurt of running was managed and shortly our number of captives had risen to eight! Hampered by our gum boots and marshy ground, we were unable to overtake the two parent birds which were just able to reach the water before us.

Initially our hands were more than full holding the eight cygnets and keeping the two families separate, but by tying their legs together and hooding them we were able to concentrate all our efforts on each in turn. It was interesting how quickly the cygnets settled down and in fact some of the hooded ones appeared to go to sleep with their bills resting on their mantles!

Ringing—with monel rings of Swedish make—was followed by weighing, dying and photography. Sheep-marking dye was applied as much to prevent the possibility of our chasing a previously ringed swan as to increase the chances of their being noticed in their winter quarters.

Thereafter more swans were run down, some after a sudden meeting and others after preliminary stalking, but with each the same procedure was undergone. In the case of the few adults we caught bill measurements and sexing (by vent eversion) were also carried out.

Later, with only about one week of our stay remaining, David Lloyd made what was to us a surprising discovery. After a particularly protracted chase over difficult country had ended in three cygnets reaching a small lake when almost within his grasp, he did more than expostulate and tripped and went in after them. It was then realised after several further trials that many of the lakes were in fact just over waist deep, allowing more birds to be caught by entering the water ourselves, equipped with long swan hooks. It was sometimes difficult to predict the depth of a lake and, though strongly suggestive, large size or the presence of a Great Northern Diver fishing did not invariably indicate that a given piece of water was too deep for wading. None of us however can recollect being able to cross a lake occupied by a Red-breasted Merganser.

Habits and behaviour

Mention has already been made of the flock of over 400 non-breeding birds on Úlfsvatn. Although they are seemingly well known to Icelandic ornithologists, there are few references in the literature to large flocks of swans in the breeding season. *The Handbook of British Birds* (1940) quotes Hantzsch as stating that non-breeding young birds remain in parties in summer. P. F. Holmes and D. B. Keith (*Ibis* 1936 : 322-30) are among the few to record in print a sizeable flock at this time of year, 124 having been seen by them on 31st July 1934 on Graenavatn, a small lake half a mile south of Myvatn. Just prior to our leaving Reykjavik we heard of a flock of about 200 on the coast near Eyrarbakki. According to Finnur Gudmundsson and Jón Sigurdsson this was not unusual. Clearly the literature is a little misleading on this question.

In spite of the wariness of the Ulfsvatn flock when grazing, it was not uncommon to see some birds feeding over 100 yards from the lakeside. Though it is possible that certain groups may have had regular feeding times, there was no time of day that we did not see some section of the flock ashore. Even in the fading light of 11 p.m. or at 4 a.m. we were able to make out their fat white shapes pulling at the sedge. A large part of the flock apparently moved overland to a smaller lake lying two miles to the west, where over 200 swans appeared just after the numbers on Ulfsvatn had fallen markedly.

With regard to the breeding birds we found that family parties would usually not be dislodged from a sizeable lake on which they tended to keep in a fairly close group. If surprised on the land or on a small pool, they would make for a larger lake, often setting off when we were still a long distance away. Frequently they would display a remarkable familiarity with the surrounding terrain by running in the right direction for a fairly distant piece of water even though there was no lake in view.

If a family party was being chased the adults seldom waited for the slower cygnets or showed any blatant defence of their young, though one might pause calling on a ridge before going out of sight. This was not always the case and the fact that the pen was caught on two occasions when its flightless mate escaped, no doubt reflects the greater reluctance of the female to desert the cygnets. Especially in the last week of our stay, we came across several pairs where one of the adults could fly once again and it was common for this bird to show an impressive concern by calling and flying round, sometimes close over our heads.

Once the young had been deserted, they tended to split up in confusion and if they could be intercepted before they reached a lake, it was often difficult for one man to deal with all. A. J. Clissold was more often in this position than the rest of us and undoubtedly deserves credit for his stamina.

Distinctive features of an adult swan on the run were the tall-necked appearance with the bill pointing slightly upwards (contrasting with the young which did not hold up their heads) and the tendency to hold out the wings from the body as if for balance. Though they were surprisingly quick on their feet, it was not rare for them to stumble.

Once caught, their behaviour was interesting. Both adults and young when first picked up would adopt a distinctive posture in which they would lie motionless with the neck hanging limply down. Presumably this was the ' death-feigning posture ' described by Scott, Fisher and Gudmundsson, though it was noticeable that the eyes were not closed and, particularly by the cygnets,

the posture was maintained for little more than a minute. The neck would then be raised and they would start looking round with apparent interest. If on first being caught they were placed on the ground, they would often extend the neck horizontally to its full length and lie motionless for a short while before apparently forgetting or ignoring the danger, and raising their necks once more to look about them. There was a striking variability in the temperament of the cygnets. Most were fairly placid but a few even after hooding would have blundered off if allowed.

Both Great Northern and Red-throated Divers, Scaup and Long-tailed Duck regularly shared the same lake as swans, but we never saw any sign of friction though on 18th August we watched two Whoopers being mobbed by a pair of Arctic Terns as they swam across what was presumably part of their territory. One might have thought that the frequency with which this must occur would permanently dull the terns' sense of intrusion. A similar instance was recorded by Scott, Fisher and Gudmundsson and nearer home on the Farne Islands I have seen Arctic Terns harassing Eider Ducks nesting in the middle of their colony.

Diving

Though it has been noted occasionally in the Mute Swan, diving by Whoopers does not seem have been recorded. On more than one occasion we saw well-grown cygnets diving and swimming under water in attempts to evade capture.

Moulting

On our arrival at Ulfsvatn on 7th August there was little doubt from their behaviour when approached that the majority of the 400 swans there were flightless. Judging from the vast numbers of long primary feathers which littered an extensive area around the lake, the moult had been in operation some little time. Even in the folded wing the effect of the moult could be seen at a moderate distance, but when extended the wings showed best the stumpy new primaries.

The first swan in flight was seen on 10th August. On 12th August we intercepted two adults from the large flock but a further three birds when cornered managed with a great effort to take off. After this we came across several breeding pairs in which one of the two birds could fly. The only occasion we were able to infer the sex of such a swan by sexing its still flightless mate, we found the latter to be a male. This is in agreement with the findings of Scott, Fisher and Gudmundsson, suggesting that female Whooper Swans moult before the males.

Variations, predation and tapeworm infestation

Only two abnormalities were encountered, both in the same bird, an adult pen which had blue-grey eyes and an apparently non-cystic protuberance on one toe. Scott, Fisher and Gudmundsson noted a similar variation in the irides of a female observed in Central Iceland on 24th July, 1951.

We saw no ectoparasites though a careful search was not made, but in every cygnet suitably examined we found tapeworm infestation.

We saw no evidence of predation, though it is possible that the Mink and Arctic Fox, which are common in the area, may on occasions be a threat to the eggs and newly hatched young. Swans are not popular with the farmers whose sheep graze over the region but we saw nothing to suggest that the

strict protection accorded to the species was ever infringed. Difficult as it was to believe, we were told of one pair of swans which had made headlines in the Icelandic Press by killing several sheep!

Weights

6 adults and 49 cygnets were ringed. The young varied in weight from 3.1 to 6.0 kg., with an average of 5.0 kg. The widest weight variation within any brood, of 1.1 kg., occurred in no less than five of the eleven broods of three or more cygnets, including both the broods of five and six which were ringed. Though the numbers are clearly too small upon which to base any definite deduction, they nevertheless suggest that the larger the brood the more likely there is to be a fairly large weight difference between the heaviest and lightest cygnets in a brood. This cannot be due to age or selective parental feeding, as the eggs are said to hatch at about the same time and the young are not dependent on food brought by the parents. It might possibly reflect a limited brooding capacity of the parent with a partial loss of hardiness by the less fortunate cygnets.

The six adults caught varied in weight from 7.4 to 10.3 kg. The three breeding birds were heavier (average 9.4 kg.) than the presumably younger non-breeding swans (average 7.9 kg.) and their bill measurements were also greater (averaging 99.3 mm. compared to 92 mm.).

Breeding density and brood size

No accurate estimate of the density of breeding pairs was made but in an area of 15 square miles north of Ulfsvatn there were approximately 40 pairs of Whoopers.

I am grateful to A. J. Clissold for the following details of brood sizes:

brood size	..	1	2	3	4	5	6
number seen	..	5	7	13	4	2	1

mean brood-size 2.81

All the cygnets seen were well-grown and the above counts may well be rather less than clutch-size or the number of eggs hatched.

Recoveries

Two of the cygnets we ringed have already been recovered. The first (028) ringed on 15th August east of Ulfsvatn was found dead, badly decomposed, beneath some high-tension cables near Downpatrick in County Down on 8th December, 1962. The other (002) was ringed north of Ulfsvatn on 11th August and found dead under electric cables on the Polmaise Estate, Stirlingshire in January 1963. The only previous Whooper recovered in Britain (in South Uist) had also been killed by flying into wires.

Conclusion

It is our conviction that the ringing of a much larger number of Whooper Swans would be possible by a larger expedition equipped with watercraft faster than our slow rubber dinghies. A flock could be directed into a pen erected in the shallows at one end of a lake and then ringed with a minimum of disturbance, in much the same way as flightless geese have been ringed. A more ambitious expedition on these lines is at present planned, provisionally for August 1963.

Acknowledgements

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Measurements of White-fronted Geese wintering at Slimbridge

J. V. Beer & H. Boyd

Summary

BETWEEN 1959 and 1963 181 White-fronted Geese caught alive or handled after death at Slimbridge in the months January to March were weighed and measured. As in other geese, males were found to be bigger than females. First-winter geese weighed less and had shorter wings than older geese, but were indistinguishable by length of bill, head or tarsus. In early March, 1959 the geese weighed were heavier than at any other time. Males and females were identified by examination of the gonads of dead birds and the cloaca of live ones: attempts to classify males and females on the basis of measurements alone did not give sufficiently reliable results. Weights and lengths are highly correlated. An investigation of the possibility of developing an index of "condition" utilising these correlations showed that for statistical reasons such an index would be too unreliable to be of much value.

Introduction

257 White-fronted Geese *Anser albifrons* caught for ringing at Slimbridge, Gloucestershire between February, 1958 and March, 1962 were weighed and many of them had several linear measurements made. These data from live birds have been supplemented by those from 55 geese shot in the vicinity and from 12 others picked up dead or dying. This investigation had four objects. First, to provide for *A. a. albifrons* morphometric data comparable with those available for Pink-footed Geese *A. brachyrhynchus* and Greylag Geese *A. anser* (Elder, 1955, Beer and Boyd, 1962). Second, to seek a reliable method of determining the sex of a White-fronted Goose from its external characteristics. Third, to investigate the relationships between body-weight and other measures of size, in order to establish criteria for the "condition" of an individual for use in pathological studies. Fourth, to look for differences in weight in the course of the winter and between one year and another.

The geese handled alive, after capture in rocket-propelled nets, were weighed and measured in the field. For weighing, each goose was wrapped in a sack and laid on a dial spring balance calibrated in 20 gm. intervals, periodically standardised against brass weights. The sack was check weighed at frequent intervals. The weight of the goose was determined by subtraction of the sack weight from the indicated weight, and recorded to the nearest 0.01 kg. Wing lengths were measured, to the nearest mm., on a metal scale with a stop at the zero end. Other linear measurements were made with a vernier caliper reading to 0.1 mm. The sex of live geese was determined by eversion of the cloaca to detect the presence or absence of a copulatory organ. Geese in their

first winter were identified by the presence of notched juvenile tail-feathers and of dark-shafted contour feathers on the breast and by the absence of heavy spotting on the breast.

Dead geese were examined, with less haste, in the laboratory. Measurements were made with the same equipment as in the field, though it was of course unnecessary to wrap the geese for weighing. The sex of dead birds was determined by examination of the gonads. Because of damage, it was often not possible to obtain the complete range of measurements from dead birds.

All linear measurements were made by the procedures described by Baldwin, Oberholser and Worley (1931): 'wing' being the chord of the closed wing, without flattening of the primaries; 'bill' being the length of the exposed culmen; 'head' being the length of a straight line from the extreme base of the culmen to the hindmost point of the head, on the occiput; 'tarsus' the distance from the mid-point of the joint beween the tibia and metatarsus behind to the middle of the articulation of the matatarsus with the base of the middle toe in front. 'Tarsus thickness', not defined by Baldwin *et al,* was determined by measuring the lateral width of the tarsus at its narrowest point; since this was intended to be an index of bone size, the calipers were applied firmly: both tarsi were measured and the mean value used.

Linear measurements

The results recorded in Table I show that in these Whitefronts, as in other geese, males tended to be larger than females in all the measured characteristics, though with extensive overlapping.

Table I. Measurements of White-fronted Geese handled at Slimbridge 1958-62. N = sample size; s.e. = standard error of mean; range = observed range; V = coefficient of variation = $\frac{100\sigma}{m}$. Measurements in mm.

	males					females				
	N	mean	s.e.	range	V	N	mean	s.e.	range	V
ADULTS										
wing	73	423.4	1.66	377 - 464	3.35	60	399.7	1.79	379 - 438	3.46
bill	74	47.1	0.32	42.8-53.2	5.90	64	44.9	0.33	40.0-50.5	5.79
head	50	57.4	0.30	53.3-62.6	3.65	33	54.1	0.40	49.9-58.9	4.23
tarsus	49	72.8	0.41	67.8-79.6	3.98	34	69.3	0.47	63.5-76.4	3.97
tarsus thickness .	47	6.8	0.05	6.1- 7.7	4.56	33	6.7	0.52	6.0- 7.1	4.50
1st WINTER										
wing	15	398.8	3.98	375 - 419	3.86	18	388.1	4.23	359 - 410	4.63
bill	15	47.1	0.71	40.2-52.1	6.30	18	44.4	0.73	40.2-49.5	6.98
head	7	57.7	0.68	54.9-59.5	3.12	9	55.1	0.70	52.5-59.7	3.80
tarsus	7	72.3	0.94	67.0-74.9	3.44	10	69.4	0.76	66.5-74.2	3.50
tarsus thickness .	7	6.9	0.07	6.6- 7.3	2.69	10	6.5	0.06	6.2- 6.8	2.75

There were no differences in size of bill, head and tarsus between first-winter and older birds of the same sex. This suggests that the growth of the skeletal elements involved must be virtually complete by the age of six months.

The wings of first-winter geese tended to be a little shorter than those of older birds: the averages for young males and females being about 6% and 3% less than the corresponding averages for older birds.

There were no clear differences in the dimensions of geese handled in different winters or at different times in the same winter: nor was this to be expected since, from recoveries of ringed birds, it is known that the geese visiting Slimbridge are drawn from a small breeding area and that a very high proportion of them return regularly to Slimbridge.

The relatively large standard errors associated with the means for first-winter birds seem to be simply a consequence of small sample size: the coefficients of variation for adults and first-winter birds are remarkably similar. It appears that the length of the bill is inherently more variable than the other measures taken, a fact of some taxonomic consequence.

Weights

Table II summarises the information on weights obtained in the years 1958-62. The coefficients of variations are higher than those of the linear measurements. The weights of adults seem to be more variable than those of geese in their first winter.

Table II. Weights (in kg.) of White-fronted Geese at Slimbridge, 1958-62

	number	mean	s.e. of mean	observed range	V
all years combined					
adult males	87	2.45	0.029	1.79-3.34	11.07
adult females	92	2.18	0.027	1.72-3.12	11.91
first-winter males ..	63	2.15	0.023	1.67-2.49	8.40
first-winter females ..	67	1.99	0.023	1.49-2.40	9.32

Most comparisons between sub-samples grouped according to date of weighing show no clear differences, often perhaps because the groups are small. The most marked divergence, other than the low weights of January, 1963 considered separately later, is that the average weights of adult males and females on 9th March, 1959 were 325 gm. (13.6%) and 280 gm. (13.2%) above the corresponding averages based on all other birds handled. Only three first-winter males and two females were taken at that time; these were also heavier than usual. It seems likely that this difference was due to unusually favourable feeding conditions in February and March that year, after a mild and wet winter.

Determination of sex from measurements

It is clear from Tables I and II that the overlap in size between males and females is so great that few birds could be sexed correctly using as a criterion any one of the measurements recorded. In such a situation an obvious remedy is to make use of multiple regression to obtain a "discriminant function" (Fisher, 1938, Mather, 1943), but calculation of a number of such functions, coupling together the values of the six available measurements in pairs or in threes, has failed to provide one of useful precision. In all the cases tried it seemed that at least 10% of the geese handled would have been classified incorrectly by means of the calculated functions.

An experienced observer can achieve better results than this by looking at the shape of the head and bill together: males seem to have larger and

deeper heads than females. The most promising approach in future work on this problem thus seems likely to be by concentration on measurements of the head, though it is not easy to find measurements that can be adequately standardised.

Weight and size

If a single linear measure of body-size has to be chosen, wing-length seems to be the most suitable: it and the length of the bill are those most widely used in taxonomy and the wing is evidently less intrinsically variable than the bill. Estimation of the relationships between weight and wing-length leads to the results shown in Table III. There is strong positive correlation between weight and wing-length in all four age and sex classes. The regression coefficient for adult females is significantly less than that for adult males. The first-winter samples do not show a parallel difference.

Table III. Statistics for correlation and regression of weight on wing-length for different age- and sex-classes of White-fronted Geese

	adult males	adult females	1st winter males	1st winter females
sample size, N	73	62	15	18
correlation coefficient, r ..	+0.57	+0.73	+0.68	+0.83
z	+0.65	+0.93	+0.83	+1.19
sz	0.120	0.130	0.289	0.258
regression coefficient, b ..	+1.21	+0.57	+0.99	+1.30
$sy.x$.	25.88	28.26	16.92	15.01
sb	0.219	0.068	0.298	0.211
t ($= b/sb$)	5.50	8.36	3.31	6.16

These relationships were studied in order to provide a basis for classifying the condition of individual geese. As Snedecor (1946) has emphasised, predicting the performance of individuals from a regression equation is a hazardous venture unless the standard deviation from regression ($Sy.x$) is unusually small, which is not so here. The scatter of the points for males and females was compared with the straight lines of the corresponding regression equations and with limits calculated from the standard deviation from regression for individuals. The latter are not straight lines, for the standard deviation is least at the mean value of the wing-length and weight and increases on either side of the mean. The theoretical limits ($\pm$ 1 standard deviation), within which about two-thirds of the population values should lie, are very wide. The scatter of the values actually obtained is relatively small. It seems to follow that an index of condition derived from the regression of weight on wing-length (or on any other of the lengths measured) will be too unreliable to be of much practical value except in extreme circumstances, such as those of the cold weather in January, 1963, when an index is scarcely necessary. It may be more helpful to measure condition more directly, for example by assessing the amount of subcutaneous fat and the thickness of the pectoral muscles, though standardised techniques for doing so have not yet been developed.

Comparisons with other material

No morphometric studies of large samples of *A. a. albifrons* have yet been made. Most text-books give only the ranges of measurements—usually from

samples of unspecified size. For comparative purposes these are almost valueless. The best available data seem to be those of Schiøler (1925) relating to Danish birds and of E. S. Ptushenko (in Dementiev and Gladkov, 1952) on Russian material. These are summarised in Table IV.

Table IV. Measurements of *Anser a. albifrons* in Denmark and the U.S.S.R. published by Schiøler (1925) and Ptushenko (in Dementiev and Gladkov, 1952)

	Denmark			U.S.S.R.		
wing (mm.)	number	mean	range	number	mean	range
males (ad.) ..	11	414.9	395 - 431			
(1st w.) ..	5	406	395 - 410			
males				31	421.4	385 - 455
females (ad.) ..	14	408.2	387 - 420			
(1st w.) .	4	382	369 - 401			
females ..				27	405.7	380 - 420
bill (mm.)						
males	16	46.3	43.0-50.5	36	48.2	39.8-56.5
females	18	44.9	39.0-51.0	30	48.8	39.8-51.5
tarsus (mm.)						
males	16	73.6	70 - 78	—		
females	18	70.7	65 - 76	—		
weight (kg.)						
males	—			15	2.67	2.40-3.20
females	—			10	2.43	2.00-3.00

Schiøler's samples agree with those of this study in showing the wings of geese in their first winter to be shorter than those of older birds. The limits of adult wing-lengths in the Danish material are less extreme than in the British sample, as would be expected from such a small number of birds. For the same reason, the fact that the difference between the mean wing-lengths of males and females is only 6.7 mm. in the Danish and 15.7 mm. in the Russian, against 23.7 mm. in the British geese is not likely to be important.

There are no valid differences between the measurements of the bill in the three groups. Salomonsen (1948) indicated a range of 43-50 mm. for Danish-taken birds, compared with 48-55 mm. for English, but without giving any reason for supposing that a significant difference exists between the groups.

Alpheraky (1905) and Ivanov (1951) give the range of tarsus length, of both sexes together, as 51-81 mm. and 50-81 mm., including specimens far shorter, and others rather longer, than any encountered in the fully-detailed Danish and English studies. Neither author indicates where the short-legged geese were found but both were chiefly concerned with Russian birds: perhaps there is a stock breeding in central Siberia and wintering in south-east Europe or in Asia which tends to be short-legged.

Schiøler only mentions the weights of three birds. The weights of *albifrons* in Russia given by Ptushenko tend to be rather higher than those of the birds caught at Slimbridge, though the largest weights he quotes are less than those of the largest geese found here. Witherby *et al* (1939) cite records by H. L. Popham of 21 British Whitefronts, not sexed and taken before 1903, with an average weight of 5 lb. 3 oz. (2.35 kg.) and a range of 4-6 lb. (1.81-2.70 kg.) and Fisher (1951) gives ranges of 4½-7½ lb. (2.04-3.40 kg.) for males and 4-6½ lb. (1.81-2.95 kg.) for females, presumably in Britain. The impression given by these figures is consistent with the views that geese handled in January-March are likely to weigh less than at other times of year and that the differences between Russian and British weights do not indicate any fundamental distinction between stocks.

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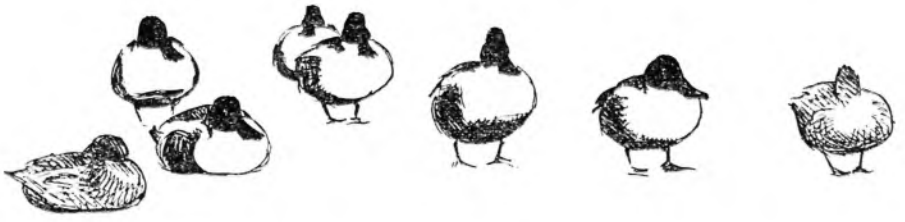

CORRECTIONS TO THE TEXT OF THE THIRTEENTH ANNUAL REPORT, FOR 1960-61

Page 44. Wildfowl Research and Conservation in Portugal. *Geoffrey M. Tait.* The inclusion of the Teal as a common breeding duck is an error. *Anas crecca* is not known to breed regularly in Portugal.

Page 94. Brent Goose population studies, 1960-61—*P. J. K. Burton.* The last line of p. 94 should be omitted, so that the sentence reads " Observations in Strangford Lough, near Dublin, in Wexford Harbour and at Dungarvan showed 435 young in 1087 geese (40%) with no significant variations from place to place."

Page 174. The pre-nuptial display of the Shoveler — *John Hori.* The quotation from Lorenz in paragraph three should read " a distinct turning of the back of the head to the female " instead of " . . . back of the head of the female."

Initial direction tendencies in the European Green-winged Teal

G. V. T. Matthews, J. A. Eygenraam and L. Hoffmann

Introduction

MALLARD *Anas platyrhynchos* have been shown to fly off predominantly between north and west whether captured in Illinois, U.S.A. (Bellrose, 1958) or in Gloucestershire, U.K. (Matthews, 1961). It therefore seemed possible that such a tendency might be species-specific. Although later work (Matthews, 1963) showed that this was not so since different Mallard populations in Europe had different direction tendencies, the investigation of other species was obviously desirable.

Bellrose (1963) has since provided data on three further species caught in Illinois. Several hundred Blue-winged Teal *Anas discors* showed a north-west tendency while smaller numbers of Pintail *Anas acuta* and Canada Geese *Branta canadensis* tended respectively to the west and to the south-south-west. The present paper reports on the orientation of European Green-winged Teal *Anas crecca crecca* wintering in western Europe, having bred in the Baltic countries and north-west Siberia.

Technique

The Teal were caught at three ringing stations, the first and last being duck-decoys, the other operating cage traps:—

Piaam, Netherlands	53.02 N. 05.25 E.
Tour du Valat, S. France	43.30 N. 04.40 E.
Peakirk, England	52.38 N. 00.17 E.

The Dutch and French releases were undertaken at times when catches were abundant, the English releases being continued throughout the season. Generally the birds were taken straight to the release-point after capture but it was found possible in England to 'store' Teal, when necessary, for a few days in avaries, as has been done with Mallard. The birds were released one at a time in good, sunny weather and followed through binoculars until lost from sight. The bearing of this vanishing point and the time taken to reach it was noted. To avoid bias by local topography more than one release point was used in each case, five from Piaam, two from Tour du Valat and four main ones from Peakirk. The Dutch release points were from 10 to 95 km. distant, between west and SSE; the French points were 15 km. east and 45 km. NNW; the English points were 10 to 30 km. distant between north and south-west.

Results

Piaam

In September, 1960 a total of 192 Teal were released. In the Netherlands it is difficult to find release sites away from water, on which the birds tend to land. As a result a large proportion of birds came down and others were lost flying low and within a minute of release. In all only 88 birds (46%) gave satisfactory vanishing points and their bearings are plotted in Figure 1. A strong WSW tendency is apparent.

Tour du Valat

In February, 1961 a total of 129 birds were released, giving a much higher (84%) proportion of useful bearings, largely, it would seem, because of less watery release sites. The 108 vanishing points are plotted in Figure 2. Again half of the birds were lost between west and south although the scatter was wider and the tendency more southerly than for the Dutch-caught birds.

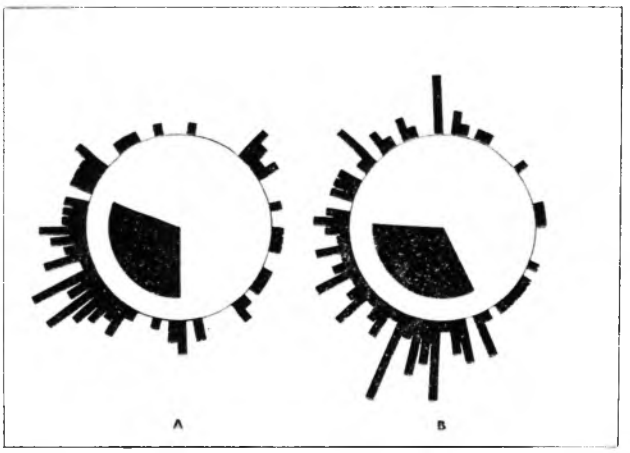

Figure 1. Bearings of the vanishing points of Teal caught at a) Piaam, Netherlands in September and b) Tour du Va'at, S. France in February.
The length of each ray is proportional to the number of birds lost to sight in that direction. The central fan represents the spread of the distribution, being the mean deviation about the median (A ± 56°, B ± 60°).

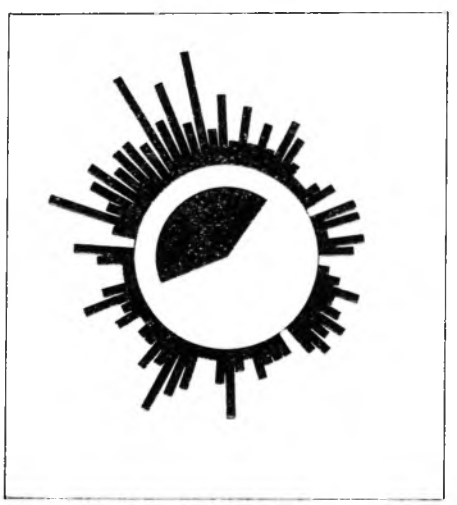

Figure 2. Bearings of the vanishing points of Teal caught at Peakirk, England, September-March.
Mean deviation ± 74°.

Peakirk

Releases were carried out from September to March in three seasons, 1960-61 to 1962-63. The birds totalled 337, of which 70% gave useful vanishing points, the 234 bearings plotted in Figure 3. Here the situation is very different from that in the two other countries. No one quadret is strongly favoured, though the proportion of bearings (39%) lying between north and west is significantly more than would be expected by chance.

Discussion

The distribution of release points was such that suggestions that the birds might be trying to fly 'home' (*i.e.* to the point of capture) can be dismissed.

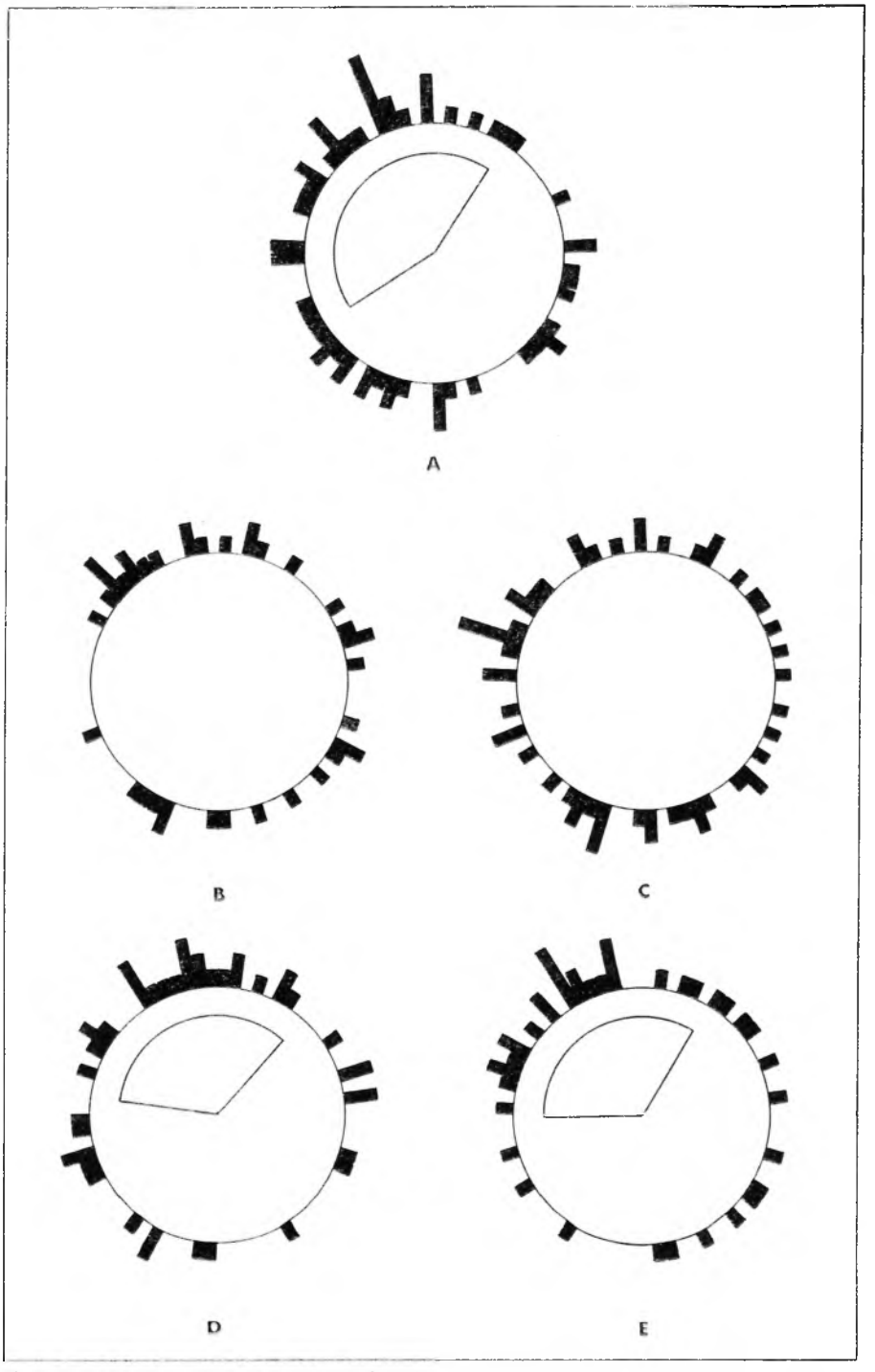

Figure 3. Bearings of the vanishing points of Peakirk Teal grouped according to month of capture.
A) September, m.d. ± 78°; B) October; C) November;
D) December, m.d. ± 62°; E) January-March, m.d. ± 61°.

Although the Dutch birds might have been proceeding in the general migratory direction for that time of year this was certainly not the case in the French releases; there, if anything, such a tendency would be the reverse of that shown. There were thus grounds for supposing that we were dealing with a " nonsense " orientation correlated with neither homing nor migration. The similarity of the Dutch and French results suggested that a SW tendency might be species-specific or at least common to Teal from quite a wide breeding area; for some of the French birds pass through the Netherlands while others move on a more direct line to and from the breeding grounds (Hoffmann, 1960). However the English results have made such a simple answer untenable as these birds derive from the same general area as those passing through the Netherlands.

On the precedent of the results obtained with Mallard caught at Peakirk (Matthews, 1963), an explanation based on different migratory sub-populations having different orientations would result in different scatters at different seasons. In the present case, however, there is no substantial local-bred population to give an orientation pattern which is seen to change as migrants arrive. The migratory sub-populations must themselves be sufficiently different in their time of arrival and/or length of stay for visible differences in the scatter patterns to emerge. Splitting the Peakirk results according to date of capture (Fig. 4) does not produce any very clear-cut differences. However the north-west tendency is strong in September (39%) and again in December (39%) becoming most marked after the turn of the year (51%). All three values are significant statistically. In both October and November, however, the scatters are essentially random. A likely interpretation of these changes is that an early wave of Teal with north-westerly tendencies arrives in eastern England and takes up residence. Teal with other direction tendencies then arrive but mostly pass on (*e.g.* to Ireland) and have not returned by the end of March. Such a picture is not inconsistent with what is known of Teal movements through England (Boyd & Ogilvie, in prep.).

It is unlikely that the situation will be clarified by further English releases, but it would be desirable to extend the season of releases in the Netherlands. The lack of marked directional trends in Peakirk Teal at the time when they can most plentifully be trapped means that they cannot be used to investigate the astronomical bases of orientation.

Acknowledgements

The Teal at Piaam were captured by H. W. Mutter and released by him, H. N. Kluyver, J. J. Smit and J.A.E.; at La Tour du Valat A. Galleron, R. Kunz, A. Mercer and P. Straw assisted with the captures and releases; at Peakirk W. A. Cook captured all the birds and made most of the releases. One of us (G.V.T.M.) holds a post financed by the Nature Conservancy (of Great Britain).

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Three-bird flights in the Mallard

John Hori

Summary

NESTING-PERIOD flights were investigated in an intensive study completed in 1962. In North Kent, three-bird flights performed during the nesting season are not territorial in the Mallard or the Shoveler. Experiments with a live bird and with models demonstrated the absence of territorial aggressiveness on the breeding grounds. Females were always the centre of attacks and in the Mallard paired males showed remarkable passivity which contrasted with vigorous defence of the female in the Shoveler. Two distinct levels of intensity were discovered in the three-bird flights which are considered to be a phase in the indiscriminate pursuit of females characteristic of *Anas* species: comparable behaviour in the Shoveler is described. Three-bird flights coincide with maximum activity in the gonad cycle and with the period of isolation of drakes. Behaviour of paired drakes during Mallard flights indicates a polygamous tendency. It is suggested that the flights are primarily sexual in origin, but that latent gregariousness is also a causal factor. The biological significance is obscure, but possible explanations are given.

Introduction

Widespread discussion of territorialism in Mallard *Anas platyrhynchos* has occurred, especially since Hochbaum postulated a territorial concept in 1944. Dzubin (1955) and Sowls (1955) demonstrated inconsistencies and later Hochbaum (1959) agreed that his interpretation had been too rigid. Conflicting opinions still exist, but it is now widely agreed that Mallard do not hold territory in the sense of a static defended area. During the breeding seasons of 1958 to 1961 inclusive I found no evidence of territorial behaviour in North Kent and in 1962 an attempt was made to discover the significance of what had previously been taken to be primary evidence for territorialism: the " defence flights " of Hochbaum and others, which had first been described as territorial defence by Geyr (1924).

Three-bird flights

Three-bird flights occur in spring at the beginning of the nesting period and have been described under various names. They are quite distinct from aerial courtship display parties which precede them, in which a number of drakes display to a single female, and from attempted rape flights which follow them. The latter are usually characterized by the fact that a number of drakes harass a lone female, attempting to force her down and rape her. (See also Dzubin, 1955 & 1957 and Lebret, 1961). Generally, the sight of a pair flying over nesting or feeding terrain at this season stimulates a loafing drake to rise and pursue them. After a chase of varying length, during which the pair usually move well away, the pursuing drake returns to the spot where it was loafing. These flights were generally called " defence flights ", but " Vertreiben " (Geyr, 1924) and " expulsion flights " (Lebret, 1961) have also been used to describe them. In America the expression " three-bird flights " has been used and this seems more satisfactory because it reflects the present state of knowlege without attempting to pre-judge the nature of the behaviour involved. In the descriptions and discussions which follow the latter terminology is used and the male which initiates the three-bird flight by rising from the ground at a flying pair is referred to as the pursuer.

As far as I can recollect I have never seen a lone drake Mallard attacked in circumstances suggesting territorial defence in fourteen years of visiting the North Kent marshes. Further, all nesting season flights seen from 1958 to 1961 inclusive, totalling approximately 200, were directed at female members of pairs or at lone females.

Most of my observations were made on the Isle of Sheppey, North Kent, which is bordered on its north side by the Thames estuary and divided from the mainland by the Swale channel. On the southern and eastern sides there are some 13,000 acres of fresh grazing marshes, similar in many respects to those at Delta, Manitoba (Hochbaum, personal communication). A few salt marshes of 100 acres or more adjoin the Swale shore and some 5,000 acres of upland arable border the grazing marshes. The wintering and breeding Mallard populations are, as far as I can ascertain, wholly wild and no appreciable farming or breeding of birds has taken place. There are no ornamental waters or similar artificial habitat.

Mallard flights

Because of prolonged cold weather, breeding was late in 1962 and my main observation period corresponded with commencement of first nests. A description of every flight seen in that season was recorded and the primary features of these are summarised in Tables I and II. As in previous years no

Table I: Location, intensity and numbers of three-bird flights of Mallard in north Kent, spring 1962.

Location	Flight(s) Against		Intensity of Flights		Date
	Paired ♀♀	Lone ♀♀	Low	High	
SB	70	—	—	70	10th - 29th April: one 13th May
SB	13	—	13	—	10th - 29th April
UB	2	—	2	—	20th April
G	23	—	—	23	9th April - 26th May
G	9	—	9	—	17th April - 13th May
SB	—	4	—	4	10th & 28th April
G	—	2	—	2	9th April
G	—	1	1	—	6th May
totals	117	7	25	99	

G = Fresh grazing marshes; UB = Upland breeding grounds; SB = Salting breeding grounds.

case of a lone drake being attacked was seen. Table I analyses the flights according to date and intensity, whilst Table II shows the reactions of the two or three individuals in the same flights. Behaviour patterns were

Table II: Mallard behaviour during flights

Intensity of flight		Paired ♀ harassed	Reaction of paired ♀	Reaction of paired ♂	Additional display by pursuing ♂
Low	High				
25	—	No	Slight evasive flight in 15	Nil	"Neck pressing" in flight in 7 cases.
—	74	Yes	Evasive flight	"Moved away"	Nil, except one case where it "hung neck", (see text)
—	8	Yes	Repulsion note	"Moved away"	Nil
—	3	Yes	Loud quacking	"Moved away"	Nil
—	5	Yes	Inciting during flight	"Moved away"	Nil
—	7	Lone ♀ harassed	Evasive flight in 6	—	Nil
—	1	Yes	Repulsion note	Remained at side of ♀	Nil
—	1	Yes	Evasive flight	"Moved away"	2 ♂♂ pursuing

observed, some of which have not previously been described. The most important patterns are:—

1. Three-bird flights occur at two levels of intensity. Lower intensity flights occur principally at the beginning of the period, when the pursuing drake merely flies near to the female or perhaps glides past her once or twice before planing back to his loafing spot. Occasionally the pursuer is seen to display during low intensity flights by pressing his head and neck back, usually whilst gliding. High intensity flights are in sharp contrast; here the pursuing drake harries a lone or paired female with extreme vigour, twisting and closely following her as though attempting to seize her tail. Table I shows that of 124 flights observed, 99 (almost 80%) involved high intensity pursuits. Once a pursuing drake was seen to hang its head and neck almost vertically, presenting a contorted appearance which had not previously been seen.
2. In every high intensity flight against a pair, the female was harassed without the paired drake attempting to defend her. On the contrary, the paired drake usually moved away, sometimes as much as forty yards, and allowed his female to be pursued. During the pursuit he trailed behind, flying leisurely. When the pursuing male "dropped away" the paired male rejoined his partner and flew close to her. This behaviour is summarised in Table II by the term "moved away" for the paired drake's reaction.
3. When pursued in a high intensity flight the female, whether paired or not, takes evasive flight which is often quite spectacular. Sometimes the paired female will "incite" (Lorenz, 1951), and not infrequently one hears a female using the "repulsion note" (*loc. cit.*). I was not always close enough to be certain whether inciting and repulsion notes occurred and some such may have gone unrecorded. When subjected to low intensity flights the paired female either fails to react, or takes only slight evasive action. Reactions seen are recorded in Table II.
4. In very few cases can three-bird flights be precisely associated with any particular area on the ground. This is discussed further in Appendix B.
5. In a number of cases lone drakes flew directly over loafing drakes without the latter exhibiting aggressiveness. However, pairs or lone females which flew over the same loafing males either immediately before or afterwards were pursued. A drake which was watched at close quarters for ninety minutes on 15th May, 1961 whilst waiting for its incubating mate at their feeding spot was seen to flatten and remain motionless when a strange drake flew low over him.

To supplement visual analysis of flights, attempts were made to determine the birds' reactions when areas which might have been their territories were entered or crossed by others of the same species. The behaviour of the pursuing drake before and after it took part in a three-bird flight was noted: case histories are given in Appendix A.

Shoveler flights

Shoveler *Anas clypeata* indulge in three-bird flights at the same phase in their annual cycle as Mallard and flights appear to originate in the same manner. There is however, a striking difference in the behaviour of the paired drakes in that the male Shoveler always defends its mate. Cursory observation might lead to the conclusion that the Shoveler holds territory, but many

incidents occur in which the bird that appears to be a territorial defender is found to be pursuing a paired female. Marauding males, which seem to be unmated, are more noticeable in Shoveler than Mallard at the beginning of the nesting period. They apparently result from the substantial excess of males which is found in the population on Sheppey at that time. Three case histories typical of Shoveler behaviour are given in Appendix C: these have been included to illustrate the behaviour of paired drakes.

Discussion

Females, whether with their mates or not, are always the centre of attacks during these flights. This suggests that three-bird flights are attacks of sexual rather than territorial origin. These flights occur at the beginning of the breeding season and correspond with building of nests and egg laying. They are thus coincident with the breaking up of flocks and the spacing of pairs over the breeding range. This does not necessarily preclude gregariousness and one section of the population studied showed some gregariousness of pairs throughout the laying period for a number of years; similar behaviour has been noted by Gollop (1954) and others. The significant point is that three-bird flights do not occur amongst the flocks, but are restricted to pairs and males which have split away from them.

I have witnessed only one case in which a male initiated a three-bird flight whilst his own female was with him. Often a female will scarcely have settled on her nest, after parting company with her mate, before the latter begins three-bird flights. Flights appear to be caused by males who for one reason or another are alone. Isolations may be temporary and of short duration, *e.g.* when a male is waiting for a laying female. Alternatively, they may be longer isolations in the incubation period, during which many of the drakes become semi-gregarious. Mallard drakes appear to have one of the shortest periods of isolation amongst *Anas* species. Johnsgard (1960) estimated that " 50% paired after December " and pairing does not necessarily involve leaving a flock. Consequently, when isolation occurs it may be for the first time in nine months or more. If a first nest is successful, at least as far as the incubation stage, it may then be as little as two or three weeks before the drake begins to seek the company of other males again, albeit for short periods only at that stage. The gregarious tendency must be strong and throughout the period under consideration the sight of flying birds remains a powerful stimulus to lone males. The strength of the stimulus is sufficient to cause numerous errors and I have seen Mallard drakes repeatedly take off after Shoveler and Wigeon *Anas penelope* females, only to turn back before reaching them. Similar behaviour has been recorded by Hochbaum (1944) and Lebret (1961). These considerations suggest that one factor in the motivation of three-bird flights is latent gregariousness in the pursuing male.

During low intensity three-bird flights the pursuing males display to females instead of attacking them. Comparison with the results reported by Johnsgard (1960) suggests that such flights may be a transitional phase between the pairing display and the three-bird flight periods. High intensity three-bird flights also appear to be a display form and no physical contact or apparent result has been witnessed. The manner in which the pursuing drakes end the encounter is in my opinion definitely symbolic. Weidmann (1956) stresses the importance of inciting in pair formation, but its (apparently ineffective) use during three-bird flights has yet to be elucidated. During these flights the

paired drake ignores his mate's constant inciting, but as soon as they land he responds to it.

Another unexplained phenomenon which coincides with commencement of three-bird flights is a period in which females, usually paired birds, quack loudly and frequently on the nesting grounds, particularly in the early morning. This has been called the " period of persistent quacking ". Quacking is a common feature of the winter flocks but is uncommon once egg laying commences. Following the " period of persistent quacking " it will not be heard again at all frequently until the moult is finished and birds re-assemble in autumn flocks. There is a clear advantage in breeding females remaining silent during the whole period of pursuit flights, since calling would attract males and might threaten breeding success. For this reason the burst of quacking is puzzling. It occurs at the beginning of the laying period and appears to emanate from birds which have not commenced laying. It should not be confused with the " decrescendo quacking " (Lorenz, 1951).

It is apparent that there is a high sexual element in the motivation of three-bird flights and I believe this to be the most important single factor. Males remain sterile until approximately mid-February and activity in the gonad cycle reaches a maximum about March or April in south-east England (Höhn, 1947). The coincidence with commencement of three-bird flights is striking. Increase in the testes weight after mid-February corresponds with increasing intensity of pursuits and with weakening of pair bonds. Drakes wander farther and farther from the original loafing spots and tend to associate with other drakes. In April 1962, when many clutches were nearly complete, drakes joined together in groups of three or four whilst waiting for their females during dawn nest visit periods. These parties would fly slowly about the salt marsh apparently looking for females; if one was seen or could be " put up " the group harassed her in concert. This further suggests that males are not attached to territories, but rather are held near to their females by the pair-bond. Similar behaviour was observed on upland nesting grounds during pre-incubation nest visits. Most upland nests are in wheat and barley fields, where loafing pools and waters are non-existent. In the early stages of laying, males remain in the fields quite close to the females (see Appendix B, Flight B), but later they adjourn to adjacent pasture where parties of waiting males feed and loaf together without friction. Observed behaviour and the comparatively early desertion of incubating females indicate that the pair-bond in Mallard is weak by comparison with other *Anas* species, *e.g.* Shoveler and Pintail *A. acuta*. As pair bonds weaken and finally break, a pattern of gradually increasing intensity can be discerned in the aerial pursuits of females. The beginnings of these pursuits are seen in pairing displays (Johnsgard, 1961) and subsequently they find expression in low intensity three-bird flights; the latter quickly develop into the high intensity pursuits. As more and more pairs break up, another type of flight develops in which groups of males chase any lone female and these lead eventually to rape flights and attempted rape flights. In all these flights the harrying of the female is similar in form but varies markedly in intensity from a simple display to the violence of a rape flight.

One of the most remarkable aspects of three-bird flights in Mallard is the passivity of the paired drakes. The latter deliberately move away from their partners during the flights, allowing the pursuing male " free access " to the female. Table II shows that in 82% of the high intensity flights,

corresponding to 73% of all flights, paired drakes deliberately " moved away ". These results are at variance with those of Lebret (1961), who says of the pursuing drake " In many such cases he is not only assaulting the female and a short clash of the two drakes may precede. After the drake of the assaulted pair has been driven away, the victor may turn to the female and chase her some distance, her mate following immediately." I have never seen anything resembling this in three-bird flights of Mallard in Kent. It is possible that since Lebret's birds were " very tame " and in part artificially fed, they may have been living at a density considerably greater than that found in wild populations. Out of several hundred Mallard flights in Saskatchewan Dzubin (1955) recorded only six which " showed friction between the drakes ". He also says (p. 291) " most of my observations of the territorial pursuits in the Mallard have been inconclusive since I could not follow many of the pursuits to completion ". In those cases where the paired drake did not " move away " in the present study, his role was nevertheless completely passive.

Dissimilarity between the paired drakes' behaviour in Mallard and Shoveler flights has already been noted. In the Shoveler the paired drake attacks the pursuer and attempts to force him away by constantly interposing himself between his mate and the pursuer or by actually buffeting the latter. The concept of " mated-female distance " (an area surrounding the female from which the drake excludes other males: Conder, 1949) certainly applies in Shoveler, but I am doubtful whether they hold territory in the sense of a defended area. The biological significance of the pursuers' actions is not apparent; possibly such behaviour could ensure that all females are " fast-paired " and stimulated to breeding condition. In the Shoveler the paired drakes' behaviour has an obvious survival value, but in Mallard the opposite appears to apply. I suggest that the paired drakes' reaction in these flights is a measure of the strength of the pair-bond. In Mallard the completely passive reaction suggests a polygamous tendency which is also suggested by the comparatively large number of ' trios ' which exist throughout the breeding season. Like Lebret (1961), I am unable to produce proof as yet, but I have had the strongest possible circumstantial evidence that in some of the trios with two females, both were laying.

It appears likely that three-bird flights are caused by simultaneous drives of sexual and gregarious origin in the drakes. At the beginning of the period, the former, which is dominant, is increasing and the latter decreasing in intensity. The maximum effect seems to occur just before drakes re-flock. Thereafter the sexual drive regresses as gregariousness increases and I agree with Lebret (1961) that the urge to harry females has largely died out when drakes congregate for the moult.

My conclusions on territory accord with those of Munro (1943) that " no behavior that might be interpreted as territory defence has been observed ". Some incidents might have been so interpreted if the whole sequence of events had not been clearly observed or the case history had not been known.

Acknowledgements

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Appendix A

Mallard case studies

Case A

A pair studied during their laying period in April 1962 was recognisable because of unusual " pricking " of the male's left wing. They visited the nest site every morning and stayed from approximately 04:00 hrs. to 08:30 hrs. (All times are G.M.T.) While the female was at the nest the male went to a small pool about 100 yards away. From the pool this drake initiated many three-bird flights and also pursued lone females ; always returning to the same spot and apparently holding territory at the pool. However, the following anomalies were discovered :—

(i) Only one of the pairs pursued looked as though they were going to pass over or near the loafing place or the nest site. All other birds pursued were well away from this vicinity and flying away from it. Frequently the pursuer would fly 80 yards or more to catch up with the bird attacked.

(ii) The nest was near the outer edge of the salt marsh and about 30 yards from the estuary shore. On five occasions three-bird flights took place wholly over the estuary and involved pursuits of three or four hundred yards over water. Once the pursuing drake landed on the water beside the pair 200 yards out in the estuary after a flight lasting three minutes. The three birds floated near to one another without further antagonism.

(iii) In an experiment on 13th April 1962, a tethered adult drake Mallard was placed in full view, on the usual loafing spot of the paired drake. The captive was placed in position just after 04:00 hrs. at which time the pair was already on the pool, although they had not visited the nest. After initial disturbance the pair returned twice, at 04:25 hrs. and 05:07 hrs., dipping and setting their wings as though to land. Each time they veered away at the last moment, apparently disturbed by the strange male on their loafing water. At 06:20 hrs., the pair circled again and this time almost landed beside two drakes who had meanwhile walked to the end of the loafing pool nearest the nest, but they fluttered on a further 60 yards. At 06:30 hrs., after the drakes had moved away, the pair walked quietly to the pool. They had shown no aggressiveness towards the two drakes and they now appeared not to notice the captive drake, which was only 25 yards from them. At 06:45 hrs. the pair " jumped up ", circled the nest area and landed between the nest and the loafing water. The female went straight to the nest and the drake to the loafing spot, again, the latter ignored the captive drake. The female laid her fourth egg that morning.

Case B

Because of the possibility that birds might be alarmed by the occasional flapping of a captive male it was decided to use a wildfowler's drake decoy in further tests.

Another pair was located on 16th April 1962: their nesting area was similar to that in Case A. Another Mallard was laying 30 yards away and a Shoveler 40 yards away. The pair in Case B flew into the nest area at times up to 55 minutes after first light, always arriving from the same direction. As in the other pairs studied, while the female was at the nest, the male took part in three-bird flights, always planing back to a loafing pool about 20 yards from the nest.

At 04:55 hrs. on 18th April this pair was already in the area, but the female had not yet laid. They flew out into adjacent *Spartina* beds when disturbed and the decoy was then placed on the pool in the position from which the drake had risen. At 05:30 hrs. the pair circled the area and flew over the loafing pool, veering away on seeing the decoy on the water. They circled again in exactly the same manner ten minutes later. At 06:30 hrs. the pair sneaked back to the nest area, fluttering low over the *Spartina* beds. The drake did not return to the loafing pool, but remained in the *Spartina* while the female went to the nest and laid her eighth egg.

Two other laying pairs were tested with the decoy and in both reactions were similar to those above. The pair spacing tendency, by which nesting pairs passively re-adjust their positions, was thus common to all pairs. A further illustration of the same tendency is noted in Case C below.

Case C

At times outside the nest visit period, pairs were found spaced over the fresh grazing marshes, often beside ditches and fleets. Table I shows that the minority of three-bird flights were seen over the grazing marshes and this was considered to result from the fact that there were comparatively few lone male Mallards on the marsh at this phase of that season.

On 19th April 1962 two pairs were observed from a car approximately 60 yards apart on a small ditch. The car disturbed the nearer pair which swam slowly away towards the farther pair who were standing on the bank. The female of the second pair began to extend her neck as the first pair approached and then walked slowly away, her mate following; as she did so she incited against the approaching drake, but her mate did not respond. The first drake became increasingly interested in the other female as he neared her, straightening his neck until it was fully erect, looking in her direction and swimming towards her, but she continued to incite. Ultimately the first pair occupied the position the second pair had been in and the latter settled to sleep approximately 30 yards away.

Appendix B

Mallard flights unrelated to possible territory

Many incidents were recorded which were seemingly unconnected with any particular area on the ground or which were entirely contrary to territorial behaviour. Three typical cases are given below:—

Flight A

On 25th April 1962 a typical high intensity flight, in which the pursuing male harassed the female of a pair for about 30 seconds was seen over Borough Market railway junction near London Bridge. This is a wholly built-up area and the nearest water is the River Thames some 200 yards away. This flight also typifies those seen to take place wholly over water, e.g. over the Thames in the City of London and the Thames estuary and Swale channel around Sheppey.

Flight B

On 12th April 1962 at an upland breeding ground pairs were seen visiting nests in a wheatfield, arriving between 04:30 hrs. and 05:00 hrs. At 05:10 hrs. a female who had been under observation for forty minutes left her nest and rejoined her mate who was standing nearby. They began to walk slowly through the wheat, feeding off the ground. After a minute or two the drake from a nest 40 yards away, whose female was still laying, noticed the feeding duck. He walked quickly towards her, running the last 10 yards notwithstanding the fact that she was only 10 yards from her own nest. She raised her head when she saw the intruder coming, gave a flight intention movement and "jumped up", she was closely followed by the pursuer and a typical high intensity three-bird flight followed. As usual, her mate trailed along behind. After the flight the pursuer dropped back to the spot where he was first seen, but the first pair left the area.

Flight C

On 17th April 1962 birds were watched on a feeding ground in fresh grazing marshes. A male was seen to rise at a pair, the female of which incited against him repeatedly during the flight without invoking any response from her mate. They circled the marsh two or three times and then all landed together. The female incited against the pursuer in a most agitated fashion and her drake then ran at him twice with head lowered. No further intrusions were attempted even though all three were now standing on the spot from which the pursuer had risen.

Appendix C

Shoveler case studies

Case A

On 10th April 1962 in an area of fresh grazing marshes which had been a nesting ground in previous years a Shoveler drake was seen harrying the female of a pair in a typical high intensity three-bird flight. Afterwards, the pursuing drake planed back and landed on a freshwater fleet. Immediately, another male who had been standing on the bank walked quickly into the water, swam through a screen of reeds and began vigorous head pumping at the male which had just landed. The latter backed away from the displaying drake who continued head pumping for another minute before advancing further. The original pursuer retreated again and then simply " hung about ". Previously a female had been glimpsed in the reeds and similar incidents of this type suggested that the displaying male was in fact defending its mate. On " walking the birds up " the original pursuer flew off alone, whilst the female from the reed bed flew off with the drake which had been displaying. The first drake had therefore been a marauder rather than a territorial defender.

Case B

An incident seen on 9th April 1962 further illustrates the behaviour of marauding drakes and the maintenance of " mated-female distance ". Two pairs were standing some 50 yards apart near a freshwater fleet. Single, apparently marauding males, were continually flighting in the area and one stood staring at one pair from about fifteen yards distance. Occasionally the paired male nearest the single male would rise to pursue flying males which came too close, but it made no objection to the other pair and the odd male which stood nearby. After about twenty minutes the single male suddenly flew straight at the pair it had been watching and landed between the male and female, practically touching the latter. All three exploded into the air and after vigorous aerobatics the paired drake drove the intruder away. None of the birds returned, the pair and marauder moving off in different directions.

Case C

Another instance of pair-bond defence was observed on 12th April 1962 at 05:50 hrs. when a drake was noted head pumping at another which was swimming towards it on a freshwater fleet. Close observation revealed that the swimming bird was making towards a paired female partly hidden in a reed bed. As the intruder approached, the head pumping of the paired drake became more violent until, when the intruder was two feet distant, he flew at him, rushing over the water calling and stabbing at him. In spite of a further attack from the paired drake the intruder flew at the female, forcing her to take off. The paired male flew after them and not only succeeded in getting between the intruder and his own female, but he forced the intruder away by stabbing at him in flight and then pursuing him over the water surface.

Wild ducks and swans at the New Grounds

M. A. Ogilvie

IN the *Ninth Annual Report* (1958) there appeared a survey of the status of ducks on the River Severn at the New Grounds and in the Wildfowl Trust's enclosures based on counts made between 1947-1957.

The object of this present survey is to bring the picture up to date, in fact to the end of the 1962-3 winter. Counting in the winter has been slightly more regular in recent years than in the past, thanks to changes in the behaviour of the wild geese, which have made it possible to count ducks with less disturbance to geese than used to be the case. Monthly counts between September and March have been made both in the Decoy and adjacent pens, an area of 40 acres, and on the River Severn half-a-mile away between Frampton Pill in the north-east and Purton Breakwater and the Royal Drift in the south-west, at low tide an expanse of mud two and a half miles by one mile, bordered by a strip of high saltmarsh some hundreds of yards wide. During the last four years frequent counts have also been made during the summer giving valuable information on the departure and arrival dates of wintering species and confirming unpublished records on summering birds made in the early 1950's.

Many species flight regularly between the Trust enclosures and the river and despite segregation in some instances the two areas will be considered as a unit but with two parts. The counts of each are made as nearly together as possible for an accurate assessment of the total population. To save constant reference to the earlier survey, the main points raised then will be mentioned again under the appropriate species heading.

The status of Bewick's and Whooper Swans is also discussed.

MALLARD *Anas platyrhynchos*

The local breeding population of this species has been subject to much interference. In the summer of 1948 130 hand-reared birds were released to help establish a 'lead' on the Decoy pool. The increase in breeding pairs following this was so great that by 1956 moulting adult birds were being caught each summer and taken away before being released, and in more recent breeding seasons eggs and young have been collected and sent away in considerable numbers. Coupled with this attempted reduction of the summer population, in the last four winters the great majority of the Mallard caught in the Decoy, totalling over 3,600, have been released at distances between 10 and 150 miles from Slimbridge to try and reduce the numbers living in the pens during the winter and save on the food they consume.

Although the count of Mallard in the enclosures fell in 1959-60, the first winter of transporting, the numbers have since climbed above the 1957-1959 average peak of 450-500, providing a new maximum of 718 on 17th November, 1962. These figures are daytime ones; each evening a large flight of Mallard takes place from the river to the pens. In the Decoy alone 3-400 birds was a common evening count in the autumns of 1961 and 1962. (The Decoy is now rarely used as a resting place by more than a few Mallard).

Counts on the river have shown an increase from an average annual peak of 540 in the years 1951 to 1957, to 1240 in the last five winters. Although the Mallard has shown a steady increase in its wintering population in Britain in the last fifteen years (Eltringham & Atkinson-Willes, 1961) the numbers at the New Grounds have grown at a much greater rate than in the country as a whole. During the hard weather of early 1963 a new maximum count of 2550 was made on 14th January 1963, though on this occasion the numbers in the pens, at 250, was about one-half the normal.

Estimates of Mallard numbers in summer have been based on counts of breeding pairs and counts on the river. The breeding population has risen from about 100 pairs in the early 1950's to probably over 200 pairs in the last few summers. The bulk of these nest within the enclosures with not more than 25 pairs in the surrounding area. On the river 2-300 are usually present throughout the spring and summer, building up rapidly to an August peak of over 1000 as the local breeding birds and their young join into flocks.

TEAL *Anas crecca*

As explained in the earlier survey, this is the hardest species to count accurately and the population is subject to rapid fluctuations in numbers as large flocks of birds move through the area. Counts on the river have revealed little change in numbers compared with earlier years, with the peaks over the last six seasons ranging between 390 and 1700. The latter count on 17th December, 1961 equalled the previous highest number of Teal recorded at the New Grounds just ten years before.

Most of the Teal leave in March, but up to ten have summered in recent years and breeding probably took place in the area in 1962. Numbers build up again during early August.

The enclosures are rarely favoured by Teal, which never become tame, the Decoy being the favourite haunt, though less commonly visited now than in the past, 40-50 being the maximum recorded in recent years.

GARGANEY *Anas querquedula*

No change has taken place in the status of this species, still an annual visitor to the enclosures in very small numbers, mostly between March and September. Although most records are of singles or pairs, up to six (five of them males) were present between March and June, 1959. One bird was present from September to December, 1960.

GADWALL *Anas strepera*

The true extent to which wild Gadwall visit the New Grounds has been obscured by the release of full-winged hand-reared birds which have since bred in the area. Before this happened, up to six wild birds had been seen, and ringing has revealed that immigrants from the continent are still regular winter visitors. Birds caught between August and March have been recovered in Sweden, Poland, Germany and southern France in subsequent autumns. However, so few Gadwall have been ringed either in Britain or on the continent that there is no full picture of the distribution or movements of this species into which the Slimbridge results can be fitted.

Apart from occasional excursions to the river, the Gadwall at the New Grounds spend most of their time in the enclosures. Recent maximum counts in winter of 30-35 show a very slight increase in the past decade.

WIGEON *Anas penelope*

This has always been the most numerous winter visitor to the river, with four of the last six seasons producing peaks of over 2000, and a maximum count of 3000 on 17th December, 1961 equalling the previous highest recorded in December, 1954. Though an increase can be detected in the period since 1957 over the average peaks for the previous six years, the fluctuations that took place from year to year obscure any true rise in numbers. This is typical of the picture over the country as a whole (Eltringham & Atkinson-Willes *op. cit.*).

The maximum numbers are present in the area from November to January and the bulk of the Wigeon have departed by mid-March with only small flocks staying into April. Arrivals in autumn are uncommon before the middle of September.

Wigeon occasionally come into the pens and Decoy in some numbers, particularly during rough weather, but counts of over 100 have been made only rarely.

PINTAIL *Anas acuta*

The increase of this species at the New Grounds in the first ten years after the war has apparently levelled out, with an annual peak between 200 and 300. There is considerable movement between the river and the pens, and the whole population may at any time be in one or other of the areas. The tendency in recent years has been for the birds to spend the day on the river, coming in to feed at night in the pens. Some days, however, as many as 200 may sit out on the Big Pen lawn taking little or no notice of people near them. The maximum count of 500 was made on the river in late December, 1954.

Pintail arrive at the New Grounds later than the other winter visitors and there are rarely more than 40 before the middle of November. Departure is usually in early March.

SHOVELER *Anas clypeata*

The increase in wintering numbers of this species has continued with between 50 and 100 now regularly present compared with a range of 30-70 six years ago. Like Pintail, Shoveler move a great deal between the river and the pens, though preferring the latter. A maximum figure of 400, considerably above the next highest count, was recorded on the river on 8th February, 1959. This influx was short-lived and the count a week later at 110 was only slightly above average. The reasons for it remain obscure.

Ringing has shown that our native birds together with early immigrants from western Europe move south during September and October mostly to France and the Iberian Peninsula. Later arrivals reaching Britain from November onwards have come from Scandinavia and Russia. Peak numbers at the New Grounds are reached in the winter months though on many waters in Britain the maximum counts are made in March and April.

TUFTED DUCK *Aythya fuligula*

Before 1960, Tufted Ducks were recorded as occasionally occurring in the pens in some numbers, though this was nearly always during a spell of hard weather, maximum 110 in February, 1956, and the resident winter population was very small. During the winter of 1960-61 a late evening flight, taking place usually about one hour after sunset, was noticed coming into the pens. Counts of between 150 and 200 were made and the probable origin of these birds traced to the gravel pits some two miles to the north-east where winter counts of 200-250 are made. The flight has been noticed in each of the succeeding winters with maximum figures around 150, starting in late October and ceasing in early March. The birds show distinct preferences in the pens they go to, choosing those in the south-east part of the enclosures, particularly the rather deep " African " pen.

Small numbers are occasionally seen on the river; an exceptional figure of 70 in January, 1963 was in very severe weather when the local gravel pits were frozen and the population of 100-150 from there was living in the enclosures and sometimes flighting out to the river.

POCHARD *Aythya ferina*

Although an isolated figure of 150 Pochard was recorded in November, 1947, this species is a rarer visitor to the area than the Tufted Duck. Up to ten flighted in regularly with the Tufted Duck in 1960-61, though not noticed in subsequent winters. Small numbers occur at times on the river and in the enclosures, with a maximum of 60-70 during hard weather early in 1963. A possible resident winter population of 10-25 that seemed to be forming between 1956 and 1960 has now disappeared.

SHELDUCK *Tadorna tadorna*

Shelduck have been counted for longer and more regularly, summer and winter, than any other ducks at the New Grounds. The number of pairs that nest on the New Grounds side of the estuary is very small in proportion to the adults present in the spring and summer. The greatest number of ducklings seen in the area in any year was 87 during July, 1951, the progeny of about a dozen pairs. The total of apparently non-breeding birds present at this time

was about 100. The number of young hatched each year varies between 30 and 70 with no apparent signs of change in the numbers of pairs nesting.

All or nearly all of the adults leave the area to moult in early August but before this day-to-day fluctuations of considerable size take place in the numbers of adults present, particularly in late July. These are attributed to local movements and to passage through the area of birds from further afield, the latter being more important. On 17th July, 1962, a maximum count of 276 was made, yet just one week later only 20 birds remained. Support for these fluctuations being attributable to a moult migration comes from the recovery of a Shelduck caught in the Decoy in May, 1955 and found on the Wash on 20th August, 1959, having been dead at least a month. Shelducks on passage in late summer have been seen leaving eastwards, presumably *en route* for the Heligoland Bight. They do not appear to go to Bridgwater Bay, the only known English moulting area (Eltringham & Boyd, 1963).

The autumn and winter figures show wide variations from year to year, the counts in some years remaining below 50 until February, in others rising to over 100 in mid-September.

Only one nest of wild Shelduck has ever been found at the New Grounds when a pair bred successfully in the Decoy wood in 1957. This pair was ringed at the time and have been recaught together in the Decoy in June, 1959 and May, 1960, though breeding has not been proved again. Intensive searching in the whole area has failed to discover any more nests.

BEWICK'S SWAN *Cygnus columbianus bewickii*

This species is now established as a regular winter visitor to the New Grounds. Prior to 1955, there were two or three reports, the most recorded being seven birds. Since then Bewick's Swans have appeared each year in steadily increasing numbers staying for longer periods and have simultaneously shown a growing tendency to come down in the enclosures for food. Until 1959, the swans did not usually arrive before late December or January and departed again in February, but in the last four winters the first birds have come at the beginning of November and some have stayed until early April.

The maximum recorded is 39 which were present briefly on 13th March 1962, before most of them flew off towards the north-east already on migration. The most here for any period is 24 during January and February, 1963, all of them roosting by the river during the day and flighting into the pens in the evening to feed.

Four birds have been caught and ringed, one fewer than the total in the whole of Britain, and though none have been recovered one bird, first ringed in the spring of 1961, has since returned to spend each of the two succeeding winters at the New Grounds.

WHOOPER SWAN *Cygnus cygnus*

There have been five occurrences of singles or pairs of this species at the New Grounds. On only one occasion has a bird stayed more than a few days, in 1961 when one was here most of January to March, coming frequently into the pens.

Vagrants

There has been no change in status of any of the duck species to visit the New Grounds as vagrants. The only new species to have been recorded here since 1957 is Red-breasted Merganser. The list is as follows:

BLUE-WINGED TEAL *Anas discors*
Single drake in the pens in December, 1956.

AMERICAN WIGEON *Anas americana*
Single drake on the river on 9th March, 1946.

RING-NECKED DUCK *Aythya collaris*
Adult male in the pens, 12th-14th March, 1955.

SCAUP *Aythya marila*
Two on the canal, February, 1956, and individuals in the pens January-March and November-December, 1960.

GOLDENEYE *Bucephala clangula*
Six occurrences in winter and spring from the river and pens involving thirteen birds.

LONG-TAILED DUCK *Clangua hyemalis*
Three winter records on the canal totalling four birds.

COMMON SCOTER *Melanitta nigra*
Several winter records on the river or canal, maximum five birds. A single male on the river, June, 1957.

RED-BREASTED MERGANSER *Mergus serrator*
One ' red-head ' on the river April-May, 1960.

GOOSANDER *Mergus merganser*
Five winter records from the river involving one or two birds on each occasion.

SMEW *Mergus albellus*
Four winter records from river and pens. Singles except for 14 in early February, 1956.

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Additional voice recordings of the Anatidae

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IN the *Twelfth Annual Report* a list was published of all the forms of Anatidae whose voices were known to have been sound recorded (Boswall, 1961a). Since then a number of new gramophone records have appeared (Boswall, 1961b and in press) and other recordings have been made, which considerably increase the number of forms recorded—hence this supplementary contribution.

Available recordings

Scott (1957) lists 247 living forms of 147 species of Anatidae 61 forms of 55 species appeared in the earlier list (*op. cit.*) as having their voices available on either commercial or BBC gramophone records. All the new recordings are

systematically listed below (cross-referenced to a discography) and include 17 additional forms of 17 species, bringing the total to 78 forms of 72 species.

Another gramophone record of instrumental mimicry of bird sound has come to light. Translated literally from the Portuguese, its title is " Hunting all through Brazil ". It is a 12-inch, 78 r.p.m. record and is published by Gravacos Electricas in Sao Paulo. Its purpose is to teach hunters how to use the " bird calls " (whistles) made by the family firm of Sr. Maurillio Coehlo (Fabrica de Pios de Aves, Cachoeiro de Itapemirim, State of Espirito Santo, Brazil) and it includes examples of ducks, tinamous, doves and other game birds (Mitchell, 1957, p. 32).

Supplementary List of Forms of Anatidae whose recorded voices are available

Note: the numbers refer to the discography that follows; those in italics refer to recordings of captive birds. Subspecies are inset under the nominate race. Forms additional to those in the list published earlier are asterisked.

*Fulvous Whistling Duck	*8*
White faced Whistling Duck	*6* (see note)
Northern Red-billed Whistling Duck	8
Black Swan	3
*Black-necked Swan	*2*, *6*
Whistling Swan	4, 7, 8
Bewick's Swan	*6*, 12
Whooper Swan	9, 11
Trumpeter Swan	*2*, *6*, 8
' Geese '	5
Pink-footed Goose	12
European White-fronted Goose	6, 12
Pacific White-fronted Goose	7, 8
Lesser White-fronted Goose	10
Bar-headed Goose	*6*
Emperor Goose	8
Lesser Snow Goose	7, 8
(Blue Goose)	7, 8
' Canada Goose '	4, 7, 8
Atlantic Canada Goose	6, 9
Hawaiian Goose or Ne-Ne	*6*
Russian or Dark-bellied Brent Goose	8, 12
*Atlantic or Light-bellied Brent Goose	8
*Ruddy Shelduck	*6*
*Radjah Shelduck (ssp?)	*6*
*Andean Goose	*2*, *6*
Cereopsis Goose	*6*
Northern Pintail	1, 7, 8
European Green-winged Teal	8
*American Green-winged Teal	7, 8
Mallard	1, *6*, 7, 8, 14
North American Black Duck	1, 8
Gadwall	7, 8
American Wigeon	7, 8
European Wigeon	*6*, 8, 9, 12
*Chiloe Wigeon	*6*
Blue-winged Teal	7, 8
Common Shoveler	7, 8
European Eider	*6*, 8, 12
Canvasback	*2*, 7, 8
*European Pochard	12
Redhead	*2*, 7, 8
*Ring-necked Duck	8
Tufted Duck	12
Lesser Scaup	8
*European Greater Scaup	12
North American Wood Duck	8
Spur-winged Goose	13

*Velvet Scoter	12
Long-tailed Duck or Old Squaw	*6*, 8, 12
Barrow's Goldeneye	*6*, 8
*European Goldeneye	12
American Goldeneye	8
*Bufflehead	8
*Smew	12
*Hooded Merganser	8
Red-breasted Merganser	8, 12
Goosander	12
North American Ruddy Duck	7, 8
*African White-backed Duck	*2*, 6

Supplementary List of Gramophone Records which include voices of the Anatidae

1. ANON. *c.* 1957. *Black Ducks and Mallards* (no. D-100), *Black Ducks, Mallards and Pintails* (no. D-101) and *Geese* (no. G-200). Three 7-inch, 45 r.p.m. discs. Lititz, Pennsylvania: Animal Trap Company of America.
2. BBC NATURAL HISTORY RECORDINGS LIBRARY. Recent additional discs up to no. 25108. Duplicate sets are available at the offices of the British Trust for Ornithology and at Madingley Ornithological Research Station, Cambridge, and a part-set at the Laboratory of Ornithology, Cornell University, Ithaca, New York State.
3. BIGWOOD, K. and J. 1961. *A Treasury of New Zealand Bird Song, No. 4.* One 7-inch, 45 r.p.m. disc, no. EC-25, and booklet, Supplement No. 1. Wellington: A. H. and A. W. Reed.
4. BOYES, E. and A. 1960. *Wild Bird Songs, Vol. 2.* One 12-inch, 33.3 r.p.m. disc, no. L08P 4352. Detroit, Michigan: E. and A. Boyes.
5. BRAMBLE, CLAYTON. *c.* 1954. *Genuine Wild Geese Calling.* One 7-inch, 45 r.p.m. disc, no. E4-KW-7432/3. Cambridge, Maryland: Lewis Record Co.
6. DUDDRIDGE, PETER. 1962 *Wildfowl Calling.* One 7-inch, 45 r.p.m. disc, no. 7 EG 8764. London: HMV. (Michael Kendall has pointed out that the sound introduced as that of the Red-billed Whistling Duck is in fact the call of the White-faced Whistling Duck).
7. GUNN, W. W. H. 1962. *Prairie Spring.* One 12-inch. 33.3 r.p.m. disc, no. T.51091/2. Don Mills, Ontario: Federation of Ontario Naturalists.
8. KELLOGG, P. P. 1962. *A Field Guide to Western Bird Songs.* Three 12-inch, 33.3 r.p.m. discs. Boston: Houghton Mifflin. (N.B. six of these recordings were made in Europe).
9. KIRBY, JOHN. 1962. *Songs of Birds in Britain.* Two 7-inch, 45 r.p.m. discs, accompanying the book *Birds in Britain* by Kenneth Richmond. London: Odhams Press.
10. LEKANDER, G. and PALMER, S. *c.* 1954. *Birds* (Swedish). One 10-inch, 78 r.p.m. dics, no. 61. Stockholm: Radiotjanst.
11. LINDBLAD, JAN. 1961. *The Singing Bird Book* (Swedish). One 7-inch, 45 r.p.m. disc, no. 307. Stockholm: Metronome.
12. PALMER, STURE. 1961-63. *Radio Bird Records* (Swedish). Fifteen 7-inch, 45 r.p.m. discs, nos. RFEP 221-235. Stockholm: Sveriges Radio.
13. QUEENY, EDGAR M. 1951. *Birds of Lake Nyibor.* One 12-inch, 78 r.p.m. disc. New York: American Museum of Natural History. (This record appeared in the earlier paper (*op. cit.*) but is repeated here as Myles North has kindly pointed out to me that I overlooked the Spur-winged Goose).
14. ZWEERES, KO. 1962. *Naardermeer.* Two 7-inch, 33.3 r.p.m. discs, nos. EFC 8 and 9. Amsterdam: European Phono Club.

Amendments

Three amendments need to be made to the earlier paper (Boswall, *op. cit.*). In the list of gramophone records, No. 4 should be amended to read: " HOSHINO, K. and KABAYA, T. 1954. *Japanese Bird Songs.* Nine 10-inch, 78 r.p.m. discs, nos. AE 133-5, AE 160-2 and AE 201-3. Yokohama: Victor ". The year of publication of disc No. 5 was 1942. Under No. 13 the disc numbers should read RFEP 201-220.

Unpublished Recordings

Five major sources of unpublished recordings were listed in the earlier paper. The address of one has changed and four new ones need to be added.

Dr. W. W. H. Gunn now lives at: 455 Meadow Wood Road, Clarkson P.O., Ontario.

The four additional sources are:

The private collection of Tsuruhiko Kabaya, 327, 1-chome, Kashiwaga, Shinjuku-ku, Tokyo, Japan.

The collection of R. Nakatsubo, Japan Broadcasting Corporation, Uchisaiwai-cho, Chiyoda-ku, Tokyo, Japan.

The private collection of Peter Duddridge, 8 Hatherley Court Road, Cheltenham, Glos., U.K.

The private collection of Reay H. N. Smithers, P.O. Box 8540, Causeway, Southern Rhodesia.

Col. Donald S. and Mrs. Marion P. McChesney, Research Associates of Cornell University's Laboratory of Ornithology, recorded the voices of over eighty species in the Trust's grounds early in 1962 and have deposited the tapes with the Library of Natural Sounds at the University (Kellogg, 1962).

Species and forms known to have been recorded beyond those on gramophone records are listed below. All are of captive individuals in the Trust's collection, except five species recorded wild in Japan, U.S.A., Venezuela and S. Rhodesia (two), as indicated. Recordings by Peter Duddridge (D.) or D. S. McChesney (McC.) unless otherwise marked.

Magpie Goose (McC., D.)
Spotted Whistling Duck (McC.)
Coscoroba Swan (McC., D.)
Thick-billed or Eastern Bean Goose (McC.)
Eastern Greylag Goose (McC.)
Ross's Goose (McC.)
Great Basin or Moffitt's Canada Goose (McC.)
Taverner's Canada Goose (McC.)
Dusky Canada Goose (McC.)
Vancouver Canada Goose (McC.)
Richardson's Canada Goose (McC.)
Cackling Canada Goose (McC., D.)
Pacific Brent or Black Brant (McC.)
South African or Cape Shelduck (McC., D.)
Moluccan or Black-backed Radjah Shelduck (McC., D.)
Australian or Red-backed Radjah Shelduck (McC., D.)
Orinoco Goose (D.)
Upland or Lesser Magellan Goose (McC.)
Falkland Upland or Greater Magellan Goose (McC.)
Bronze-winged Duck (W. C. Dilger)
Marbled Teal (McC., D.)
Hottentot Teal (wild: R. H. N. Smithers)
Cape Teal (McC.)
Southern Silver or Versicolor Teal (McC.)
Red-billed Pintail (wild: R. H. N. Smithers; captive: McC.)
Greater Southern or Bahama Pintail (McC., D.)
Southern Georgian Teal (McC.)
Kerguelen or Eaton's Pintail (McC.)
Florida Duck (wild: R. S. Little and J. W. Kimball)
African Yellowbill (McC.)
African Black Duck (McC., D.)
Chinese Spotbill (wild: R. Nakatsubo)
Northern Cinnamon Teal (McC.)
Cape or South African Shoveler (McC.)
Ringed Teal (McC.)
King Eider (McC., D.)
Red-crested Pochard (McC., D.)
Rosy-bill (McC.)
Mandarin Duck (McC., D.)
African Pygmy Goose (McC., D.)
Eastern Hartlaub's Duck (McC.)
Muscovy Duck (wild: Paul Schwartz)
American Merganser (D.)

References

BOSWALL, J. 1961a. "Voice Recordings of the Anatidae". *Wildfowl Trust 12th Ann. Rep.* : 147-51.

BOSWALL, J. 1961b. A World Catalogue of Gramophone Records of Bird Voice. *Bio-Acoustics Bulletin*, 1(2) : 1-12.Cornell University, New York.

BOSWALL, J. 1962. Amendments and Additions to A World Catalogue of Gramophone Records of Bird Voice. *Bio-Acoustics Bulletin*, 2(4) : 25-9. Cornell University, New York.

KELLOGG, P. P. 1962. "Sound-recording expeditions". *Newsletter to Members*, Cornell University, New York.

MITCHELL, MARGARET H. 1957. *Observations on the Birds of Southeastern Brazil*. Toronto University Press.

SCOTT, PETER. 1957. *A Coloured Key to the Wildfowl of the World*. The Wildfowl Trust, Slimbridge.

The migrations of European Redshank and Dunlin

M. A. Ogilvie

Summary

A REVIEW of published recoveries of birds ringed in all European countries, supplemented by unpublished British material. The picture of Redshank movement remains similar to that given by Salomonsen (1954), though interpreted rather differently. Redshank from Scandinavia and north-west Russia migrate along the western coasts of Europe into Iberia, wintering around the Mediterranean and in west Africa. Birds ringed in summer in Finland and on passage in southern Sweden include more visitors to west Africa than Danish-ringed birds, more of which stay on the north shore of the Mediterranean. Very few continental Redshank visit Britain. Many from Iceland winter on both the east and west sides of the British Isles, few reaching the Continent. Much of the British-bred stock emigrates to western Europe, south to Portugal. Individuals wintering in Britain move little during the winter.

Very few Dunlin have been ringed or recovered in the breeding season. Many passage-migrants ringed in Norway visit Britain, others going into south-west Europe. Most Swedish-ringed Dunlin winter in the Mediterranean area. Though some reach north Africa their winter range does not extend as far south as that of the Redshank. The preponderance of Norwegian-ringed birds in Britain is probably due to a large northern Scandinavian element, Swedish passage-migrants including relatively more Siberian birds. Late summer ringing in Britain shows that some early immigrants move on south-westwards, though many remain, together with birds from Iceland. British-bred Dunlin show southward movement within the country in autumn and winter, though none have yet been recovered abroad. A late spring passage in western France probably consists of British and Icelandic, rather than Scandinavian, stock.

Introduction

Both the Redshank *Tringa totanus* (L.) and the Dunlin *Calidris alpina* (L.) have been the subject of detailed migration studies based in the main on ringing recoveries (Salomonsen, 1954; Nørrevang, 1955). With the great increase in wader ringing in Britain in recent years there has arisen a need for our knowledge of wader migration to be brought up-to-date, with particular reference to the new light now being thrown on those parts of the European populations breeding in or visiting Britain.

The sources used are all published recovery lists of European ringing schemes since 1948, and all British recoveries since 1945. Both Salomonsen and Nørrevang made use of all available recoveries up to 1954. There is thus some overlap in each case, but much of the material analysed here is new, and no pre-war material used in the two previous studies has been incorporated.

I am indebted to Mr. Robert Spencer, Ringing Officer, and the Bird Ringing Committee of the British Trust for Ornithology for permission to use, and facilities in obtaining, the full details of British ringing recoveries.

Redshank

Results from Scandinavian ringing

Salomonsen (1954) found that Redshank ringed in Denmark, nearly all of them on autumn passage at Amager, near Copenhagen, wintered on the Mediterranean coasts of Spain, France and Italy. He suggested that most of these birds travelled on a trans-continental route direct from Denmark and recoveries on the west coast of France indicated a much smaller number of birds using a path down the western sea-board of Europe. His evidence for the direct route consisted of two recoveries from the interior of southern France together with observations of Redshank passage across France and Switzerland.

Table I. Distribution of recoveries of Redshank ringed in Denmark

Area Recovered	Month of recovery												
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
Denmark		1				1			1	1			4
England								2					2
Holland							1			1	1		3
N. France	1	6			1		2	1					11
W. France	1	8	7	2		1		1	2	4	1		27
Cent. France							1			1			2
S. France		18	7	5	5	4	2	6	4		1	1	53
Italy		15	9	3	3	2	2	6	3	1			44
East Spain		3		2	5	2	3	1					16
Portugal & West Spain			6	1	4	3	3	3	1				21
N.W. Africa						1	1	1					3
Total	2	51	29	13	18	14	15	21	11	8	3	1	186

It is equally plausible, however, to suggest that the coastal route is the main one. Table I, which though it contains 186 recoveries instead of 154 available to Salomonsen differs little in proportion from that published by him, displays the recoveries of Danish-ringed Redshank arranged by month and area of recovery. Though the total number of recoveries has been increased, no more have occurred in central France since 1953. Inspection of the autumn recoveries on the coastal route indicates that the majority of birds could well pass south from Denmark this way, crossing from the Atlantic coast of France to the Mediterranean coast just north of the Pyrenees. Further evidence of the use of this route is given by the smaller number of recoveries of Redshank that have kept to the Atlantic coast and reached Portugal and north-west Africa.

In Sweden, Redshank are ringed on autumn passage at Ottenby on the southern tip of the Baltic island of Öland. The recoveries are shown in Table II. The use of a coastal migration route is clearly indicated, with few birds deviating from the west coasts of France and the Iberian Peninsula. A complete lack of recoveries in December and January suggests a wintering place beyond Europe. This is partially confirmed by the few recoveries on the west coast of Africa as far south as Sierra Leone, within 9° of the Equator. The true extent of the wintering haunts of the Swedish-ringed Redshank remains unknown with the usual paucity of recoveries from this continent of people backward at least in the matter of returning rings.

Table II. Distribution of recoveries of Redshank ringed in Sweden

Area Recovered	Month of recovery												
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
Sweden		1										1	2
Germany	1												1
N. France	1	9	1	1				1		1			14
W. France	2	23	5	2					2	4	16		54
Cent. France		1											1
S. France	2	1	2	1						1	1		8
Italy		2		1						1			4
Portugal & West Spain		4	6	1	2								13
N.W. Africa				1						1	1		3
Tropical W. Africa ..			1		1								2
Total	6	41	15	7	3			1	2	8	18	1	102

Salomonsen indicated that the route followed by the Swedish Redshank from Ottenby to northern France took them directly across that of the Danish birds on the trans-continental path to the Mediterranean. The evidence is certainly there, however, to suggest that the two streams of birds follow the same line out of the Baltic, west and south along the coasts of Holland and France. The divergence to the separate wintering areas does not occur before south-west France is reached.

The two populations of Redshank travel south at much the same time, the recoveries in Portugal and west Spain showing this very clearly, with the main arrival in the area in September. The Danish-ringed birds stay and the Swedish-ringed ones continue their journey. This is shown equally well by the recoveries on the Mediterranean coast. Very few Swedish-ringed birds reach this region, but those that do are nearly all on autumn passage and the absence of any winter recoveries of these birds in the area indicates that they similarly pass on south.

While the timing of the autumn passage is much the same for the two populations, in the spring there is a considerable difference. The recoveries of Danish-ringed Redshank in the period March to May show that they leave the Mediterranean coasts in late March and then make the return passage during April, following the coastal route northward. The Swedish-ringed birds hardly reappear in Europe until April and the main passage on the west coast of France does not occur until the end of the month and during the first two weeks of May; of 28 recoveries in the spring, 23 are in the period 18th April to 13th May.

New results since 1954 have come from ringing, mostly during the breeding season, in Finland. The recoveries of these birds, though only totalling 19, show a coastal route and southern wintering area similar to that of Swedish-ringed birds. Despite the lack of recoveries to the north it might be supposed from its geographical position that many of the Redshank passing through Ottenby have come from Finland. However, the Finnish-bred birds follow a path to the north of the island, crossing central Sweden to Denmark before turning south to join the coastal route. The Redshank ringed in Norway also pass through Denmark. 11 recoveries reveal a pattern similar to the Swedish- and Finnish-ringed birds. One bird from Norway and one from Finland have reached tropical West Africa.

The picture that emerges from the Scandinavian ringing is of the populations breeding in the north of the area migrating to winter quarters well to the south of those taken up by birds presumably breeding in a more southerly area: a very clear illustration of 'leap-frog' migration (Salomonsen, 1953, 1955). The absence of any recoveries of Scandinavian-ringed Redshank from western Russia, and eastern Europe, is remarkable, since the breeding birds of these regions seem not to be morphologically distinguishable. Presumably they have separate, more easterly winter quarters too.

A very few recoveries are available from the ringing of Redshank in other European countries, mostly in Holland and Germany, but these are not sufficient to show clearly where their winter quarters are situated. The route followed by these birds is again the coastal one, with the Iberian Peninsula the likely destination.

There have only been four recoveries in England of Redshank ringed in Europe, all four being in East Anglia. One of these was ringed in west France

in March and recovered in May, almost certainly belonging to the British population. The other three were all bred on the Continent and recovered in autumn or winter.

Results from British ringing

There has been a considerable increase in the ringing of Redshank in Britain in recent years, the total marked having doubled since 1954 and having reached 7267 by the end of 1961. Much of this increase has come from the introduction of new techniques for catching birds capable of flight, while the number of pulli ringed has grown only slightly in the same period. There have been 105 recoveries of Redshank ringed in Britain between 1945 and 1962. 46 of these are assumed to belong to the native breeding population, having been ringed either as pulli, or as full-grown birds between 1st May and 15th July. While it is certain that British Redshank occupy breeding territory before and after these dates, particularly in the south of the country, birds still moving north to Scotland and Iceland in late spring, and early return passage, restrict considerably the period within which the great majority of birds ringed can safely be said to have been caught on their breeding grounds.

Table III. Recoveries of Redshank ringed in Britain, grouped by date of ringing

	May-July 15th	July 16-31st Aug/Sept/Oct	Nov/Dec/Jan/Feb	Mar/Apr	Total
Iceland		1			1
Britain 100+ miles N		4			4
„ 10-100 m. N	2	5	1		8
„ Local	11	21	3	5	40
„ 10-100 m. S	12	2		1	15
„ 100+ m. S.	5	1			6
W. Europe	13	4			17
	43	38	4	6	91

Table III sets out the recoveries by period or month of ringing against distance and direction, or country, of recovery. Table IV uses the same recoveries but shown by period of recovery and also differentiating between birds ringed during the breeding season and outside it. 14 recoveries of Redshank found less than one month after ringing and within ten miles of the ringing place are omitted. Distinction is made between birds that have moved in a southerly direction from the ringing place and those that have moved to the north.

Table IV. Recoveries of Redshank ringed in Britain, grouped by date of recovery

	May/June/July		Aug/Sept/Oct		Nov/Dec/Jan/Feb		Mar/Apr		Total
Iceland								*1*	1
Britain 100+ miles N ..						*1*		*3*	4
„ 10-100 m. N ..		*1*		*3*	2			*2*	8
„ Local	5	*4*	3	21	1	*2*	2	*2*	40
„ 10-100 m. S ..	2	*2*	7		1	*1*	2		15
„ 100+ m. S ..	1		4	*1*					6
W. Europe	5		5	*2*			3	*2*	17
	13	*7*	19	*27*	4	*4*	7	*10*	91

Numbers in roman are of birds ringed in the breeding season;
in italic of those ringed outside the breeding season.

Our native population of Redshank mostly leave their breeding areas by the end of July and move south in Britain, some reaching the western coast of Europe as far as Portugal. All but 6 of the birds ringed in the breeding season, and subsequently recovered, were pulli and there are recoveries of these from France by the middle of July in the summer of ringing, indicating a very early start to the autumn emigration. The 6 recoveries of breeding adults give little indication of timing but show that they too leave their summer quarters and move south.

Ringing outside the breeding season, mostly in August and September, reveals that having taken up their winter quarters the Redshank tend to stay until the following spring. Recoveries of winter-ringed birds have been made in spring and summer well to the north of the ringing place, including one in Iceland which adds to the evidence that the British Isles form the main wintering quarters for the Icelandic Redshank population.

Ringing in Iceland

A limited amount of summer ringing in Iceland before and since the second World War has produced 8 recoveries between July and April in the British Isles and a single winter recovery in Holland.

Iceland Redshank *T. totanus robusta* (Schiøler) have been identified on the west coast of continental Europe where they probably occur regularly in small numbers. The main wintering area of *robusta* is, however, on the east and west coasts of Britain and Ireland.

Dunlin

Results from Scandinavian ringing

Large scale ringing of Dunlin in Norway and Sweden since the War has produced sufficient recoveries in autumn and winter for useful comparisons to be made, while not providing more than a few records in spring and summer.

Tables V and VI set out the recoveries of Dunlin ringed in Norway (273) and Sweden (361) respectively, by date and place of recovery. The bulk of the ringing in Norway was carried out in the south at Revtangen, and in Sweden at Ottenby on the island of Öland. Comparisons between the two tables show an autumn passage through Denmark by both streams of birds continuing down the west coast of Europe with a strong branch into the British Isles.

Table V. Distribution of recoveries of Dunlin ringed in Norway

Recovered	Aug.	Sept.	Oct.	Period of Recovery Nov. to Feb.	Mar. to May	June	July	Total
Russia	2	2			1	3		8
Scandinavia	3		1		1		11	16
Denmark	10	14	14	5	2	2	1	48
Germany		1	3	5	2			11
Holland		1	2	3	1			7
British Isles	5	10	10	41	1			67
N. and W. France	3	8	11	56	20		1	99
S. France				2				2
Portugal & West Spain				6	1	1		8
Italy					3			3
N.W. Africa			1	3				4
Total	23	36	42	121	32	6	13	273

Table VI. Distribution of recoveries of Dunlin ringed in Sweden

Recovered	Aug.	Sept.	Oct.	Period of Recovery Nov. to Feb.	Mar. to May	June	July	Total
Russia	3	1	1	1	4	3		13
Scandinavia	2	1					2	5
Denmark	12	17	11	5				45
Germany	2	7	3	7	6		1	26
Holland		2		6	6	1		15
British Isles	11	1	6	35	3			56
N. and W. France ..		8	5	95	30			138
S. France		1	3	6	2			12
Italy & Greece		1	1	16	5			23
E. Spain				2				2
Portugal & West Spain		1	1	16	4		1	23
N.W. Africa			1	2				3
Total	30	40	32	191	60	4	4	361

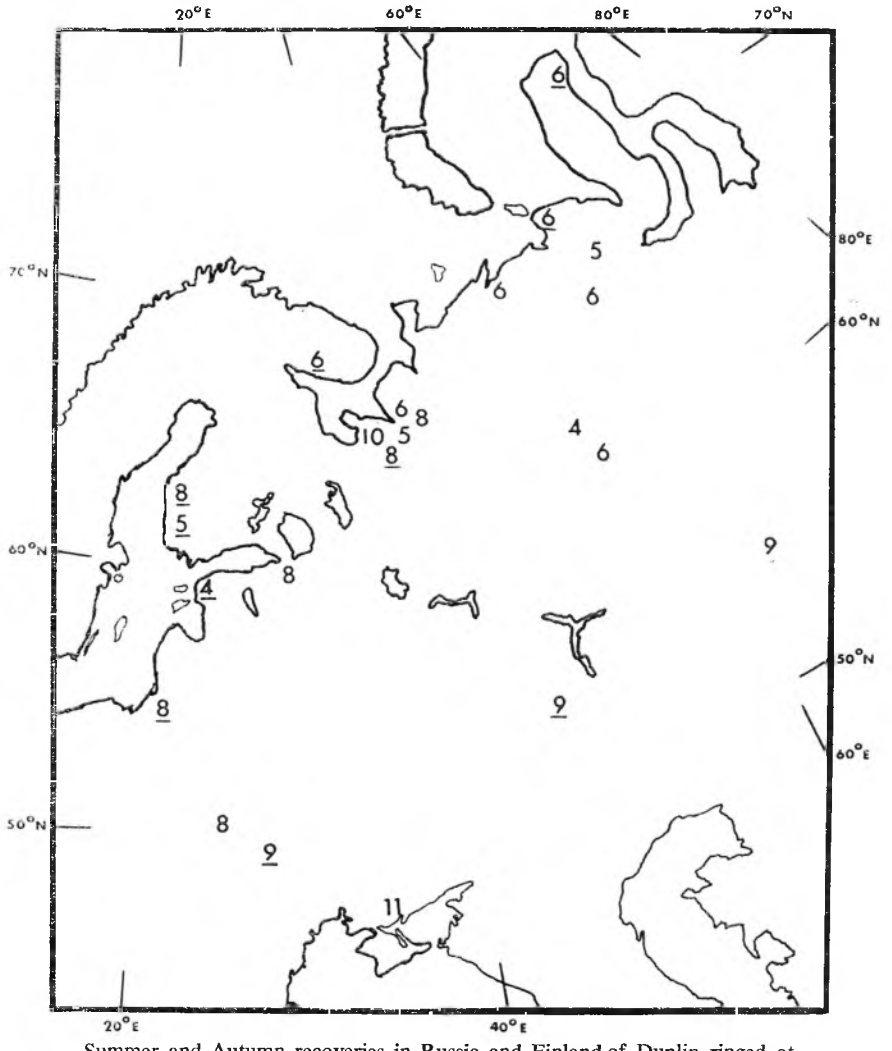
The wintering areas for the two groups overlap to a considerable extent, with the main headquarters of both on the north and west coasts of France. There is a tendency for the Norwegian-ringed Dunlin to winter further west with a higher proportion of recoveries in Britain and very few reports from the Mediterranean area, used extensively by Dunlin ringed in Sweden. A few birds winter as far north as the North Sea coasts of Germany and Holland, and some from each ringing place travel to the west coast of North Africa, but the numbers involved are probably small. (Whereas Redshank occur in winter down the entire west coast of Africa, Dunlin are not often reported south of 30°N.).

Table VII shows the dates of ringing of Dunlin at Revtangen and Ottenby. Migrants in July are caught only at Ottenby, and in October more birds are taken at Revtangen than Ottenby. Despite these differences, the timing of the onward autumn migration as shown by recoveries is surprisingly similar, even allowing for the simultaneous effect on both groups of the onset of the shooting season. It suggests a possible pause in the migration of the birds passing through Ottenby in July, perhaps in the west Baltic or Denmark area. It will be seen later that these early migrants are virtually all adults. It would seem likely that the supposed pause is for the purposes of moult, though the Wash Wader Ringing Group has found that many adult Dunlin arrive in Britain from Scandinavia before moulting.

Table VII. Recoveries of Dunlin ringed at Revtangen, Norway and Ottenby, Sweden, grouped by month of ringing

Place ringed	June	July	Month of Ringing Aug.	Sept.	Oct.	Total
Revtangen, Norway ..			54	174	38	266
Ottenby, Sweden	6	100	115	128	7	356

The return passage in spring shows few differences and the distribution of summer recoveries (see Map I), though suggesting a preponderance of Swedish-ringed birds north and east in the U.S.S.R., is based on too few records to establish a difference. Also on the map are three Dunlin ringed in Scandinavia one autumn and recovered in southern Russia in subsequent years, also in autumn. There is a possible indication here of a migratory divide in Arctic Russia, with the west part travelling to Europe and the easterly moving south



Summer and Autumn recoveries in Russia and Finland of Dunlin ringed at
Ottenby, Sweden 0
Revtangen, Norway 0

to the Black Sea or eastern Mediterranean; similar examples of individuals following different migration routes in different years occur in a number of other northern breeding species.

The difference in timing of ringing at Revtangen and Ottenby indicates that juveniles, rather than adults, use the more northerly route across Sweden into southern Norway. Unfortunately, accurate ageing has not been carried out at Revtangen and other evidence must be found. At Ottenby, the migrants occurring in late July and early August, are nearly all adults (Nørrevang, 1955). Martin-Löf (1958) found that by the end of August juveniles predominated, and continued to do so throughout September. With the peak movements at Revtangen in September, it is reasonable to suppose that they consist mostly of juveniles.

Nørrevang (*loc. cit.*) suggested that a regular migration at Revtangen would not be expected, presumably because of its geographical position. He put forward two suggestions to explain why a strong migration actually took place: 1) that the southward movement from northern Scandinavia passed through southern Norway: and 2) that a regular, yet abnormal, deviation from the usual migratory path was made by a certain proportion of the juveniles moving west in the Baltic. Nørrevang preferred the second explanation and put forward the possibility of drifting before the wind as the likely cause. This still left unexplained the difference in wintering areas used by the birds, supposedly of common origin but, due to weather conditions, ringed at different places. Nørrevang suggested that many of the juveniles, having reached Revtangen under influence of the wind, then resumed their standard migration direction and reached areas more to the west of those birds moving normally through Ottenby.

There is the usual lack of recoveries from northern Scandinavia, a gap common to many species and due to the legal protection afforded them. This is no reason to reject the probability that the Dunlin breeding in this area migrate south through southern Norway, and that these birds ringed at Revtangen provide the most westerly element in the wintering areas used, with the rest of the Dunlin passing through there being just a part of the westerly stream of juveniles leaving their breeding-grounds in Russia. A divergence of routes across southern Scandinavia is found in other wader species, including Redshank, and seems a more likely and simple explanation than drifting of Dunlin from the Baltic, clear across Sweden to the Kattegat, taking place each year over a period of five or six weeks.

As would be expected the Dunlin ringed in Denmark at Amager, near Copenhagen, use migration routes and wintering areas that show little differentiation from those of the Norwegian- and Swedish-ringed birds combined. There are 85 recoveries only, but the proportion in Britain compares well with that of birds ringed in Norway, and a number on the Mediterranean shores of Spain, France and Italy share a common wintering area with many of the Dunlin ringed in Sweden.

A small amount of ringing in Finland in recent years has produced 19 recoveries which show an autumn migration through Sweden and Denmark to Britain and France. Even fewer recoveries from ringing in Germany, Holland and Belgium since the war do nothing to alter the picture given by the Scandinavian ringing.

Results of British ringing

The ringing of Dunlin in Britain has increased tenfold in the last four years. At the end of 1961, over 12,500 had been ringed compared with 1300 to the end of 1957. It follows that the 172 recoveries notified by 31st December, 1962, do not fully represent the results of this very recent growth in ringing. They do, nonetheless, give a reasonable picture of migration and distribution, and also present an opportunity for making some deductions that may or may not be borne out by subsequent recoveries.

Of the 172 recoveries, 76 were reported abroad. These are set out in Table VIII by date and place of recovery. Over three-quarters of them were ringed in August and September, caught whilst on passage through Britain. Some of the autumn-ringed birds and most of those ringed in the winter

months remain here until the following spring. The Dunlin that move on to winter on the Atlantic coasts of Europe and North Africa provide a close comparison with the winter distribution of Dunlin ringed in Norway. This confirms that birds ringed in Norway come to Britain in the autumn, but suggests that a considerable number pass through the country and on into south-west Europe. The lack of recoveries in the Mediterranean from British-ringed birds indicates that while many Dunlin ringed in Sweden winter here, they do not visit the British Isles on passage.

Table VIII. Distribution of recoveries of Dunlin ringed in the British Isles

Area recovered	Period of Recovery									
	Aug.	Sept.	Oct.	Nov. to Feb.	Mar.	Apr.	May	June	July	Total
Iceland								1		1
Russia	2									2
Scandinavia	1								2	3
Denmark	6	1		1						8
Germany & Holland	1					1		1		3
Britain Local	15	1	7	29	2	4	1	5	4	68
„ 10-100 miles	6	2	2	2			1			13
„ over 100 miles	2	1	1	7	1	1			1	14
N. France	3	1	1	1	1	1	2		1	11
W. France		7	2	1	4	10	11			35
Portugal & W. Spain		1		5			1			7
N.W. Africa		1		4			1			6
Total	36	16	13	50	8	17	17	7	8	171

There is an interesting group of foreign recoveries in April and May, mostly on the west coast of France. There is no comparable movement as late as this by the Dunlin ringed in Scandinavia, suggesting that these birds belong to a different population, presumably that breeding in the British Isles and Iceland. Though no British-bred Dunlin has been recovered abroad, evidence to support this hypothesis comes from three birds ringed on the breeding grounds in Iceland in June and July and recovered in France in May. Further corroboration is provided by a bird ringed on Fair Isle on 23rd May, 1961 and recovered on 10th May, 1962 in north-west Spain. Of the 18 recoveries of Dunlin that can reasonably be assumed from the date of ringing to have bred or been bred in Britain, seven show a movement of over 30 miles, all of them in a southerly direction with recovery dates in autumn or winter, one reaching the south coast within a month of being ringed in Westmorland.

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Birds at Borough Fen Decoy in 1960-62

W. A. Cook

MUCH has been written about the duck ringing at Borough Fen, Peakirk, which is, of course, the main function of the decoy. The Decoy is however very attractive to " the little brown jobs ", being an isolated wood in a largely fen area. The Decoy is composed of fourteen and a half acres of mixed wood. Willow and Elder predominate, but there are also a few of the following trees: Ash, Oak, Poplar, Aspen, Hazel, Hornbeam, Elm, Conifers and a few introduced fruit trees. Evergreen shrubs include Holly, Laurel (three types), Privet, Box, Lonicera, and Rhododendron. This superb habitat surrounds a two and a half acre pond, which in turn contains about half an acre of Common Reed. The Decoy is situated half a mile south of the river Welland, which is a well-used migration route. The fens end four miles to the west and the Wash is only twenty miles away at the nearest point. 106 different species of birds have been recorded during 1960-62, including twelve forms of the Anatidae which I do not propose to discuss here. 2,666 birds of 51 species have been ringed, producing 41 recoveries, of 12 different species, so far.

A daily census has been kept on observatory lines since 1961 and a monthly return is sent to the B.T.O. for inclusion in the " Inland Observation Point " scheme. Nest record cards have also been completed for two years although the breeding species are not very co-operative, laying their eggs in the late spring and early summer when the Decoy maintenance prevents full coverage of all breeding birds. The sedge, nettle and bramble patches are particularly attractive to warblers, and seven species have bred in the past three years. The reed bed houses about fifteen pairs of Reed Warblers and provides a roost for two to three hundred Swallows in September and October.

Small bird ringing is restricted in the summer by the amount of mowing and general repairs. Most of the warblers ringed were caught in mist nets set about six o'clock in the evening and left up until dark. A number of Swallows were also taken this way. Small bird movement in the autumn also coincides with the influx of ducks, but a mist net set near a favourite roost takes the bulk of the Turdidae ringed.

I built a Crow-type trap on the north side of the Decoy measuring 6 feet by 6 feet. This is kept baited most of the winter and can be permanently closed, or the door tripped from fifty yards away. This has been particularly successful for mixed finches and in December, 1961 I trapped 66 Greenfinches at one pull of the string. Catching in this way the bird's feeding activities are only disrupted for a very short time. I do not use mist nets in the hard weather when every minute spent feeding is vital to the birds. Cage-type traps do not upset the birds so much as mist nets. A few sacks of combine cleanings are stored for such times so that easy food and drink is available whenever the trap is in use. By providing this I feel less guilty, as I have ringed and released birds in the hut one hundred yards away and have re-trapped them feeding inside the trap five minutes later. One male Blackbird, ring 45181, takes up residence in the trap about November and stays until the spring.

A number of birds are caught in the Decoy pipes, flushing down with the ducks when shown over. All the Moorhens, Woodcock and Herons were taken by this method.

The following is an abridged account of all species ringed in the Decoy from March, 1960 to December, 1962, with the number of recoveries, if any, so far reported. For the sake of completeness I have included a few recoveries up to January, 1963. Only birds that have travelled more than five miles have been written up in full. The numbers of each species ringed and recovered are shown in brackets after the scientific name. For example (71 : 0) should be read as 71 ringed, none yet recovered.

HERON *Ardea cinerea*. (3 : 1). Herons feed regularly in the decoy. I have only observed them taking frogs, as there are no fish in the pond other than eels.
514373 1st W. Ringed 23.8.62. Recovered Stonea, March, Cambs., 19 miles ESE. 6.10.62.

MOORHEN *Gallinula chloropus*. (71 : 0). An apparently static population of about 40 birds have only produced 7 re-traps in three years.

KESTREL *Falco tinnunculus*. (1 : 0). Bred in a disused Magpie nest in 1960.

WATER RAIL *Rallus aquaticus*. (4 : 0). Regular winter visitor.

SNIPE *Capella gallinago*. (3 : 0). Recorded in every month of the year. Peak numbers in the autumn.

WOODCOCK *Scolopax rusticola*. (2 : 0). Autumn visitor.

STOCK DOVE *Columba oenas*. (1 : 0). Arrive in the late autumn, building up to a maximum of about 200 and staying until the Wood Pigeon flocks break up in the spring.

WOOD-PIGEON *Columba palumbus*. (149 : 15). Flocks of up to 1500 roost in the Decoy wood. Most of the birds are taken in the pipes when feeding on the landings with the ducks. These Pigeons spoil many potential catches by flying out of the trees when I try to flush feeding duck in the late afternoon.
3068329 Juv. Ringed 4.9.60. Recovered 18.2.61. Wormgay, Kings Lynn, Norfolk. 30 miles E.
3068316 Ad. Ringed 6.8.60. Recovered 15.4.61. Cabourne, Caister, Lincs. 55 miles N.
3068389 F. G. Ringed 6.10.61. Recovered 25.11.61. Holme, Huntingdon. 12 miles S.
3068324 Juv. Ringed 30.8.60. Recovered 3.2.62. Stoke-by-Clare, Nr. Haverhill, Suffolk. 51 miles SE.
3068390 Juv. Ringed 12.10.61. Recovered 13.8.62. Kimbolton, Hants. 24 miles S.
3080647 F. G. Ringed 19.12.62. Recovered 8.1.63. Fleet, nr. Holbeach, Lincs. 17 miles NE.
3080656 1st W. Ringed 10.12.62. Recovered 9.1.63. Wigtoft, Boston, Lincs. 20 miles NNE.

TURTLE-DOVE *Streptopelia turtur*. (11 : 1). Four breeding pairs in 1961, five in 1962.
2037511 Ad. Ringed 1.7.61. Recovered 1.8.62. Waltham Abbey, Essex. 65 miles S.

BARN-OWL *Tyto alba*. (1 : 0). Roosts in ivy-covered Willow trees and big Laurel bushes.

TAWNY OWL *Strix aluco*. (1 : 0). Bred in the Decoy in 1961 and 1962.

KINGFISHER *Alcedo atthis*. (4 : 0). Bred in 1959 and 1960.

GREEN WOODPECKER *Picus viridis*. (1 : 1). Irregular visitor.
2037517. Ringed 29.9.61. Recovered 22.12.62. Market Deeping, Lincs. 4 miles NW.

SWALLOW *Hirundo rustica*. (62 : 0). Caught in mist nets over the pond at dusk in July. The presence of duck prevent the reed-bed roost being exploited to the full .

CARRION-CROW *Corvus corone*. (3 : 0). Three pulli ringed in 1962: one later fell from the nest and was fed on the ground by both parents. Items of food noted include a Red-legged Partridge, nine Pheasant eggs and seven Wood-Pigeon eggs.

JAY *Garrulus glandarius*. (2 : 0). A pair resident 1959 to 1961. Bred in 1961 and then disappeared. One irregular in 1962.

GREAT TIT *Parus major*. (38 : 1, local).

BLUE TIT *Parus caeruleus*. (53 : 0). Resident population of about 20.

COAL TIT *Parus ater*. (2 : 0). Irregular visitor.

MARSH TIT *Parus palustris*. (1 : 0). Only this one ringed specimen identified.

WILLOW TIT *Parus atricapillus*. (16 : 0). Two pairs resident. Has bred each year since 1958.

LONG-TAILED TIT *Aegithalos caudatus*. (23 : 0). Semi-resident. Has bred each year since 1958. Leaves the Decoy in very hard weather.

TREE-CREEPER *Certhia familiaris*. (11 : 0). Two pairs present in 1960 and 1961. Not recorded since April, 1962.

WREN *Troglodytes troglodytes*. (36 : 0). Ties with Tree Sparrow as the commonest breeding species.

MISTLE THRUSH *Turdus viscivorus*. (10 : 0). Has laid eggs in the four years 1959-1962 but the nest has been robbed on each occasion.

FIELDFARE *Turdus pilaris*. (23 : 1). 67506 X. Ringed 30.10.60. Recovered 29.7.62. Partaharju, nr. Pieksämäki, (Mikkeli) Finland. This is the first British ringed Fieldfare to be recovered in Finland, although the reverse has occurred several times.

SONG THRUSH *Turdus ericetorum*. (207 : 1, local).

REDWING *Turdus musicus*. (46 : 0). All trapped Redwings were measured in order to separate birds of the Icelandic and Continental races. None of the Icelandic race has yet been found.

BLACKBIRD *Turdus merula*. (423 : 10). Unusual eggs were found in two nests in 1962. These were pale blue in colour with no flecks or spots. The blue was nearer the Song Thrush colour than the green/blue normal base of the Blackbird's egg. Both clutches were being incubated at the same time, so that there is no possibility of one female being responsible. One clutch hatched and the young were successfully reared. Unfortunately the second nest was robbed before hatching.
67783 X. Ringed 14.1.61. Recovered 29.10.62. Djursdala, nr. Vimmerby, (Kalmer) Sweden.

ROBIN *Erithacus rubecula*. (61 : 0). The population in the Decoy is 6 pairs. Four birds ringed when full-grown in 1960 are still being regularly re-trapped.

REED-WARBLER *Acrocephalus scirpaceus*. (36 : 0). About fifteen breeding pairs in the Decoy. This is the only species I have found as host to a Cuckoo.

SEDGE-WARBLER *Acrocephalus schoenobaenus*. (6 : 0). Two breeding pairs in 1961; possibly three pairs in 1962.

BLACKCAP *Sylvia atricapilla*. (16 : 0). Four breeding pairs in 1961. Only one pair in 1962.

GARDEN WARBLER *Sylvia borin*. (7 : 0). Bred in 1961 and 1962.

WHITETHROAT *Sylvia communis*. (36 : 0). Commonest warbler recorded in the Decoy.

LESSER WHITETHROAT *Sylvia curruca*. (2 : 0). One male ringed in each of the past two years. Assumed to be breeding as they are present from May through the summer.

WILLOW-WARBLER *Phylloscopus trochilus*. (19 : 0). At least four pairs bred in 1961 and three pairs in 1962.

CHIFFCHAFF *Phylliscopus collybita*. (4 : 0). Passage migrant. No record of breeding in the Decoy. Earliest appearance 13th March, 1961.

GOLDCREST *Regulus regulus*. (4 : 0). Arrive with the migrant Turdidae and move on as the weather hardens.

SPOTTED FLYCATCHER *Muscicapa striata* (18 : 0). Breeds in the Decoy.

DUNNOCK *Prunella modularis*. (82 : 0).

STARLING *Sturnus vulgaris*. (46 : 1, local). Six nests found in 1961, five in 1962. 2-300 roost in the reed bed in September and October.

GREENFINCH *Chloris chloris*. (386 : 7, including 3 local).
28361 S. Ringed 31.8.61. Recovered 4.1.62. Basildon, Essex. 77 miles SSE.
28418 S. Ringed 21.9.61. Recovered 19.12.61. Luton, Beds. 52 miles S.
47763 S. Ringed 3.1.62. Recovered 30.4.62. Tallington, nr. Stamford, Lincs. 5 miles W.
47915 S. Ringed 13.3.62. Recovered 22.4.62. Uffington, nr. Stamford, Lincs. 7 miles W.

GOLDFINCH *Carduelis carduelis*. (145 : 1).
AC 213319. Ringed 30.8.61. Recovered 8.4.62. Baracaldo, (Vizcaya), Spain. 43.17N, 2.59W.

LINNET *Carduelis cannabina*. (85 : 0). About five pairs breed in the Decoy. Big flocks build up and roost in the bushes surrounding a ballast pit west of the Decoy. I have netted along the side of this pit and have ringed a total of 509 there in three years. The habitat in the Decoy is similar and I fail to see why this species should not occur more frequently.

BULLFINCH *Pyrrhula pyrrhula*. (95 : 1, local). Three nests found in two years and six birds are frequently re-trapped. It is puzzling where the rest originated as ringing records show this species to be very sedentary.

CHAFFINCH *Fringilla coelebs*. (95 : 0). Not so common the Decoy as one might expect.

BRAMBLING *Fringilla montifringilla*. (3 : 0). Regular winter visitor. The number ringed is not a true indication of the quantity present.

REED-BUNTING *Emberiza schoeniclus*. (7 : 0). Probably breed but I have not found a nest, or seen any very juvenile birds. Irregular winter flocks roost in the reed bed.

TREE-SPARROW *Passer montanus*. (307 : 0). Very common: estimate 30 breeding pairs. One nest box had five clutches of eggs, from which four broods were reared.

At Slimbridge

Rev. P. B. Clayton
of Toc H

I THINK it must be Horace in his Odes who speaks about Italian ponds as mirrors in which the sky and stars can see themselves; but British ponds are muddy and obscure.

Thus when you enter Slimbridge, you discover a baffling series of adjacent ponds which are indeed of every size and shape. The most extensive, when they were devised, hoped that they might be lakes when they grew up. But the main series knew right from the start that they must play a very minor part and be condemned to become the nursery of unimportant and unambitious homes, where parent ducks of small significance can raise a family they soon forget.

It was upon the fringe of one such pond that we stood talking with unseeing eyes, until one tiny eye shone like a star. We then discovered, to our surprise, that this one eye belonged to one small mouse bent on adventure, as a mouse can be. So very tiny was this new born creature, determined to conduct an escapade all of his own invention as he thought, that we stood there ignoring his existence until a sunbeam fastened on this eye. Six inches nearer to the pond itself five feathered infantile and nervous ducklings became acutely conscious of his presence, and called for rescue to their mother-duck. Then this severe and estimable parent, who hitherto had whiled away her time by preening feathers to her heart's content, much like a duchess at a Coronation, took a decisive step nearer her brood, and placing herself between them and the foe, for which she looked in vain with her right eye, she stood on guard.

The mischievous young mouse found that his courage had deserted him, and froze into the size of a peanut. We thought at first that he had disappeared; but he had simply closed both eyes in terror, for the approaching footfall of this monster, the mother of the children he had disturbed, caused him to blame himself for taking risks, regardless of his parents' wise advice that little ducklings should not be disturbed. Thus for some moments we held our breath, hoping the tiny brigand might escape.

The mother-duck stood solidly on guard, but failed to catch a glimpse of the invader. If the wee mouse had had the gift of patience, or if he had even turned to run for home, it is even betting that the mother-duck would not have left her charges in pursuit. She would have shrugged her shoulders, more or less, and led her feathered infants to the pond; naval manoeuvres would have been pursued, and the small mouse would be alive today. The spirit of adventure in his soul was a temptation he could not resist. We watched his bright eyes open once again, and saw him stir upon his fatal mission. As he moved, we watched the mother-duck make her decision to defend her brood, cost what it may. We watched her anger rise up to a fighting peak with unseen foes—indeed it was not until the final stage that she beheld the microscopic size of the intruder, whom she then approached. Her bill flashed downwards in fierce descent. She lifted up with obvious contempt the trembling mouse, now frozen in its fear. She shook it like a terrier shakes a rat and dropped it with an air of deep disdain. We waited on, all hoping that the mouse, though sorely stricken might shew signs of life. Our hopes were all in vain. The tiny creature had plainly died of fright, if not of wounds. Naval

manoeuvres in line ahead, and then abreast, were steadily pursued. The mouse lay dead, forgotten by its prey.

What had the mouse been hoping to achieve? Was it approaching with a fell intent? Did it intend to launch a fierce attack? Or was it merely hoping to establish a friendly feeling as between good neighbours? Was it proposing that a Common Market should be set up between the mice and the ducks, whereby each race would surely benefit? Was it attracted on aesthetic grounds? Did it delight in the discovery that God, who made it, also made small ducks, and did not make them both to harm each other but to pursue their aims by land and water?

Some notes on a pseudo-ornithological World Tour

By a Member of the Administrative Staff

IT is not, perhaps, generally known that on a possibly significant date in 1962—the first of April, it was, and in the very small hours of the morning, the Director of The Wildfowl Trust remarked to me: " I have always thought that you poor fish of the Administrative Staff have had a bit of a raw deal. These Scientific chaps go cruising about the globe, First Class on sumptuous Air Liners, with blonde Air Hostesses, free drinks and all that, while you stay here like a lot of moles, scrabbling away in the dark, underground . . . " After which promising opening, he went on to instruct me to proceed with all possible speed in several different directions in search of the Wildest of all Wild Geese (*Anser anser anser anser* . . . and so on), which had last been reported, it seems—the only known survivor of the species, the genus, the Family, the Order, the Lot—sitting on a Mare's nest on the summit of Mount Ararat, close to the remains of the Ark (or did he say the Auk?).

" Of course," he went on, " I know you don't know an awful lot about *birds*. But that is one reason why I think you may be just the man for this particular job. No theoretical axe to grind, no professional status to risk, nothing to lose, you should be a completely impartial observer. What is more, you can't possibly go wrong. After all, there is only one of this bird in the world. Go and find it. And write down just anything you notice about it. If you can gain its confidence, and persuade it you have nothing but its welfare in mind, you might even be able to bring it back . . . . You don't speak Russian, do you? Oh, well, never mind. But if you see any Scientists lurking about (you can tell them a mile off) pretend you're a Russian Agent or something . . . Anyhow, don't talk. Well, there you are! It's all yours—get cracking!"

Now, I had never been to the top of Mount Ararat before. Let's face it: one can't do *everything*. So I thought it might be as well to make some preliminary inquiries. I sought out the Assistant Director (Research). " Look, Geoffrey," I said, trying to be casual and nonchalant, not to arouse his suspicions, " I have to go to Asia Minor to see a man about a bird . . . " I had rather hoped that might impress him a bit, so I was a little put out when he emitted a yelp of laughter (rather sinister laughter, I thought) and started to pull out of the shelves behind him various fat volumes of *The Ibis* and Annual

Reports of this and that Learned Society, and run his fingers expertly down the index-pages, with a most unnerving air of calm authority. " Here you are," he said, thoroughly enjoying himself, looking at me as if he would rather like to pickle me in alcohol, " Fitzflunk on the Flamingo; Braundorff on the Bustard; Bilgeworthy on the Bunting; McLeod-Boomynge on the Bittern . . . "

After five minutes of this kind of Scientific Third Degree, with a formidable pile of unreadable statistics rising at my feet, I said: " Yes. Thank you. But . . . er . . . equipment?" He sprang up, rushed out, assembled the Scientific Staff. And, in a crack, I found myself in possession of 3 telescopes, 5 pairs of binoculars, 4 compasses, 2 Geiger Counters, an Electronic Computor, a magnet, 2 butterfly nets, a hurricane lamp, a portable incubator, a tape-recorder, 6 microscopes, an out-board motor, a pair of skis, and a pocket Old Testament.

So I left, a little chastened, for Asia Minor. The Senior Biologist, a kind man, slapped me on the back in an encouraging way and said: " Good luck, old boy! If you mention my name at Smyrna, no doubt they will dig you out a few Asia Minorities or Minor Asians, or whatever they are, to help you to carry it!"

Well, to cut a tall story short, as they say, the first bird I saw was one of Darwin's Finches in the Galapagos Islands. But, for all I could see, it might have been just any old Farm, Field or Fireside finch; just one of the mob, as it were—not at all conscious of its evolutionary importance. So I passed on to glance at Huxley's Herons on Ascension, and Wallace's Waxbills in Tierra del Fuego . . . You may think this was rather a long way round to Asia Minor, but remember this was an important assignment, where you can't be bothered with an odd degree or so of longitude, not to mention latitude.

To while away the time between, I read Matthews on Bird Navigation, and several back numbers of the Annual Report of The Wildfowl Trust. Inspired by these, fascinated by the beauty of statistics, I decided, on my eventual arrival in Asia Minor, to make a survey of the population-density of the Anatolian Sedge-Warbler or Greater Spotted Bul-bul (*Bulbulosus maximus maculatus*). This, while not precisely within the specialised field of the Wildfowl Trust, might, I thought, impress them a bit at Headquarters, or anyhow induce them to take the Admin. staff a little more seriously.

As a preliminary, therefore, soon after my arrival, I started to peg out a sample square mile of the *terrain,* but this piece of Asia was, unfortunately, so full of ravines, crevasses, dry wadis, fetid marshes, raging torrents and bitter-salt lakes that I ran out of pegs after doing one side and a half, and had to guess the remainder. However, the result was really so unsatisfactory (.00563 of an Anatolian Sedge-Warbler per hectare) that I felt some mathematical adjustment (such as, I am told, Scientists on occasion have recourse to) was called for. I hadn't time, nor, it must be confessed, the know-how, to apply the Differential Calculus, so I multiplied by the Square on the Hypotenuse, and divided by the sum of Planck's Constant plus the Square Root of Minus One. This, as you might expect, gave me a final figure rather like something by Fred Hoyle, the diameter of the Spiral Nebulae expressed in Light Minutes, or something, so reluctantly I abandoned the project. A pity . . .

Shortly after this, however, I had a real stroke of luck. I met a Kurd. This, I agree, may not at first sight seem a specially notable encounter in Kurdistan. But this particular Kurd was, from my point of view, no ordinary Kurd. He was a Kurd who knew about birds. He knew all the *Ansers,* in

fact—or so he told me. So I engaged him as my dragoman, unloaded my collection of ironmongery on to him, and we started for the distantly visible snow-capped summit of Ararat.

I could not help admiring the dexterity with which this Kurd utilised every fold or hollow in the ground, every sparse bush or tuft of coarse grass, every rock or crevice on our laborious ascent to deposit some priceless item of my scientific equipment, so that, long before we arrived at the summit, only the pocket Old Testament remained. (At least, I reflected, it might help us to identify the Ark).

Eventually, breathless both from exertion and from a state of nervous excitement bordering on hysteria, my Kurd and I gained the summit. And there, believe it or not, there—a few feet away from us, was the Bird—this fabulous Bird that I had come all these thousands of arduous miles to see, sitting there placidly, quite unperturbed, just as though it were visited every day by representatives of The Wildfowl Trust (Admin.) and Kurds! It just stared unwinkingly at us, quite unmoved. It couldn't care less. It was rather an awful moment, really. Here was I, trembling with excitment, and this Kurd behind me, giggling. And the Bird looking at us, too bored for words. I began to get uneasy.

" Do you think it isn't well?" I said, " Do you think it's got *aspergillosis*?" —wondering whether I ought, perhaps, to take a swab or something back for John Beer. (Could one take a swab on a page of *Deuteronomy* or *Leviticus*?). The Kurd was still giggling.

" What's so damn funny about that?" I asked. He was getting on my nerves. The Kurd said: " Ha! Ha! That bird—Him dead, long time!" I expressed, somewhat violently, I fear, the hope that the Kurd would soon be in a similar state for a comparable period, but he ignored this bit of Western charity in his eagerness to explain.

It had been dead, he told me, several hundreds of years. But, being a sort of distant cousin of the Phoenix (he had had this from a very learned Imam, who had it from a Turkish professor of some sort), it had succeeded in perfecting a technique of decomposing by day and recomposing by night. It occurred to me that we ought to name this unique bird, officially—now that we had actually found it, and, as it were, stake a kind of claim to it, on behalf of the Wildfowl Trust. It flashed through my mind to wonder what it would look like on a Trust tie. But, after all, it was really a Kurdish bird. So I said to this Kurd: " What's your name, my friend?" He answered " Ali Mohammed Sidi Ismael Nasr al Hussein Bey." But I thought that was a bit much, even for ornithological nomenclature, so we eventually settled for Ali, and with due solemnity named it *Anser anser anser anser Aliii* (S.), and left it at that. The Bird, which had just started, I think, to recompose, did not seem to mind.

But I just hadn't the heart to pick it up and take it back to Slimbridge. After all, if you are the only bird of your kind in the world, there is a lot to be said for living at the top of Mount Ararat—*au dessus de la mêlée*, so to speak . . . At Slimbridge, God knows what might happen to it. It could get a fixation on somebody—Geoffrey Matthews or Tim Sparrow, anybody, and it could be frightful for the poor old thing (the bird, I mean). I just couldn't do it. Indeed, for a moment, I was tempted to stay there with it myself. One could do worse . . .

Shooting of wild geese in cold weather

During the hard winter of 1962-63 geese and other birds suffered severely in many parts of Europe. A joint appeal to sportsmen by the Wildfowl Trust and the Wildfowlers' Association of Great Britain and Ireland, asking them not to shoot birds in places where they were obviously weakened by shortage of food, met with a good response from organised wildfowlers. But there continued to be a great deal of shooting by irresponsible people. The following letter received by the Trust provides a splendid example of effective action against this kind of behaviour. We publish it to draw attention to a means of helping the Trust's funds while encouraging respect for the law and for high standards of sportsmanship.

* * *

Helensburgh.

26th March, 1963

Dear Sir,

During the recent very hard winter I had a large number of wild geese sheltering and feeding in the fields in front of my house and with a bit of effort by our family we had managed to protect them from various so called " sportsmen ".

However, unfortunately on one occasion a lorry driver was successful in shooting one of the geese from his vehicle. My wife with the aid of field glasses was able to pick up the name of his employers on the lorry and I, in turn, when the matter was reported to me, was able to report the matter to the Company. Therefore, when the driver reported to his Depot he was informed that he could either be immediately dismissed or pay the sum of £5 to your Society. He preferred to do the latter and I have pleasure in enclosing a cheque for £5.

It is very difficult to understand the mentality of people who shoot wild fowl under conditions such as existed at that time; the creatures were starving on many occasions and barely able to fly. I was very glad indeed that I was able to trace the man.

So far as I am concerned, I have been shooting all my life but one only does a thing if it is reasonably difficult and I think to shoot one of these geese was like shooting ' a grazing cow '!

I have always been interested in your Society and should you care to send me an application form I would seriously consider asking you to accept my membership.

Yours sincerely,

JOHN L. ROXBURGH.

Waterfowl drowning accidentally under ice

OCCASIONS when waterfowl are accidentally drowned under ice must be extremely rare; in fact, we have been unable to trace any record of such a thing happening in this country, other than by swimming into underwater obstructions such as nets or, of course, in captivity.

On 17th March, 1962, a first-year Shag *Phalacrocorax aristotelis* spent the night roosting on a nesting raft on the wildfowl experimental reserve at Sevenoaks, Kent. During the night there was a severe frost and much of the lake froze except for an area of about 50 square yards around the raft. Apart from this, the nearest open water was across 100 yards of ice. At full daylight the Shag was seen to leave the raft and to swim around beside it for a short while before it dived. It never reappeared. Next day, after a thaw, it was found floating dead beside the river outlet from the lake.

At post-mortem, water was found in both lungs and in the trachea and had penetrated into the abdomino-thoracic air-sacs. It was interesting that in spite of being an obvious case of death by drowning, the lung tissue did not sink in water, the reason for this being that air from the air-sac systems of the bird must seep back into the lungs after death, particularly when the bird is handled. All the internal organs were intensely engorged and dark from venous congestion, as would be expected.

It is interesting to speculate how the young Shag came to make such a fatal misjudgement. The bird was one of a remarkable " wreck " of Shags, which was found in numbers widely distributed in south and east England. Being a temperate zone sea bird, it is unlikely that it had ever experienced ice before, certainly not under conditions such as on the night of 17th March, when large areas of fresh water froze over. It was this inexperience which was responsible for the fatal dive. " Wrecked " Shags appear to suffer considerable mortality. On 15th March, 1962, I. Crussell found four recently dead at Ruxley Ponds, Kent, and the circumstances were suggestive of drowning, although no examination was made of the bodies.

Experience is undoubtedly of great importance for survival under such conditions, for a number of Pochard *Aythya ferina,* Tufted Duck *Aythya fuligula,* Goosanders *Mergus merganser,* Smew *Mergus albellus* and Coot *Fulica atra* had been feeding by diving beside the ice for several weeks without any accidents and, of course, both the Eider *Somateria mollissima* and the Black Guillemot *Uria grylle* are able to winter in the high Arctic in Greenland, feeding by diving in the small areas of open water in the ice (Freuchen and Salomonsen, 1958, *The Arctic Year*).

It would be interesting to know what species of wildfowl are liable to drown under ice in collections such as the Wildfowl Trust. One would expect those diving species which lack any experience of ice under natural conditions to be the victims. On the other hand, their offspring bred in this country in captivity might be expected to learn about ice before conditions became severe enough to cause a fatal accident.

On 9th May, 1962, a duck Pochard, a pinioned bird kept in captivity, was drowned by getting its head caught between two rocks while feeding under water. At post-mortem, exactly similar findings were recorded as in the young Shag, including lungs which floated, but, of course, the accident occurred under artificial conditions.

James and Jeffery Harrison

Drowning in wildfowl

OVER a period of four years 16 cases of drowning in wildfowl have been found on autopsy. Ten were in birds from the Trust's collections and represented about 1% of the post-mortems on birds of similar ages to those under discussion. The cases are detailed below:—

Head caught in obstacle just below surface of water		
Spotted Whistling Duck *Dendrocygna guttata*	1st winter ♀ (full-winged)	Healthy
Chilean Pintail *Anas georgica spinicauda*	Fledgling ♀ (pinioned)	Healthy
Mallard (wild) *A. p. platyrhynchos*	Adult ♀ Adult ♂ Full-grown ♂ Full-grown ♂	Healthy Healthy Healthy Healthy
Cinnamon Teal *A. cyanoptera*	Adult ♀ (pinioned)	Pneumonia
Common Shoveler *A. clypeata*	Fledgling ♀	Pulmonary congestion
Australian White-eye *Aythya a. australis*	Juvenile ♂ Fledgling	Healthy Healthy
Trapped under ice		
Spotted Whistling Duck *D. guttata*	Adult ♀ (pinioned)	Healthy
Fulvous Whistling Duck *D. bicolor*	Adult ♀ (pinioned)	Healthy
Salvadori's Duck *Anas waigiuensis*	Adult ♂ Adult ♀ (pinioned)	Healthy Healthy
European Green-winged Teal (wild) *A. a. crecca*	Full-grown ♂	Pneumonia
Mallard (wild) *A. p. platyrhynchos*	Full-grown ♂	Healthy

Deposits of mud and dirty water were found in the respiratory tracts of the first group and the latter in the second group. In general the post-mortem findings were similar to those described by Harrison & Harrison (1963). It had been thought that drowning would have been the ultimate cause of death in more cases of diseased birds, through weakness and inability to keep the head out of the water. Only two birds showed macroscopic signs of disease and in each of the 16 birds the general condition was moderate to good, indicating an absence of chronic disease.

The circumstances leading to drowning involved either the bird being caught in some underwater obstacle or being trapped under ice. The birds were mainly Anatini with a few Dendrocygnini and Aythyini. Post-mortems on species in each of the other tribes in the Anatidae revealed no case of drowning. These cases, though small in number, indicate that the likelihood of drowning may to some extent be correlated with feeding habits, diving ability and experience of icy conditions.

The Anatini are surface- and shallow-water feeders and often search for food in small holes in banks just below the surface of the water. Occasionally the neck gets into a narrow part of the hole, trapping the bird which then drowns. The Mallard in particular seems to have a natural curiosity to search such holes, which may account for the four cases. The Spotted Whistling Duck is intermediate between the dabblers and the true diving ducks in that it feeds in shallow water but has considerable ability to dive in a coot-like manner in a search for food. The case detailed was trapped in a pipe just below the

water surface, presumably while searching for food. The two Australian White-eyes were in shallow water and were drowned in the same manner as the Anatini. Many of the diving species in the Aythyini, Mergini and Oxyurini can range freely under water in a search for food and are not likely to become trapped in normal circumstances. However drowning is known to occur regularly in the first two groups under artificial conditions where the birds are caught accidentally in deep-set fishing nets (Schorger, 1947; Gardarsson, 1961).

The liability to drowning by trapping under ice may be inversely correlated with diving ability and perhaps experience of icy conditions (Harrison & Harrison, 1963). The Anatini are not good divers and may be expected to have difficulty in getting back to the ice-free water, should the bird attempt a shallow dive and surface under the ice. The Teal and Mallard as species have experience of ice but possibly not as individuals. The Whistling Ducks, though good divers, do not range freely under water and should therefore normally surface away from the ice. However both they and the Salvadori's Ducks are tropical species and would not have experience of ice thus militating against their survival. Many of the Mergini are sea ducks and would seldom encounter ice except in the Arctic where a good ability to dive and experience of ice helps survival.

No case of drowning was found during the very cold weather in early 1963 even though some tropical species and poor divers were restricted to small areas of water on the Trust's ponds. This would suggest that the birds had gained experience from the 1961-62 cold spell and consequently escaped this particular cause of death.

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J. V. Beer

The rapid sexing of downy Anatidae by the structure of the syrinx

MANY species of the Anatidae show a marked sexual dimorphism of the syrinx due to the presence in males of an asymmetric or, in a few species symmetric, swelling or bulla; a structure which is a valuable taxonomic character (Johnsgard, 1961). During the routine post-mortem examination of downy young it soon became apparent that, with certain exceptions, this structure could be used for the rapid sexing of these birds even if decomposition or trauma had obliterated the gonads or reproductive tract. Similarly, the method could also be applied to well developed embryos and adult birds, and even to live day old ducklings (presumably domestic forms of *Anas platyrhynchos*) by palpation at the base of the neck (Kamar & Yamani, 1962).

Table I lists by genera, following the nomenclature and sequence used by Scott (1957), those birds that can and those that cannot be sexed by the presence or absence of a bulla. The list is based on the examination of a high proportion of the species as downy young and, where these have not been available, on the examination of adult birds. The latter appears to be valid

Table I: The bulla in the downy young of the Anatidae

Tribe	Genus	Bulla present: Detection easy	Bulla present: Detection difficult	Bulla 'absent'
ANSERANATINI				
	Anseranas			–
DENDROCYGNINI				
	Dendrocygna		+	
ANSERINI				
	Coscoroba			–
	Cygnus			–
	Anser			–
	Branta			–
TADORNINI				
	Tadorna	+ +	+	
	Alopochen	+ +		
	Neochen		+	
	Cyanochen	+ +		
	Chloëphaga	+ +		
	Cereopsis			–
	Tachyeres	+ +		
	Lophonetta	+ +		
ANATINI				
	Anas	+ +	+	
	Hymenolaimus	+ +		
	Malacorhynchus	No description available		
	**Rhodonessa*	+ +		
	Stictonetta			–
	Merganetta		+	
SOMATERIINI				
	Somateria	+ +	+	
AYTHYINI				
	Netta	+ +		
	Aythya	+ +		
CAIRININI				
	Amazonetta		+	
	Chenonetta	+ +		
	Aix	+ +		
	Nettapus			–
	Sarkidiornis	+ +		
	Cairina	+ +		
	Plectropterus	+ +		
MERGINI				
	**Camptorhynchus*	+ +		
	Melanitta		+	–
	Histrionicus	+ +		
	Clangula	+ +		
	Bucephala	+ +	+	
	Mergus	+ +		
OXYURINI				
	Oxyura			–
	Biziura			–
	Thalassornis			–
	Heteronetta			–

*Extinct genus

since in every species to date, even though considerable development may occur as the bird grows older, a bulla has always been present in the downy when present in the adult. In a few cases descriptions in the literature (Johnsgard, 1961) have been used. Many downies have been sexed by this method and by the more conventional method and in no case did they

disagree. However, the author has seen one bird, an adult Mallard *A. platyrhynchos,* with full male plumage but with no bulla.

In using this table there are a number of points that should be kept in mind. The males of all species in a genus either have or do not have a bulla, except *Melanitta* in which one of the three species, *M. nigra,* has no bulla. Those genera in which a bulla is present have been divided into two groups, easy and difficult. In the former the bulla is obvious in the downy young but in the latter the small size of some species or symmetry, as in *Dendrocygna,* makes detection less easy. Some genera, such as *Tadorna,* have species in both categories. The third category mainly comprises the Anserini and Oxyurini with no bulla, or with a bulla that is so small, as in *Nettapus,* that no useful distinction can be made.

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J. V. Beer

The production of offensive excreta by nesting wildfowl

MANY ducks defaecate when suddenly flushed. In the wild the habit may be very common: for instance Bennett (1938) reports that 75 *per cent* of incubating Blue-winged Teal defaecated on the nest when disturbed. Most observers have stressed the invariably foul smell of these faeces. At Slimbridge, where 160 Mallard nests in the Decoy Wood were inspected daily in 1961 and 1962, less than a quarter of the females left droppings on their eggs. Only three females out of 100 in 1961 and four out of 60 in the following year produced stinking, yellow, semi-liquid faecal material. These individuals reacted in the same way throughout the incubation period; furthermore, one nest-site was graced by a female with evil-smelling droppings in both years, possibly the same bird.

The smell is so memorable that, together with the contrast between the Slimbridge observations and those reported in the literature, it provoked an otherwise unlikely consideration of offensive excreta and their possible advantage to the nesting duck.

When a bird is frightened the rectum is prematurely emptied, a simple reflex action which lightens the bird for the escape flight. Because of the general abdominal spasm, fright also produces an evacuation of the caecae. This applies to ducks flushed from water, cover or their nests. The normal production rate of caecal droppings in Mallard is uncertain but in geese is in the ratio of 1:6 or 7 rectal faeces. Caecal droppings are homogeneous, moist and brightly coloured (the exact colour depending on the diet) and always more odoriferous than ordinary excrement though not offensive. Since the caecal constituent is present in droppings of flushed incubating Mallard, it may be responsible for the characteristically evil odour.

In many species studied in the wild the females leave the nest of their own accord only once or twice each day and these departures become less frequent as incubation proceeds. On leaving, the bird covers the eggs with down and defaecates voluminously after taking wing. She may wash and preen, feed sparingly and then return to her nest. There she remains, much longer than the two to four hours that the meal normally takes to pass through the gut. Under these circumstances there is unusual retention of food remains and, at body heat, every likelihood of the production of odoriferous compounds. The chemical nature of these is unknown but they may be derived from indole and skatole, which are formed by putrefaction of proteins, or from some volatile ester. The smell disappears as the faeces dry, suggesting that an ester is involved.

From this argument it follows that the bird that sits longest is likely to produce the smelliest faeces. While there is no direct evidence that this is so, it could account for the difference between observations on ducks in the wild and at Slimbridge where foul droppings are the exception rather than the rule. McKinney (1953) found that Slimbridge Mallard to some extent time their absences from the nest by the feeding of birds in the collection and left at least twice daily in response to sounds from the pens. There was, however, considerable individual variation. Protection from certain ground predators and the availability of ample supplies of food close to the nest may be the reason for the relatively frequent feeding of many of the Slimbridge breeding birds. In any event, their feeding regime seems to be far more regular than one might except in the wild.

Further, in species where both sexes incubate, such as the geese, or where there is frequent feeding and defaecation, the smell of the droppings is not noticeable. C. Young (personal communication) says that the hole-nesting Shelduck do not miss a meal while incubating nor do they foul their nests. They may produce solid faeces made of mollusc remains after being flushed from their burrows but the caecal portion of these is not particularly conspicuous and the smell is inoffensive.

On the other hand, incubating Eider Ducks tend to sit tight but when flushed always produce offensive droppings (*e.g.* Beetz 1916). The normal faeces of the Eider are well formed, composed of ground-up mollusc shells and smell merely fishy, while those of nesting females are green, slimy and of a frightful odour. These birds do not feed at all during incubation (the bile and droppings of unfed ducks are always green). Although the females may drink every two or three days, there is unlikely to be a complete intestinal evacuation for four weeks unless the bird is flushed. When this happens, the stored gut contents, such as green bile, urates from the kidneys, food remains and bacterial cells plus the caecal fluids, are violently ejected.

It has sometimes been suggested that the shedding of faeces on the nest has survival value. Wright (1954) thought it possible that the Black Duck made a deliberate attempt to camouflage the eggs which she had not had time to cover with down. Williamson (1949) regarded the habit as a distraction display in Eiders, a behaviour pattern evolved from the purely reflex action of defaecation. The smell is certainly so nauseating that one might well suppose it could act as a deterrent against egg-eating mammals. Gross (1938) believed that the unexpected spray of filth as the Eider sprang might confuse or discourage certain enemies and several authors have stated that neither foxes

or dogs will touch a fouled Eider's egg (Beetz, 1916; Salomonsen, 1950; Bannerman, 1958). Against this is the fact that the faeces frequently land beyond the nest and that the smell lasts only as long as the excrement is wet. It quickly disappears from the warm eggs; in the Eider (Beetz, 1916) this takes ten to fifteen minutes after which the material falls off as an unobjectionable powder.

The only experimental approach to the problem was that made by Hammond & Forward (1956). They suggested that, far from frightening predators, the smell of the faecal material may increase the chances of discovery by egg-eaters, at least where prairie ducks are concerned. They set up a series of six trials and scented hens' eggs with excrement from nests. In one case there was significant evidence that odour increased egg loss, in the others there was little difference in the predation rate between fouled eggs and the unscented controls. No deterrent effect was found and, indeed, a dog showed no abhorrence for the odour or for eggs covered with faeces. It would be interesting to make similar trials with Eider droppings.

It certainly seems that defaecation when flushed from the nest is a reflex action on the part of the duck; that any spattering of the eggs is purely by chance, and that the evil smells are produced simply as a result of constipation through lack of exercise and regular feeding. The possibility remains that some females are more prone to this than others, either because they sit more tightly or because of some physiological disorder.

I am very grateful to M. A. Ogilvie for his observations on Mallard nesting at Slimbridge in 1961 and 1962.

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Janet Kear

Heavy mortality of Mute Swans from electrocution

ON 25th April, 1962 I came across a remarkable number of Mute Swans *Cygnus olor* which had been killed by electrocution on flying into an overhead cable, fitted with a " high speed automatic recloser system ", to ensure that the resulting " swan fault " would only last for a few seconds. The cable, consisting of three lines, is sited about 10 yards above the ground and carries electricity to a large isolated farm on Romney Marsh, Kent. The route crossed the regular flight line of a herd of Mute Swans, which had been roosting on a farm reservoir and grazing on winter wheat in the early part of the year. The

flight line extended for about a quarter of a mile and in this distance beneath the cable there were the bodies of 21 swans, almost all of which appeared to have been killed within the previous one or two months, when up to 70 swans had been using the reservoir, of which 90% were adults. This proportion was reflected in the 21 dead, all of which were adults except two. If the flock was composed of the same birds during this period, which is a reasonable assumption, then the cable caused a mortality of 30%. It might seem surprising that the swans had not learnt to avoid the cable, which is easily visible, but one does not know at what time of day most were killed. Certainly a number caused " black-outs " at the farm during the evenings, when of course the cable would be difficult or impossible to see. Judging from the state of the bodies, the rate of kill had been fairly evenly distributed during the period. All except four, which were in water too deep to reach, were examined for rings and three adults carried them. They had been ringed as follows:—

23rd April, 1960, at Lydd, Kent, full-grown male. (Dungeness Bird Observatory);
1st August, 1960, at Lydd, pull. (Dungeness Bird Observatory);
10th March, 1961, at Maidstone, Kent, first-winter. (Mid-Kent Ringing Group).

Jeffery Harrison

Aspergillosis in an immature Bewick's Swan

An immature male Bewick's Swan *Cygnus columbianus bewickii* was present at Maidstone, Kent, by the town bridge over the Medway, from 10th January to 14th February, 1962 when it was found dead. It was brought over to Sevenoaks by Mr. E. G. Still, to whom I am indebted for the specimen. It had previously been ringed by Mr. Eric Philp. The bird was autopsied on 16th February when the sex was established anatomically. There was no wasting and in fact, the bird could be described as in fat condition; death was clearly attributable to acute aspergillosis. The main fungus mass was in the bronchial tree, from whence it had infiltrated the abdomino-thoracic air-sac. It seems likely that the fungus had been ingested with bread fed to the swan by the general public. It had joined a herd of Mute Swans and had become completely tame.

I am indebted to Dr. Keith Randall, Consulting Pathologist to the Orpington and Sevenoaks Hospitals for investigating the fungus, and to Mr. A. H. Heather for culturing the fungus, which has been identified as *Aspergillus fumigatus.*

James M. Harrison

The wedge-shaped yellow area on the bill of a Bewick's Swan

An opportunity to observe wild Bewick's Swans *Cygnus columbianus bewickii* from only a few yards occurred at the Wildfowl Trust, Slimbridge, Gloucestershire on 24th November, 1962, when towards the late afternoon fifteen flew into the enclosures, of which eight alighted on the largest pool in the Big Pen. An adult particularly attracted my attention because although its bill conformed in shape and size to that of the western race (*bewickii*) the area of

yellow on the side of the upper mandible was wedge-shaped and extended about an inch beyond and below the nostril, while in addition there was a narrow yellow area near and parallel to the cutting edge of the mandible. Even at so close a range, when comparisons with its companions were relatively easy, my immediate reaction leaned towards it being a Whooper Swan *C. c. cygnus,* because the bird's bill closely resembled in pattern that of the latter species. I. C. T. Nisbet (*British Birds* 52 : 393-416. 1959) considered that 5 to 10 *per cent* of the large influx of Bewick's Swans into Britain in 1956 may have been misidentified as Whoopers. B. King (*Wildfowl Trust 11th Ann. Report* : 156-7. 1960) observed two large-billed Eastern type Bewick's (*jankowskii*) at Durleigh Reservoir, Somerset, in February of the same year, which could have been thought to be *C. c. cygnus.* The details of the Gloucestershire bird described above emphasise the possibility of mis-identification of the two species in an appreciable proportion of cases.

Bernard King

An Eastern Greylag Goose in Somerset

WHILST on a visit to the Bridgwater Bay National Nature Reserve, Somerset, on 8th April, 1962, I observed a Greylag Goose *Anser anser* flying from Stert Island towards the saltings named ' The Fenning '. As the goose flew overhead and gradually descended I could see the large grey areas on the wings very well. It soon alighted on the saltings about 150 yards from where I was partly concealed, and stood on the alert for long periods, feeding intermittently. I was able, using a x 40 telescope, to obtain details of the bird's plumage: head and hind neck light brown; mantle brownish-grey, with conspicuous whitish or light narrow barring on mantle and scapulars, formed by well defined paler edgings of individual feathers; primaries and secondaries also pale edged and noticeable from a distance; tail brown, broadly tipped white; front and side of neck pale to whitish buff; paler on rest of very light under parts. The bill appeared clear pink with a whitish nail; the legs were the same colour as the bill. The bird was not ringed. It appears to be an example of the race *A. a. rubrirostris,* breeding in southern Russia. The possibility of the bird being an escape cannot be ruled out, although Mr. S. T. Johnstone, Curator of the Wildfowl Trust, Gloucestershire, informs me that there are no full winged *rubrirostris* or hybrids in the collection at Slimbridge; nor does he know of any ' free ' Eastern Greylags in collections elsewhere. In the *Wildfowl Trust 7th Ann. Report* : 13. 1953, mention is made of three Greylags thought to belong to a Baltic or Russian population staying in or around the Trust's enclosures from 21st December, 1953, to 30th March, 1954. I saw those geese several times. The Somerset bird was even paler in appearance and its bill, except for the nail, was pinkish throughout. Peter Scott and Hugh Boyd state in *Wildfowl of the British Isles* (p. 22. 1959) that pale, pink-billed birds probably of Continental origin have been recorded as stragglers, but few detailed descriptions of such birds have been published. It seems desirable that more attention should be paid to the appearance of Greylags occurring outside their usual haunts in this country, to see how often geese from eastern populations are to be found.

Bernard King

Canada Goose and Great Crested Grebe sharing a nesting raft

A GREAT deal of interest has been expressed about the wildfowl nesting rafts which are in use at the gravel pit experimental wildfowl reserve at Sevenoaks, which we described in the *13th Annual Report* (pp. 101-8). These rafts are of two types: the first, 12 x 12 feet square, is made of three metal float tanks welded together, to give a buoyant platform with a foot of freeboard; the second type has a float tank at each end with a lower central portion of railway sleepers, the surface of which is only a few inches above water level. In 1961 we only had one of the latter anchored on the east lake of the reserve. This was successfully used first by a pair of Canada Geese *Branta canadensis*, which nested high up on a float tank. When they had gone a pair of Great Crested Grebes *Podiceps cristatus* built a nest of sticks on the lower central portion and hatched off two young in early September. In that same summer, another pair of grebes on the west lake nested first on a gravel bank at the south-west corner, using sticks for their nest. They lost their clutch when the eggs were flooded following a severe thunderstorm. They then built a floating nest close to the north-east corner of the lake, but lost their eggs again, probably to boys.

By the summer of 1962, a second raft of the same design had been made for us by the owner of the Company, Mr. George Wallis, and had been anchored on this lake " especially for the grebes ". By 28th March a pair of Canada Geese were nest-building on it, choosing the elevated float tank for the nest site, as did the pair nesting on the similar raft on the east lake. By 3rd April, a pair of Great Crested Grebes were building a large nest of sticks on the exact site of last year's nest on the gravel bank at the south-west corner of the lake. Presumably, they were the same pair. On 15th April, we noted that all six rafts on the reserve were occupied by nesting Canada Geese. By a remarkable coincidence, a severe storm on 20th April resulted in the grebe's nest being submerged for the second successive year. The birds immediately deserted, to build a new floating nest at the old site under a willow tree at the north-east corner. This was different from their behaviour in 1961 when the birds returned and incubated their eggs for a further four days after they had been immersed in water for three days. By 2nd May, 1962 an egg was laid in the second nest, but this too suffered a similar fate and disappeared. On 8th May, a grebe was seen on the railway sleeper portion of the new raft, watched without concern by the sitting Canada Goose, and next day both birds were incubating peacefully within six feet of each other, the goose looking down on to the grebe from its higher resting position.

On 16th May the goose hatched off four goslings, which both parents brought back to roost with them on the raft for the next few nights. We feared that the grebe might be frightened off when this happened and that the eggs might be trodden on or knocked into the water. No such accident occurred and on 6th June four grebes were also hatched off. The Canada Goose has a bad reputation for interfering with other birds in the nesting season and it seems remarkable that this one accepted the arrival and nest-building of the grebe within six feet of her during the last fortnight of incubation and in such a restricted area as on a 12 x 18 foot raft.

We are very grateful to Pamela Harrison for the photograph illustrating this note. In order not to disturb the birds, it was taken at 60 yards with a

400 mm. telephoto lens. We are also entirely indebted to Mr. George Wallis for the design and construction of the rafts and to the men of his Company for their enthusiastic help.

James and Jeffery Harrison

Observations on nesting Shelduck

THE Shelduck *Tadorna tadorna* remains a considerable enigma. Only during the last twenty years has the fascinating pattern of its moult migration been discovered, and many aspects of its breeding biology remain shrouded in uncertainty. The main reason for this lack of knowledge is that the species usually nests in holes and, whilst its choice is catholic, the difficulty of observing behaviour at such nests is considerable. Full protection and the bird's unpalatable flesh have also helped to limit knowledge insofar as the species is of little interest to wildfowlers and in consequence research prompted by economic and harvesting considerations such as has taken place on other species of waterfowl has been lacking. My own studies on Shelduck have been made in the Thames estuary in Kent, where the species is an abundant winter visitor and also breeds commonly. In this short paper some features of the habits at the nest are described. It is hoped to publish a more complete account of the breeding biology later.

The two most common nesting situations in my study area are in stacked hay and in trees; all the observations described here were made at such sites. Tree sites are especially fascinating and one of the most strangely beautiful experiences for anyone interested in ducks is the sight of a pair of Shelduck circling and flighting through the fresh green foliage of upland tree screens in May and early June, particularly when the presence of a nest is known with certainty. I have described elsewhere the hiding reaction of a female and brood when surprised at the nest (Hori, in press). Since that observation I have recorded a number of identical reactions from incubating birds. Typical was that of a female on 3rd June, 1962. This bird was nesting in a hollow bough of a pollarded elm about fifteen feet from the ground and had been under observation since late May. As is often the case with such trees, not only was the trunk hollow but so were the stumps of old boughs which ringed the top of the trunk forming a series of holes or antechambers off the trunk, with access from inside only. By 3rd June the ten eggs were in an advanced state of incubation. On climbing the tree that morning I detected movement inside and was just in time to see the female finish covering the eggs with down, slip quietly out of the nesting hole and steal into an adjacent hole. She went to the far end of the latter, some two feet long, and flattened herself against the end. This clutch was subsequently hatched on 10th June. Another example of the same behaviour was recorded from a bird nesting in a haystack. This nest was approximately twenty feet above the ground in a " blind " hole some twenty feet long. Here the bird had obtained its hiding place by building the nest fifteen feet from the entrance, thus giving itself another five feet behind. When disturbed the bird would leave the nest and hide in either the approach or the rear tunnels, usually the latter. Only in the event of severe disturbance would it leave the site altogether. When the entrance hole was blocked it would merely slip quietly into the rear hole.

I have now witnessed the hiding and escape behaviour so often that I consider that whenever Shelduck nest in holes they always have an escape tunnel associated with the nest hole. So far, most of the escape holes I have found have been " blind " and the female has left the nest to hide in them whenever danger threatened. A few holes have been alternative exits from which sitting females escaped when necessary and one " open site ", inside a building, had a separate hiding tunnel. My observations lead me to believe that as long as the danger is not too great or too sudden, the female covers her eggs before leaving them, as do most of the Anatidae. In a paper by Captain F. W. Dewhurst (*British Birds* 24 : 66-9. 1930), among other interesting but unsubstantiated comments, I was surprised to find the statement " very often a bolt-hole connects with the nest ". This referred to nests in rabbit-holes and, although I have not opened any of these for examination, I have very little doubt of the accuracy of the statement.

Birds incubating in stacked hay will accept a remarkable amount of disturbance. One female that I had under observation for most of June, 1962 had 18 eggs in a nest five feet along a hole in hay. To test her attachment I gradually " opened up " this nest until, on 24th June, it was virtually an " open site ", i.e. it was about two feet from the face of the stack and when the bird sat she remained in full view from the outside. On 24th June she remained sitting and looking at me while I photographed her from four feet range. Three days later the nest was almost buried when a load of freshly cut hay was stacked on top of the old. An access hole was made through the new stacking to correspond with the previous entrance and the bird continued incubating. Another female with twenty eggs was found during delivery of the same hay. As the eggs were already chipping one of the farm workers made up a " pen " from bales and transferred the clutch and female into it. The bird was given her freedom next evening when she led her brood away as though nothing had happened.

Shelduck can be relatively fearless on the nest. A tree nesting female who was under observation for the whole of her incubation period in 1962 always walked off her eggs to hide in an " escape tunnel " during the first seventeen days of my visits. I last saw her on 30th June when she hissed at me very loudly each time I looked into the hole. I had to push her very hard to move her off the eggs and all the while she banged and buffeted my hand with her wings and bit repeatedly. On examination I found the eggs had not chipped, but the chicks could be heard scraping about inside quite plainly. This was exactly thirty days after the bird started incubating.

Hissing by sitting females is another habit which I have met with commonly and it appears to be the general reaction to predators. An occupied rabbit warren can frequently be identified by listening carefully for the hissing threat of the female. Once caught, the females are generally passive and their gentleness makes them extremely attractive to handle. Indeed some of the birds my wife and I have had under observation in the wild have become great favourites whom we look forward eagerly to meeting again in the future.

John Hori

Additional Note: As the proof of this paper passes through my hands, the incredible has happened. After a moult migration and a winter of unprecedented severity, AJ 62813, the " fearless " female mentioned above, incubates 10 eggs in precisely the same hole as the one she used in 1962. J.H.

Congenital malformations of the feet in Mallard ducklings

DURING the 1961 breeding season at the Wildfowl Trust all ducklings in the collections, and all eggs that failed to hatch, were examined for deformities. Six examples of abnormal congenital development of the beak and skull have already been described (Harrison & Kear, 1962); in addition, one Mallard brood, hatched by a wild female that nested within the enclosures, contained a number of polydactylous ducklings.

The figure shows the three types of deformity found : (a) complete duplication of hind toe, (b) enlargement of middle toe with duplication of nail and terminal phalanges, (c) abnormal proportions and positioning of the toes. Seven ducklings of the brood had normal feet, two showed all defects on both feet, the tenth bird had all defects in one foot and (b) and (c) in the other, and the eleventh duckling had defects (b) and (c) of both feet.

The embryonic limb bud has a core of undifferentiated tissue, the mesenchyme, which is condensed and replaced by cartilage at the site of the long bones and separates into bars corresponding to the digits of a pentadactyl limb. The influence of a special region of the distal ectoderm, the apical ridge, appears necessary in many vertebrate groups for the growth and segregation of the mesenchymal components of the distal part of the limb (Saunders, 1948). Since the digital condensations have a specific size, any genetically-determined increase in the mesenchymal plate corresponding to the future foot will result in an excess of digital bars being produced (polydactyly). Where residual amounts of mesoderm are too small to form whole digits, only partial separation of the bars occurs (syndactyly).

Apart from genetic failures, various external factors may upset normal embryonic development, such as excessive ranges of temperature, X-ray irradiation (Bagg, 1929) and the administration of certain drugs. The variations in extent of the deformity in the brood described here make it likely that the condition was of external rather than genetic origin. The relatively high proportion of abnormality among ducklings in 1961 (10 out of 1767 examined) did not recur in 1962 (0 out of 934 examined), suggesting some specific injurious factor affecting, in one year only, a number of the breeding birds at Slimbridge.

A minor degree of digital malformation such as this allows almost normal function. The effect of an increased number of digits may, however, alter their positioning and the increased trauma at the joints can lead to arthritic changes in captive birds.

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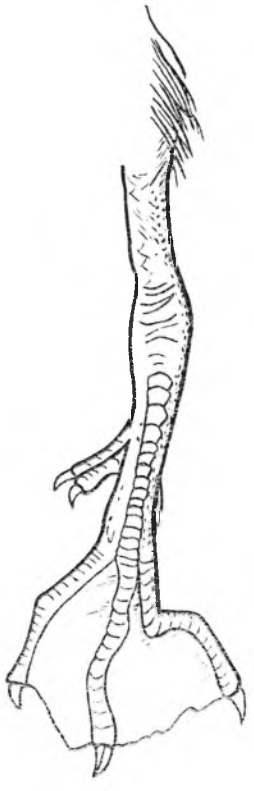
Anthony Napier



Foot of Mallard *Anas platyrhynchos* (5th May, 1961) showing polydactyly.

Mallard at sea off the west coast of Ireland

On a recent crossing of the North Atlantic from Montreal to Swansea aboard the s.s. " Birmingham City ", when about 190 miles west of the south-western Irish coast, I saw two Mallard *Anas platyrhynchos* flying round the ship. They were first seen at 18.30 hrs. on 2nd November, 1962, when the ship's position was 52° 15½′ N, 15° 26′ W. One was a female, the other a male in juvenile or partial eclipse plumage. They flew around the ship many times, occasionally very close, but made no attempt to land on board. They remained for about fifteen minutes before flying astern and being lost from sight in the heavy seas.

The Mallard twice alighted together on the sea near the ship, swimming uneasily until several Fulmars *Fulmarus glacialis* approached. The Fulmars were very curious about the ducks and on the second occasion about ten Fulmars settled around them, with others still in flight. The Mallard took off, closely followed by all the Fulmars which, however, soon lost interest and resumed criss-crossing the wake.

Stephen E. Chapman

Feeding association between Shovelers and Little Grebes

DURING the first two weeks of September, 1962, I made at least six early morning visits to a large pool at Marazion Marsh, Cornwall, where 15 to 30 Mallards *Anas platyrhynchos* and two female Shovelers *A. clypeata* were feeding. As they fed by up-ending it seemed as if the Mallards paddled with their feet primarily to maintain a vertical position whereas the Shovelers differed by using their feet vigorously to stir into suspension the sediment from or near the bottom of the pool. Two Little Grebes *Podiceps ruficollis,* an adult and an immature, were close to the Shovelers and eagerly dived into the cloudy water areas made by their active companions. Every time the Shovelers moved to new feeding grounds the grebes followed and sometimes scurried across the water in their eagerness to be near their benefactors. On no occasion did the Little Grebes attempt to associate with the Mallards. The use of Shovelers in this way by grebes does not seem to have been recorded.

Bernard King

Winter feeding behaviour of Red-crested Pochards

ON 17th November, 1962 a pair of Red-crested Pochards *Netta rufina* and an unattached male were found among at least 400 Common Pochards *Aythya ferina* at Cheddar Reservoir, Somerset. The Red-crested Pochard kept close together. During prolonged observation it became apparent that their method of feeding differed markedly from that of their companions. Whereas the latter fed below the surface of the water with some birds making throat-gulping movements immediately on emerging, the *rufina* always brought their food to the surface and then pecked at and swallowed the vegetation as it lay strewn on the water. This food was invariably obtained by the male of the paired Red-crested Pochard and commonly the male, after surfacing, swam close to its mate and so ' drew ' her towards the vegetation, which both birds then ate. It was rare for the female to obtain her own, but when she did so she showed no inclination to share it—and nor did the unattached male. E. H. Gillham (*British Birds* 48 : 322-3. 1955) has drawn attention to breeding pairs of Red-crested Pochards, both tame and wild, in a London park, in which the males fed their partners and E. J. M. Buxton (*Wildfowl Trust 13th Ann. Report* : 170. 1962) describes ' courtship feeding ' by pinioned and full-winged *rufina* on a private water in Wiltshire. Buxton noted this behaviour at all times from February to June. The Cheddar observations suggest that when individuals remain paired the practice of the male obtaining food and feeding the female may be normal well beyond the nuptial and breeding periods.

Bernard King and Robin Prytherch

Communal diving in turbid water by Red-breasted Mergansers

DEREK MILLS' interesting paper (*Wildfowl Trust 13th Ann. Report* : 79-92. 1962) on the distribution, breeding and feeding behaviour of Goosanders *Mergus merganser* and Red-breasted Mergansers *M. serrator* in Scotland prompted us to make prolonged observations on parties of Red-breasted

Mergansers diving to feed in the turbid water of the tidal River Teign, Devon, during November and December, 1962. The numbers varied from seven to twenty-four birds, comprising adult males and females (some of which were obviously paired) with a few recognisable immatures. They formed, if undisturbed by boatmen, into fairly compact flocks, and swam and dived in the same direction, although odd birds did so a few seconds before or after the main party had disappeared below the surface. We were able to make forty-three accurate stop-watch timings of their communal diving. These showed that the majority were below the surface within three to four seconds. The exceptions were the odd birds previously mentioned (approximately 20%); even including these, all were completely submerged within eight seconds. The average time below the surface was 17.4 secs., maximum period 29 secs. and minimum 13 secs. During one feeding period which included ten consecutive dives the dive-pauses averaged 7.3 secs. and were of the following duration: 2, 7, 10, 12, 10, 7, 3, 10, 5 secs.

On four separate occasions we observed three adult males and one female emerging with fish in their bills which were immediately swallowed. Otherwise, judging from the swallowing movements noted from other birds surfacing, ingestion had taken place whilst the sawbills were still submerged. Not once did we witness a Red-breasted Merganser on the surface with head partly submerged whilst searching for fish, and this method of feeding may be of little use when feeding in turbid waters.

Paul Hending, Bernard King and Robin Prytherch

Gulls "parasitising" ducks and other birds

THE note on Goosanders " parasitised " by Black-headed Gulls (*13th Annual Report* : 172-3. 1962) records a form of behaviour that I have regarded as quite normal for a very long time. The Black-headed Gull *Larus ridibundus* is certainly the worst offender and perhaps the first to have developed the habit in this country. On 9th September, 1950 at Aldenham Reservoir, Hertfordshire, I saw three gulls attacking two Herons *Ardea cinerea* that were carrying fish. On 14th October of the same year at some gravel pits near Radlett, Hertfordshire, five gulls were mobbing a Moorhen *Gallinula chloropus,* but I could not see if this was for the purpose of causing it to drop food. At Tring Reservoirs, Hertfordshire, on 15th November, 1953 two Black-headed Gulls attacked a Great Crested Grebe *Podiceps cristatus* whenever it surfaced with fish. On 22nd November at Radlett, two gulls were parasitising a party of Tufted Duck *Aythya fuligula,* and one actually alighted on the back of a duck and snatched something from the bill (see Sage, 1955). At Aldenham Reservoir, on 5th December, 1954 I again saw Tufted Duck being subjected to the same treatment. So far as Goosander *Mergus merganser* are concerned, Boyd (1944) mentions a flock of 40 being attended by Black-headed Gulls, and also a Smew *Mergus albellus.* During January-February of 1959, 1960 and 1961 numbers of Goosander were present at Tring Reservoirs and these were invariably attended by Black-headed Gulls. I first noticed an interesting extension of this habit at Thundridge, Hertfordshire, on 28th November, 1959 when these gulls were attending a flock of Lapwings *Vanellus vanellus,* which were attacked by one or more gulls whenever they picked up food. I have since seen this particular

association frequently in many different parts of the country. Both Boyd (*op. cit.*) and Glegg (1944) mention Goldeneye *Bucephala clangula* as another victim of this behaviour, and the former also mentions the Little Grebe *Podiceps ruficollis*.

The only record I have for the Common Gull *Larus canus* is from Hilfield Park Reservoir, Hertfordshire, where on 26th February, 1961 three adults were attending a flock of about 40 Wigeon *Anas penelope*. The ducks were bringing up Canadian Pondweed *Elodea canadensis* and on several occasions this was snatched by the gulls. Generally it was dropped again later, but several times I saw it swallowed by a gull. Boyd (*op. cit.*) mentions this species parasitising Great Crested Grebes.

I also have one record of Herring Gulls *Larus argentatus* indulging in this habit. On 3rd December, 1961 at Hunstanton, Norfolk, a number of adults and immatures were attending a scattered flock of about 150 Common Scoter *Melanitta nigra* and 37 Eider *Somateria mollissima* a short distance offshore, and I once saw a gull alight on the back of a surfacing Eider.

Bryan L. Sage

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The calls and displays of African and Indian Pygmy Geese

LITTLE is recorded about the sounds made by Pygmy Geese and the situations in which they may be made. Both the African and Indian species *Nettapus auritus* and *N. coromandelianus* have now lived for several years at Slimbridge and I have had many incidental opportunities of hearing their calls. The following notes summarise my records, though I do not claim to have made a complete inventory of the utterances of either species.

African Pygmy Goose. Delacour in *The Waterfowl of the World,* vol. III, p. 114 (1959), describes the voice of the male as " a soft, twittering whistle ". This general description applies to at least four different utterances used in different situations. In displaying to its mate on land the male holds its bill well down its breast as it utters a musical " chip, chip, chirrup, chiroo " which could be described as a song. When the male is excited it utters an explosive " chip, chip, chip " or " chip, chip, chirrup " with the neck extended, the head raised and the bill shaken up and down. This is used in greeting the female on returning from chasing off an intruding male and as a flight call after disturbance. A quiet, less demonstrative version of this call serves as an anxiety note.

When cornered, a single male often makes a hissing sound, though usually it threatens silently by just opening its bill.

The female responds to the " song " of the male with a sharper twittering whistle while bobbing her head up and down excitedly. A male returning from successfully repelling an intruder is greeted similarly. A subdued version of this twittering whistle occurs as an anxiety call. Sometimes this is uttered slowly (e.g. when a gull was flying over) and is then rather similar to the

" chip, chip, chip " of the male, though definitely more musical, even if with a querulous tone. According to Delacour the female's only sound is " a weak quack ". This I have not heard.

Indian Pygmy Goose. My observations have been made on three groups—the first consisting of one male and three females, the second of three young males and five females and the third of two young males and one female. I have heard four or five calls from adult males — (1) a nasal " grrr " used aggressively; (2) a nasal song " rick, rick, re-oo "; (3) a quiet rather nasal " quack " when anxious; and (4) a metallic " chak, chak, chak ", also when anxious. The young male in the third group uttered the nasal quack when being handled and the metallic " chak, chak, chak " after being released. The adult male in the first group once called " wak, wak, wak-a-wak " when driving off a female. This may be distinct or perhaps just a modification of call (4). The " song " is presumably the noise described by Delacour as " a curious rattling, metallic cackle, which is heard mostly on the wing ".

According to Delacour " the female is usually silent but can utter a weak squeaking note ". In the groups at Slimbridge two or three calls have been distinguishable: (1) " tuck-it, tuck-it ", in aggression or excitement when disturbed; (2) a conversational, musical " tick-a-tick-a-tick "; (3) " wick, wick, wick " like a rusty hinge, also conversational and probably when anxious and perhaps not really distinct from (2).

Few of the Indian Pygmy Geese have been seen to display, but Mrs. Peter Scott has photographed the behaviour of a pair before, during and after copulation. These photographs are reproduced in the gravure section of this Report. In the incomplete displays of a male to an unresponsive female which I have seen, the male dipped his bill frequently into the water on one occasion and on another bobbed his head up and down excitedly. In both cases he uttered no sound.

L. P. Alder

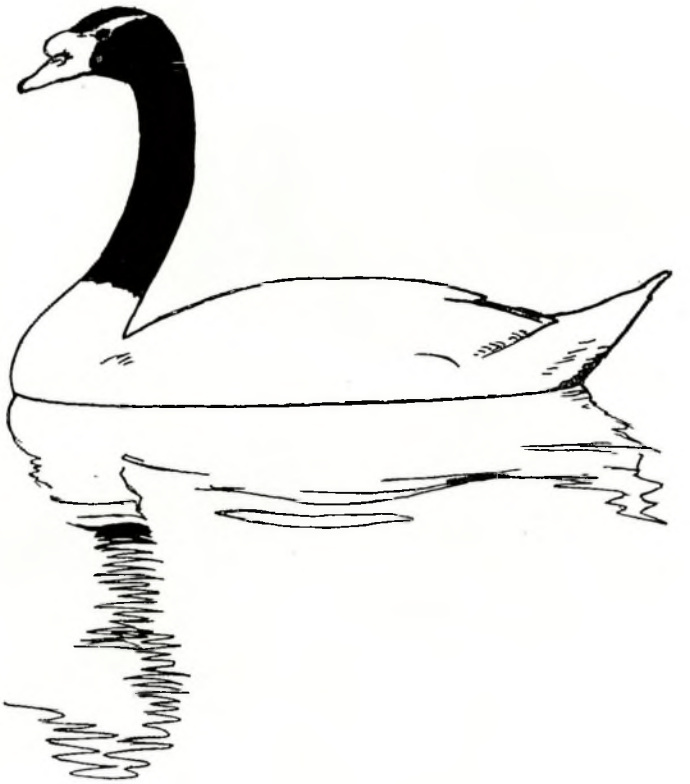
Pigmentation of the bones of certain Eiders

We have grown accustomed to the purple pigmentation found in the bones and teeth of Sea Otters *Enhydra lutris,* traceable to pigments in the Green Sea Urchin *Strongylocentrotus drobachiensis,* a primary item in the Sea Otters' diet. Such stomach samples of the Pacific subspecies of the Common Eider *Somateria mollissima v-nigra* as we have observed also contained specimens of the Green Sea Urchin. We were not, therefore, surprised to find the bones of these same eiders distinctly purple, presumably from the same pigmentation source. This observation has proven of great value to us in the identification of bird bones recovered from the nests of predaceous birds. Cottam in " Food Habits of North American Diving Ducks " (US Department of Agriculture, 1939), lists the Green Sea Urchin as forming part of the stomach samples examined from all three North American subspecies of the Common Eider and from the King Eider. As both the King and the Common Eider are circumboreal and so is the Green Sea Urchin it would appear likely that this pigmentation might be found in both species of eiders in many places.

Robert D. Jones, Jr.

FIELD MARSHAL THE RT. HON. THE VISCOUNT ALANBROOKE, K.G., G.C.B., O.M., G.C.V.O., D.S.O.

Lord Alanbrooke, the first President of the Trust, died on 17th June, 1963. The greatest soldier of his generation, his favourite recreation was watching and photographing birds. The many fine films he made included some of the wild geese at Slimbridge, where he was a frequent visitor. He held office for fourteen years, and rarely missed a meeting of the Council. His incisive approach and sure judgment were invaluable in many difficult situations that arose during the Trust's formative years. Such was his modesty, however, that few outside the Council knew just how much we depended on him. Though troubled by ill-health in the last few years, he retained a close interest in the continuing development of the Trust. We acknowledge our debt with gratitude and admiration.



Photographs (after page 180)

Page

1-3 Catching methods used by wildfowlers in Iran *Christopher Savage.*

4-5 Rounding-up of Barnacle Geese in Spitsbergen. *N. Gullestad and M. Norderhaug.*

6-7 Catching of Whooper Swans in Iceland. *A. J. Clissold and I. T. Miller.*

8-10 Hard weather at Slimbridge, 1962 and 1963. *Philippa Scott.*

11 Aleutian Canada Goose. *John A. McCann.* Slimbridge Ne-Nes on Maui. *Honolulu Star Bulletin.*

12 Borough Fen Decoy. *Peterborough Evening Citizen.*

13-14 Cotton Teal. *Philippa Scott.*

14 Canada Goose and Great Crested Grebe on a nesting raft. *Pamela Harrison.*

15 Kelp, Ruddy-headed and Andean Geese. *Philippa Scott.*

16 Trumpeter Swans. *Philippa Scott.* Mute Swan killed by electric cables. *Pamela Harrison.*

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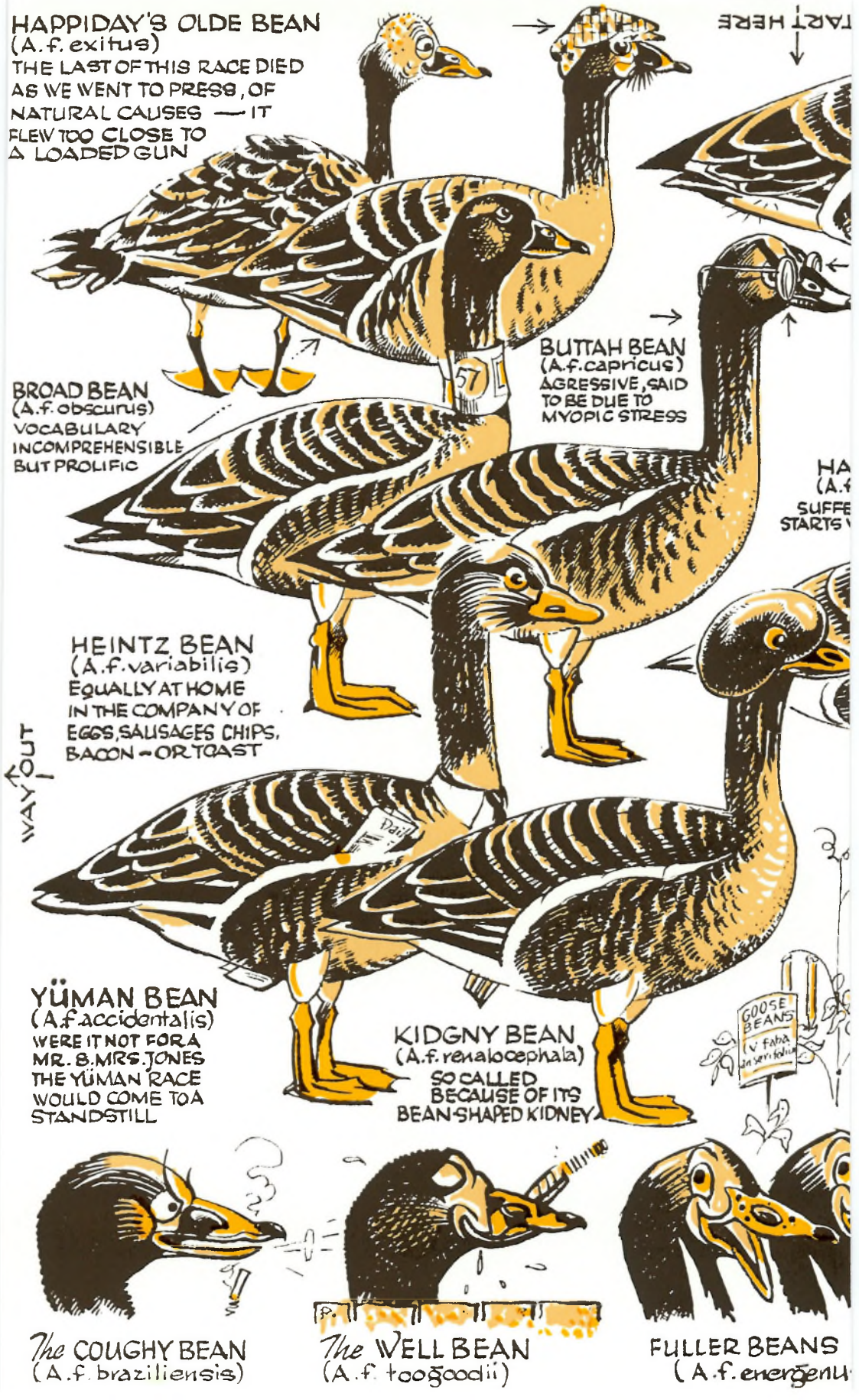
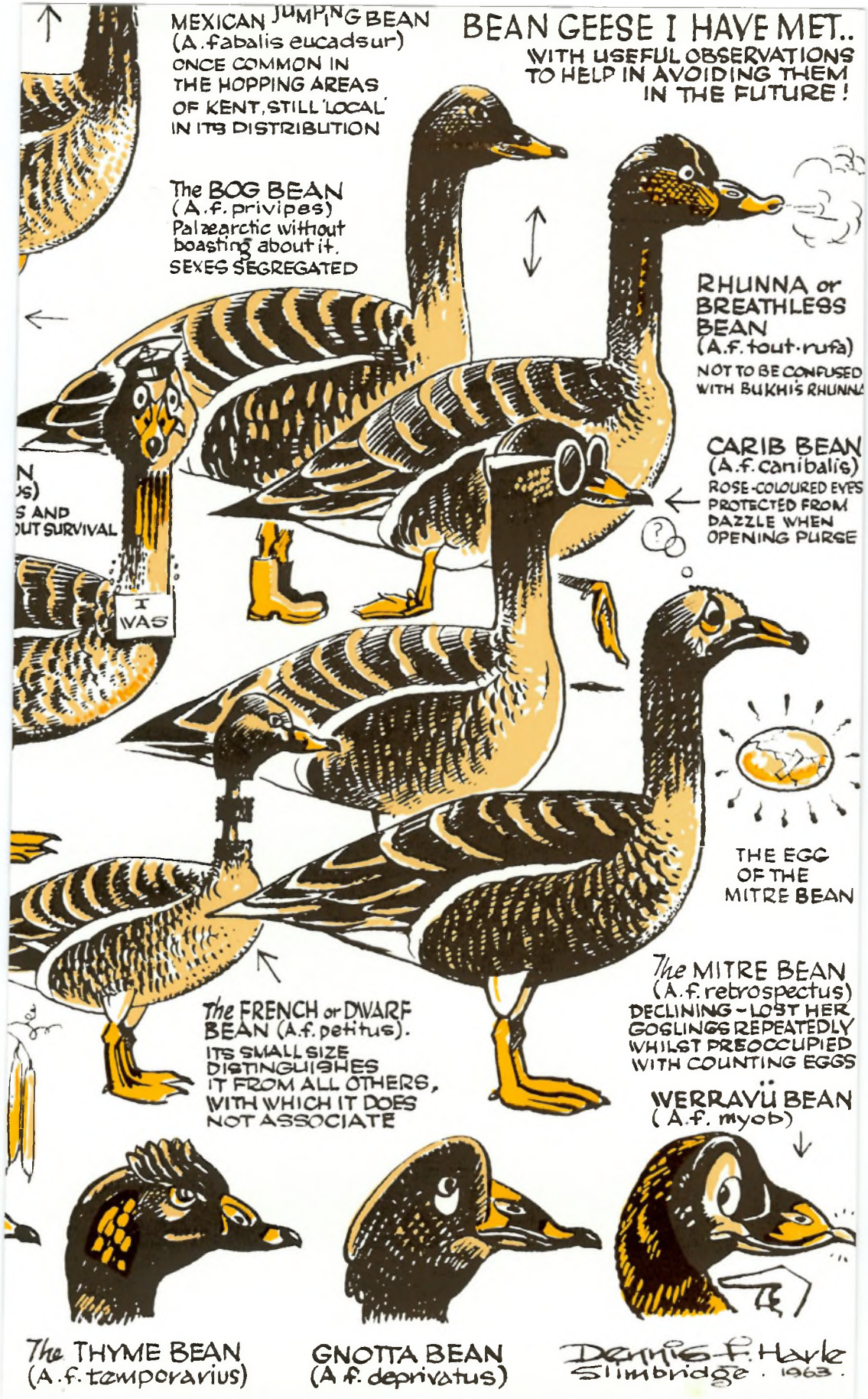
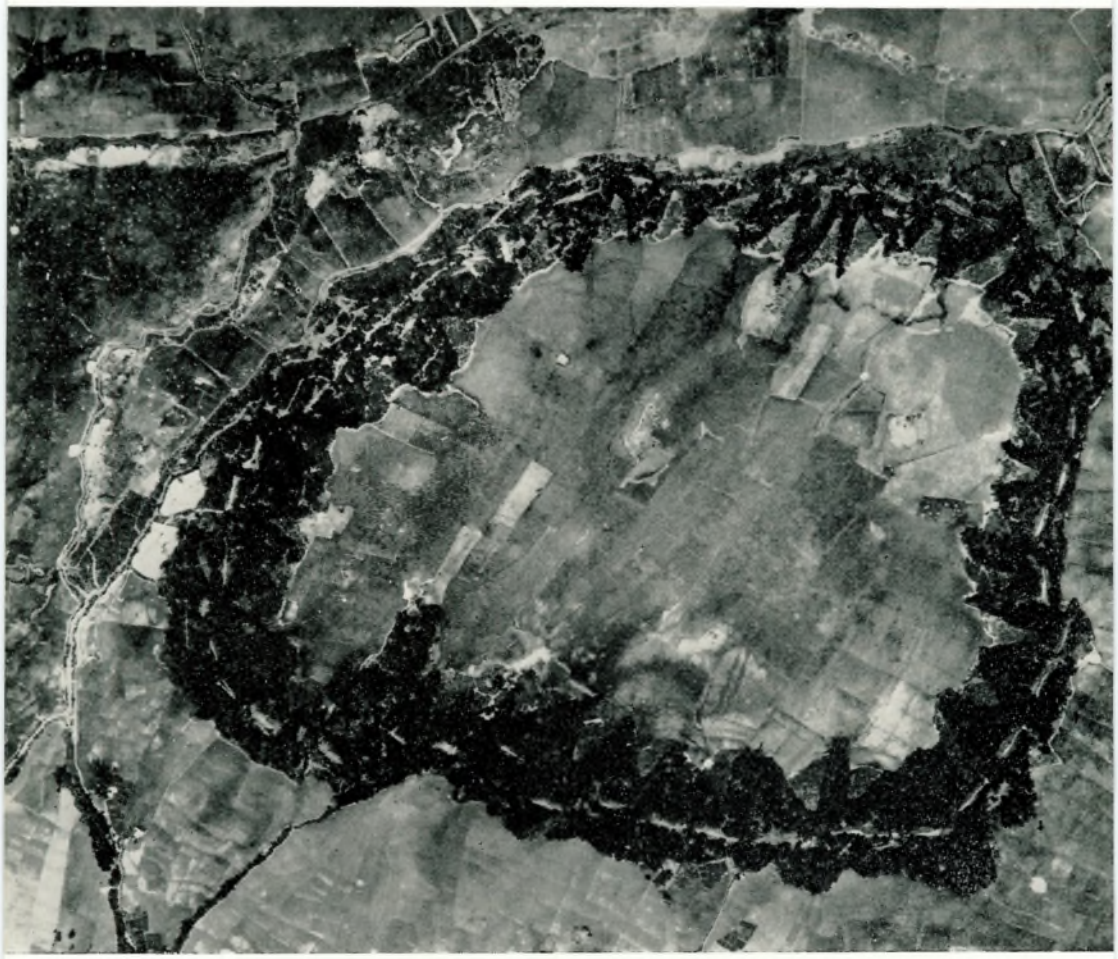
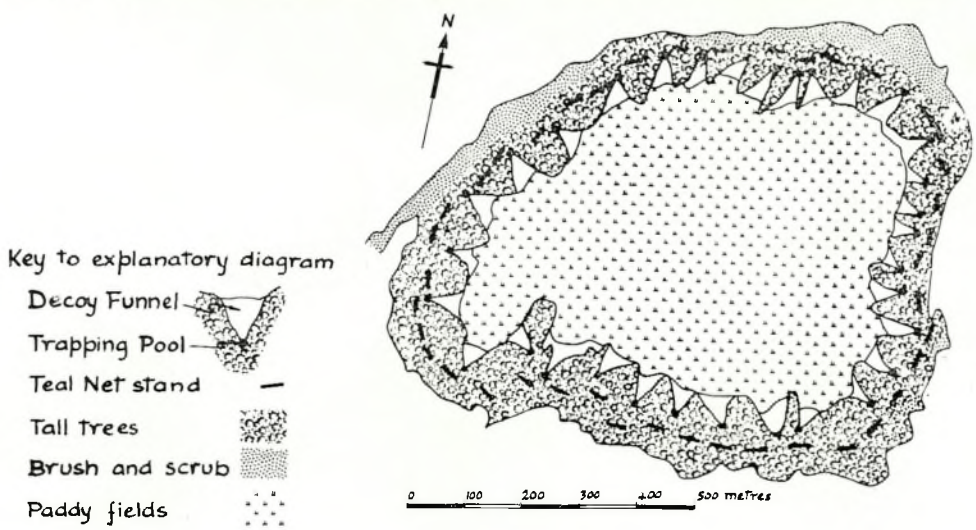
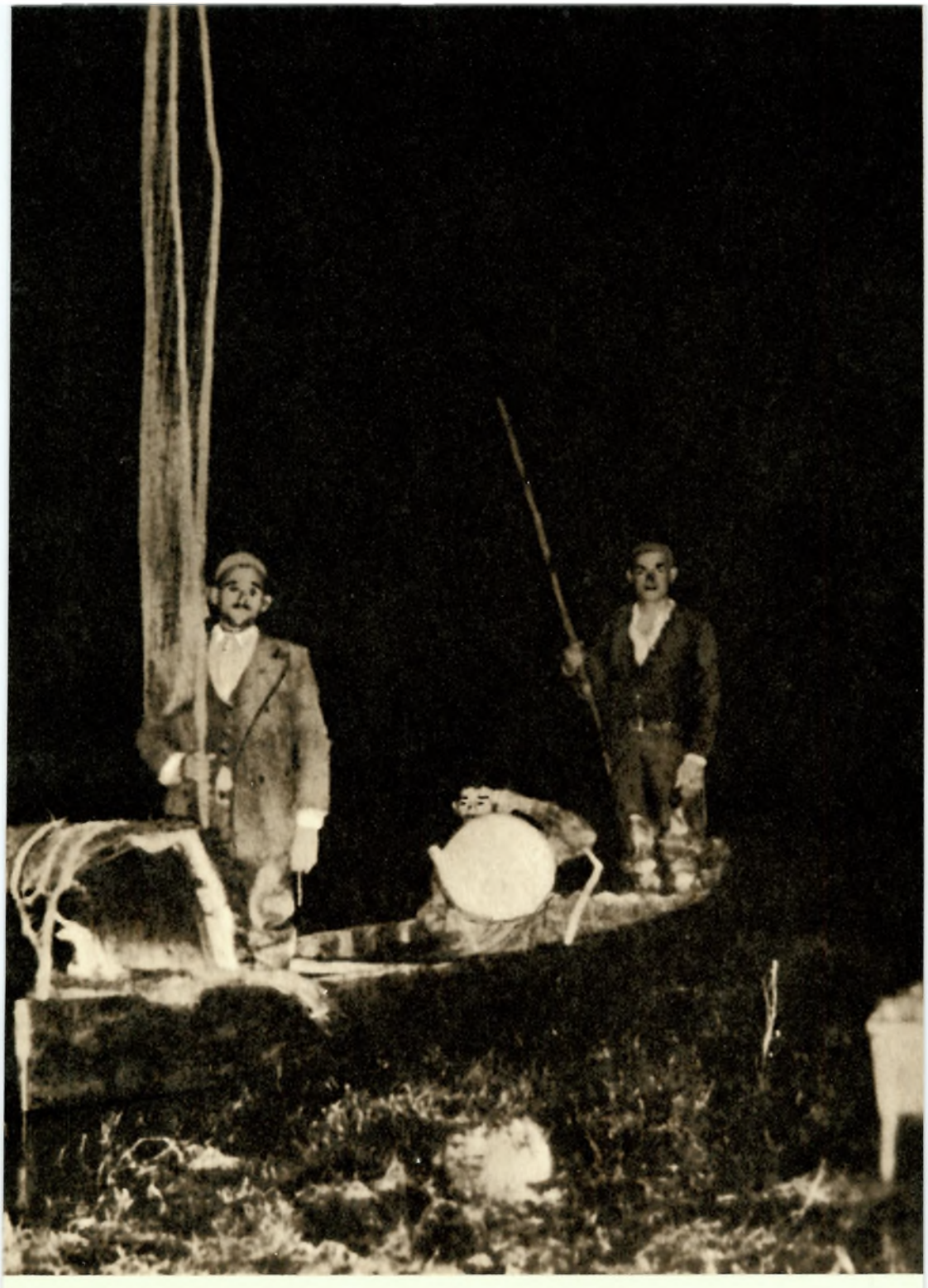

HAPPIDAY'S OLDE BEAN
(A.f. exitus)
THE LAST OF THIS RACE DIED AS WE WENT TO PRESS, OF NATURAL CAUSES — IT FLEW TOO CLOSE TO A LOADED GUN
TART HERE
BUTTAH BEAN
(A.f. capricus)
AGRESSIVE, SAID TO BE DUE TO MYOPIC STRESS
BROAD BEAN
(A.f. obscurus)
VOCABULARY INCOMPREHENSIBLE BUT PROLIFIC
HEINTZ BEAN
(A.f. variabilis)
EQUALLY AT HOME IN THE COMPANY OF EGGS, SAUSAGES CHIPS, BACON ~ OR TOAST
WAY OUT
YÜMAN BEAN
(A.f. accidentalis)
WERE IT NOT FOR A MR. & MRS. JONES THE YÜMAN RACE WOULD COME TO A STANDSTILL
KIDGNY BEAN
(A.f. renalocephala)
SO CALLED BECAUSE OF ITS BEAN-SHAPED KIDNEY
GOOSE BEANS
The COUGHY BEAN
(A.f. braziliensis)
The WELL BEAN
(A.f. toogoodii)
FULLER BEANS
(A.f. energenu


BEAN GEESE I HAVE MET..
WITH USEFUL OBSERVATIONS TO HELP IN AVOIDING THEM IN THE FUTURE!
MEXICAN JUMPING BEAN (A.fabalis eucadsur) ONCE COMMON IN THE HOPPING AREAS OF KENT, STILL 'LOCAL' IN ITS DISTRIBUTION
The BOG BEAN (A.f. privipes) Palæarctic without boasting about it. SEXES SEGREGATED
RHUNNA or BREATHLESS BEAN (A.f. tout-rufa) NOT TO BE CONFUSED WITH BUKHI'S RHUNNA
CARIB BEAN (A.f. canibalis) ROSE-COLOURED EYES PROTECTED FROM DAZZLE WHEN OPENING PURGE
I WAS
THE EGG OF THE MITRE BEAN
The MITRE BEAN (A.f. retrospectus) DECLINING - LOST HER GOSLINGS REPEATEDLY WHILST PREOCCUPIED WITH COUNTING EGGS
The FRENCH or DWARF BEAN (A.f. petitus). ITS SMALL SIZE DISTINGUISHES IT FROM ALL OTHERS, WITH WHICH IT DOES NOT ASSOCIATE
WERRAVÜ BEAN (A.f. myob)
The THYME BEAN (A.f. temporarius)
GNOTTA BEAN (A f. deprivatus)
Dennis F. Harle Slimbridge · 1963.

Wildfowling In Iran







Christopher Savage

Wildfowlers in the "Mordab" with net, gong and bulrush fluff flare.
Hendakhalek.

Christopher Savage

(*Above, left*) In Mazanderan the hand net is sometimes 18 feet long and heavier than that used in Gilan. Bisheh Sar 'abandan' behind. (*Above, right*) Three youths showing their equipment for catching duck and geese on foot. 'Abbas 'Ali Kesh, Mazanderan. (*Below*) The "Mordab" at sunset.

Christopher Savage

Fereydun Kenar. (*Above*) Decoyman throwing a decoy duck from his hide to lure nearby wild Mallard into his trapping pond. (*Below*) The entrance to the trapping pond. Decoy birds may be seen feeding inside the enclosure. On the far side, the clap net is in its raised position.

M. Norderhaug

Catching flightless non-breeding adult Barnacle Geese in Hornsund, Vest-Spitsbergen, 1962. (*Above*) Moving the geese across a small lake. (*Below*) Approaching the trap.

N. Gullestad

N. Gullestad

(*Above*) The Barnacle Geese going ashore. (*Below*) Moving into the catching pen. The catch consists of 205 geese.

I. T. Miller

Catching Whooper Swans for ringing in Iceland, 1962. (*Above*) A family of Whoopers cornered on a small lake. (*Below*) Ringing in progress.

A. J. Clissold

I. T. Miller

(*Above*) General view of the area near Ulfsvatn where the Whoopers were caught. (*Below, left*) A flightless adult with new flight feathers still very short. (*Below, right*) Measuring the bill of an adult.

A. J. Clissold

Philippa Scott

The first of two cold winters at Slimbridge. (*Above*) A view of the pens from the Acrow Tower in January, 1962. (*Below*) A family of Black Swans.

Philippa Scott

January, 1963. (*Above*) In the North American Pen. (*Below*) Black-necked Swans.

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January, 1963. Two views of the Rushy Pen.

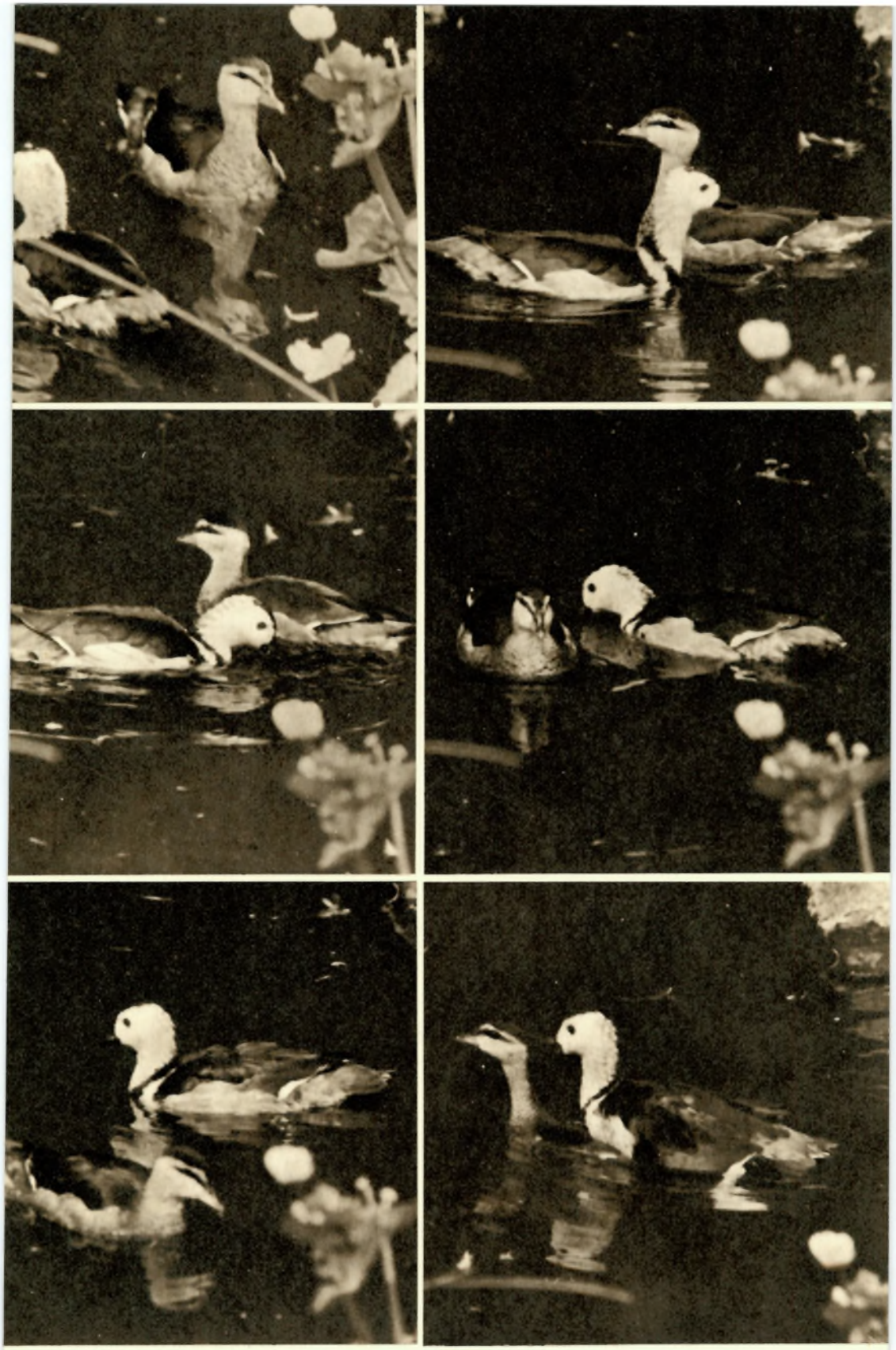
John A. McCann

(*Above*) An Aleutian Canada Goose *Branta canadensis leucopareia* on Buldir Island. This very rare race, with an unusual tendency to have a well-marked white ring at the base of the neck, has a distinctive high-crowned head, well shown here.
(*Below*) Some of the thirty Ne-Nes from Slimbridge after their release on Maui, Hawaii, in July, 1962.

Honolulu Star Bulletin

Peterborough Citizen and Avertiser

Borough Fen Decoy. (*Above*) 'Piper' in action at the North Pipe. (*Below*) The recently-rebuilt South Pipe.



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Cotton Teal *Nettapus coromandelianus*. The series of photographs on this and the following page show the sequence of copulatory behaviour.

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(*Above*) Copulation and post-copulatory behaviour of the Cotton Teal.
(*Below*) A Canada Goose and a Great Crested Grebe sharing a nesting raft in Kent.

Pamela Harrison

Philippa Scott

(*Above*) Kelp Geese *Chloëphaga hybrida malvinarum*. Male on the left, female on the right. (*Below*) An altercation between a Ruddy-headed Goose *Chloëphaga rubidiceps* and an Andean Goose *C. melanoptera*.

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(*Above, and bottom left*) A Trumpeter Swan *Cygnus cygnus buccinator* stretches a leg. (*Bottom, right*) Dead Mute Swans *C. olor* strewn beneath a high-tension cable.

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