SECTION I

TRUST ACTIVITIES, 1959-60

GENERAL

Officers and Council

In May 1960, after serving as President of the Trust since its foundation, Field Marshal the Rt. Hon. The Viscount Alanbrooke, K.G., G.C.B., O.M., G.C.V.O., D.S.O., retired from the Presidency and His Royal Highness, The Prince Philip, Duke of Edinburgh, K.G., K.T. graciously consented to accept nomination as President for a term of three years.

In July the Trust lost another of its original officers through the death of the Rt. Hon. the Lord Kennet of the Dene, G.B.E., D.S.O., D.S.C., who had been a Trustee since the foundation.

The Rt. Hon. the Earl of Mansfield has accepted the nomination of the Council to fill the vacancy.

The Officers and Council of the Trust (as at 1st April 1961) are shown on page 2. Council Meetings were held on 22nd September 1959, 15th March 1960, 1st November 1960 and meetings of the Finance Committee on 16th September 1959, 17th February 1960, 3rd October 1960 and 6th December 1960. The annual meeting of the Scientific Advisory Committee was held on 6th April 1960.

Annual General Meeting

The Thirteenth Annual General Meeting was held at the Royal Society of Arts on 24th May 1960. The minutes are recorded on p. 179.

Annual Dinner

The Annual Dinner was held at Bush House on 24th May 1960. Field Marshal the Rt. Hon. the Viscount Alanbrooke, K.G., G.C.B., O.M., G.C.V.O., D.S.O. was in the chair and the speakers were Professor Gustav A. Swanson, Mr. Peter Scott, C.B.E., D.S.C., the Rt. Hon. the Lord Howick of Glendale, G.C.M.G., K.C.V.O., and the Rt. Hon. the Lord Boothby of Buchan and Rattray Head, K.B.E., LL.D.

Gosling Party

The annual Gosling Party was held at Slimbridge on 21st December 1960 and was attended by 65 Goslings.

Membership

Comparative figures showing the membership of the Trust for the last four years are set out on p. 177. From the figures it will be seen that the total membership declined by 215 during 1960.

In Bulletin No. 30 issued in February 1961 the Council asked all Members to make strenuous efforts to enlist new members. At the time of going to press it was too early to assess the results of this appeal.

Visitors

The numbers of visitors to the Trust's collections during the last three years have been:

	1958	1959	1960
Slimbridge	120,191	129,092	102,555
Peakirk	23,495	31,135	26,531
Totals	143,686	160,227	129,086

As a result of the drop in 1960 our income from gate takings fell by £4,415. It seems unlikely that this drop was entirely due to the bad weather. Since greater numbers are desirable both in fulfilment of our educational objects and as a source of essential revenue, steps are being taken to attract more visitors by increased publicity.

THE COLLECTIONS

STAFF

Slimbridge: Curator S. T. Johnstone. Wardens: P. J. Henshaw, M. Davy, L. T. C. Shakespear, M. W. Henchman, I. Fairbairn and A. A. Milne. L. P. Alder is the gardener, with G. Huggins, J. Parsons and W. Hancock as groundsmen. Miss J. E. Overman is secretary to the Curator.
Peakirk: Curator N. Dudley. Warden: G. Cole.

THE GROUNDS

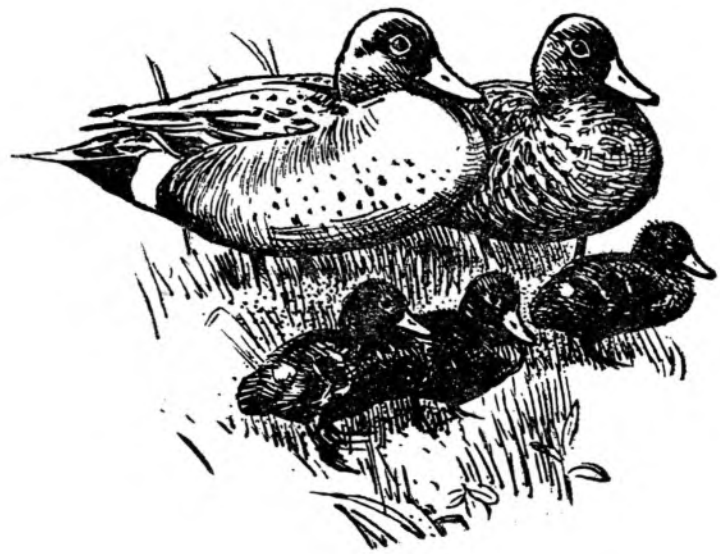
No major extensions or alterations to the enclosures at Slimbridge and Peakirk were made in 1959-60. At Slimbridge, improvements included the rebuilding of the new-arrival pens and the construction of four quarantine pens. A new incubator shed, much larger than that previously used and with several improved features, was ready for the summer of 1960. The old aviary in the Wood pen was completely rebuilt and its pens planted most attractively. Several ponds were dredged and reconstructed, and the appearance of the enclosures greatly enhanced by planting of trees, shrubs and other goose-resistant flowering plants.

At Peakirk, too, the attractiveness of the gardens has been increased. New lavatories were completed and some waste land reclaimed for use as additional pens.

THE BIRDS

New additions to the collections in 1959-60 included a flock of Steller's Eiders *Somateria stelleri* and four New Zealand Shoveler *Anas rhynchotis variegata*. Reinforcements of other species included Indian Pygmy Geese *Nettapus c. coromandelianus*, White-backed Duck *Thalassornis l. leuconotus* and Blue Ducks *Hymenolaimus malacorhynchos*.

The Steller's Eiders were caught at Cold Bay, Alaska by Mr. R. D. Jones of the U.S. Fish and Wildlife Service and came to us by way of Delta Waterfowl Research Station in Manitoba. They settled down well and have already provided new information on the moult and behaviour of the species, never previously kept in captivity.



THE BREEDING SEASON, 1960

S. T. Johnstone

SOME twelve hundred birds of ninety different kinds were reared in the two Collections in 1960, the largest number yet, despite the wet weather that marred the summer. Details of the results obtained with each species are set out in Tables 2 (Slimbridge) and 3 (Peakirk). A comparison of the success of artificial rearing among species belonging to the major taxonomic groups (Table 1) is also of interest. The proportion of eggs set which hatched successfully was about one-half, both at Slimbridge and at Peakirk. Differences between the major groups were insignificant, with three exceptions.

The hatch of swan's eggs was very poor. Unfortunately the failures included five Trumpeter Swan eggs, three of them fertile, but none of which hatched. Six Bewick's Swan eggs removed from the nest also failed to hatch, but a brood of four was reared by the parents. The breeding pair of Black-necked Swans at Slimbridge reared a handsome brood of five, now in the Orchard Pen.

The hatching and rearing success of the true geese were also appreciably below the average for all species. This has been found in earlier years too. By contrast, the pochards were unusually successful. The hatch of Mergini (Barrow's and European Goldeneye, Smew and Hooded Merganser) was quite good, but few survived to fledging. Three Hooded Mergansers hatched at Slimbridge, the first to do so, but lived for no more than three days. Most of the other losses of Mergini were due to an outbreak of aspergillosis traced to the accidental use in the nesting boxes of some straw heavily contaminated with fungal spores. This also caused deaths among Ross and Emperor goslings.

The production of eggs by the Hawaiian Geese was 150, against 91 in 1959, but the hatchability fell again, only 25 goslings emerging, of which 20 were safely reared. Five more were reared at Peakirk and four by Mr. Terry Jones at Leckford. The total stock derived from the 1950 importations

now (early 1961) stands at 122, 103 at Slimbridge, 2 at Peakirk, the remainder dispersed in seven other collections. It is intended to keep the Slimbridge population steady at 100. Though none have yet been returned to Hawaii the likelihood of this being permitted has increased. The number in Hawaii is thought to be 125, 76 in captivity and 49 wild.

We have, since 1957, received great co-operation from the New Zealand Government in our effort to acquire a comprehensive collection of waterfowl that are indigenous to the Dominion. In that year four species were caught and sent by polar air route to us at Slimbridge. These were the Grey Duck *Anas superciliosa superciliosa,* Scaup *Aythya novae-seelandiae,* Brown Duck *Anas aucklandica chlorotis* and Blue or Mountain Duck *Hymenolaimus malacorhynchos.* Early in 1960 we heard that the Department of Internal Affairs had hatched and reared some Shoveler *Anas rhynchotis variegata* and in June two pairs of these interesting birds duly arrived. They settled down well after the rigours of quarantine and it is hoped that they will breed. A further two male specimens of the exciting Blue or Mountain Duck also arrived and it is hoped to dispatch us some females of the species in 1961. Having regard to the generosity and trouble taken by the New Zealand authorities on our behalf, we are pleased to report that three of these species have now been bred here: the Scaup since 1958 (and now one of our most prolific ducks), the Grey Duck at Peakirk in 1959 and 1960, and now in 1960 the Brown Duck at Slimbridge.

Breeding of the New Zealand Brown Duck *Anas aucklandica chlorotis*

The two pairs of Brown Duck that came in 1957 have never become very tame and spend a great deal of the daylight hours hiding in the grass and rushes of their enclosure. One pair share a pen with a pair of Cereopsis Geese but neither shows any interest in the other. Nesting sites were provided in the shape of boxes at ground level, cover fabricated from willow wands and cider barrels raised some two feet from the ground. All these were used a great deal as refuges from the public gaze and it was this habit that accounted for the failure to find the nest before the duck commenced incubation. The missing duck was thought to be merely hiding in the cider barrel but when she moved she was seen to be covering some eggs. It was decided to leave her to her own devices and she was undisturbed for three weeks. On going to the barrel after this interval four large creamish-buff eggs were found deserted, two of which were addled and two infertile. These averaged 52 gms. in weight and measured 57 mm. x 42 mm. A point of interest was that there were no broken shells in the nest and a complete absence of down. Although the whistling ducks pull no down and the swans very little, one would not have expected this to be characteristic of a dabbling duck such as the Brown Duck. During this investigation of the nest both birds were invisible in the undergrowth and we assumed that we would have to wait for another year for successful breeding. Two days later, to our immense pleasure and surprise, the duck appeared on her pond with three dark brown ducklings. Both parents and babies were caught up and put into the Guinness Aviary in order to keep them free from the attentions of the Cereopsis and vermin. The food offered consisted of ant's eggs, biscuit and turkey starter crumbs. Some of the crumbs disappeared overnight and may have been

eaten by the ducklings, but from the state of the turf in the aviary it was also apparent that a great deal of nocturnal "worming" was taking place.

The downy duckling shows little contrasting pattern; save for four light spots on the back and a small area of the belly, the overall appearance is of dark mahogany. The bill is large and slate blue in colour and the tarsus is grey. My impression is that they are quite different from any other ducklings we have reared at Slimbridge. Hatched about 17th September, the young appeared to be fully grown by the middle of November.

Other notable successes include the rearing of four young Magpie Geese, twelve Spotted Whistling Ducks, three Laysan Teal, three Hartlaub's Ducks and three Cape Shoveler. Amongst the species breeding most freely, over fifty Marbled Teal and 26 New Zealand Scaup were reared at Slimbridge.

Table 1. Breeding success in 1960 of members of the major taxonomic groups in the collections at Slimbridge and Peakirk. (Records for artificial rearing only).

Tribe	eggs set	eggs hatched	proportion hatched %	young reared	proportion reared %
Dendrocygnini—whistling ducks	47	23	**49**	18	**78**
Anserini (part)—swans	22	3	**14**	1	—
Anserini (part)—geese*	242	98	**40**	65	**66**
Tadornini—shelducks & —geese	113	60	**53**	42	**70**
Anatini—dabbling ducks	1016	539	**53**	405	**75**
Aythyini—pochards	368	230	**62**	188	**82**
Cairinini—perching ducks	347	180	**52**	122	**68**
Mergini—goldeneyes, mergansers	58	27	**47**	7	**26**
Total (including other tribes)	2393	1198	**50**	879	**73**

*excluding Hawaiian Goose

Table 2. BREEDING ANALYSIS 1960—SLIMBRIDGE

The species and subspecies in the following table are listed in the order used in Peter Scott *A Coloured Key to the Wildfowl of the World* (1957). Entries in the column "reared by parents" are additional to those in "reared artificially." No details of eggs laid are given under "reared by parents," because in many cases the numbers laid and lost are not known.

Species and race	reared artificially			reared by parents
	eggs set	hatched	reared	
Magpie Goose	9	3	1	4
Spotted Whistling Duck	12	2	0	12
Wandering Whistling Duck				10
Fulvous Whistling Duck				25
Cuban Whistling Duck	10	4	3	
Red-billed Whistling Duck	25	17	15	
Black Swan				5
Mute Swan	6	0		
Black-necked Swan				5
Bewick's Swan	6	0		4
Trumpeter Swan	5	0		
Swan Goose	15	8	7	
Western Bean Goose	4	2	0	
Pink-footed Goose	6	0		
European White-fronted Goose	7	0		
Greenland White-fronted Goose	8	2	1	
Lesser White-fronted Goose	9	4	4	
Western Greylag Goose	4	0		8
Eastern Greylag Goose				2
Bar-headed Goose	17	10	10	
Lesser Snow Goose	12	7	7	
Blue Goose	8	4	2	
Greater Snow Goose	28	11	3	
Ross's Goose	31	13	7	1
Atlantic Canada Goose				3
Gt. Basin Canada Goose				3
Taverner's Canada Goose				3
Dusky Canada Goose				4
Hawaiian Goose	150	25	20	
Barnacle Goose	19	8	8	14
Black Brant	12	3	1	
Red-breasted Goose	25	12	9	
Ruddy Shelduck	8	8	8	
Cape Shelduck	5	2	2	1
New Zealand Shelduck	6	4	3	
Common Shelduck	7	3	3	
Orinoco Goose	14	3	3	
Abyssinian Blue-winged Goose	17	9	5	
Ashy-headed Goose	6	4	4	5
Ruddy-headed Goose	4	0		
Lesser Magellan Goose	4	2	0	1
Greater Magellan Goose	4	3	2	4
Cape Barren Goose	6	0		1
Andean Crested Duck	6	0		
Bronze-winged Duck	6	0		
Marbled Teal	111	88	53	
Cape Teal	14	9	9	5
Silver Teal	11	0		
Puna Teal	5	0		
Bahama Pintail	7	4	1	
South Georgia Teal	2	0		
Chilean Pintail	10	6	6	
Northern Pintail	29	15	11	
Kerguelen Pintail*	7	5	5	

SLIMBRIDGE, contd.

Species and race	eggs set	reared artificially hatched	reared	reared by parents
Chilean Teal	7	0		
Australian Grey Teal	14	5	2	
Chestnut-breasted Teal	52	?	25	
New Zealand Brown Teal				3
Hawaiian Duck	4	3	3	
Laysan Teal	6	0		3
N. American Black Duck	16	6	6	
Indian Spotbill				3
Chinese Spotbill	28	15	15	
Australian Black Duck				1
Philippine Duck	22	13	13	
African Yellowbill	7	7	3	
African Black Duck	6	5	3	
Gadwall	9	3	3	3
European Wigeon	19	14	14	
American Wigeon	12	4	4	
Chiloe Wigeon	?	?	7	2
Northern Cinnamon Teal	19	7	2	
Garganey				3
Argentine Red Shoveler	14	7	4	
Cape Shoveler	10	2	0	3
Common Shoveler	18	2	0	
Ringed Teal	64	36	22	5
European Eider	9	4	3	
Red-crested Pochard	35	21	11	2
Rosy-bill	42	18	18	3
South American Pochard	14	6	4	
Canvasback	4	3	3	
European Pochard	4	4	4	
Redhead	32	18	18	
Ferruginous Duck	22	?	17	
Australian White-eye	7	6	6	
New Zealand Scaup	30	29	26	
Tufted Duck	13	5	3	
Lesser Scaup	14	7	7	
European Greater Scaup	11	4	1	4
Mandarin Duck	14	4	4	
N. American Wood Duck	212	127	80	20
Comb Duck	10	3	1	
S. American Comb Duck	5	3	3	
Hartlaub's Duck	10	10	3	
Barrow's Goldeneye	9	6	0	
European Goldeneye	16	9	4	
Smew	24	9	3	
Hooded Merganser	9	3	0	
N. American Ruddy Duck	23	?	2	35

*hybrid Kerguelen x (Kerguelen x Pintail)

Table 3. BREEDING ANALYSIS 1960—PEAKIRK

Species and race	reared artificially			reared by parents
	eggs set	hatched	reared	
Black-necked Swan	5	3	1	
Swan Goose	8	4	1	
Lesser White-fronted Goose	1	0		
Western Greylag Goose				7
Eastern Greylag Goose				3
Bar-headed Goose	6	0		
Blue Goose	9	1	1	
Ross's Goose	5	4	3	
Dusky Canada Goose	8	5	1	
Hawaiian Goose	12	6	5	
Barnacle Goose	13	0		
Cape Shelduck	6	6	5	
Common Shelduck	14	8	6	
Lesser Magellan Goose	9	8	1	
Greater Magellan Goose				1
Cape Barren Goose	3	0		
Marbled Teal	9	7	7	
Cape Teal	20	15	10	
Puna Teal	13	2	0	
Bahama Pintail	74	50	32	
Northern Pintail	21	7	7	
Chilean Teal	11	3	3	
Chestnut-breasted Teal	12	9	6	
N. American Black Duck	15	12	10	
Chinese Spotbill	38	15	13	
N. Zealand Grey Duck	24	17	17	
Philippine Duck	62	5	5	
African Yellowbill	8	5	5	
African Black Duck	10	5	5	
Gadwall	45	36	27	
European Wigeon	16	8	3	
American Wigeon	11	10	9	
Chiloe Wigeon	14	0		
Northern Cinnamon Teal	17	15	12	
Garganey	12	5	3	
Cape Shoveler	2	0		
Common Shoveler	47	32	21	
Red-crested Pochard	33	11	8	
Rosy-bill	51	39	28	
Ferruginous Duck	7	7	7	
Australian White-eye	20	19	12	
New Zealand Scaup	8	0		
Tufted Duck	14	10	9	
Lesser Scaup	7	6	6	
Mandarin Duck	9	0		
N. American Wood Duck	87	33	31	
Ruddy Duck				7

THE RESEARCH UNIT

THE research programme is under the guidance of the Assistant Director (Research), Dr. G. V. T. Matthews, whose particular research interests are in the experimental study of migration and navigation. Other members of the Unit, with their main interests are: Senior Biologist, H. Boyd (ringing and population studies); G. L. Atkinson-Willes (wildfowl counts and refuge network); Dr. J. V. Beer (pathology); P. J. S. Olney (viscera analyses and habitat improvement); Dr. S. K. Eltringham (aerial surveys); Dr. Janet Kear (feeding behaviour and nutrition); M. A. Ogilvie (ringing assistant); Miss E. Temple Carrington (secretary); W. A. Cook (Borough Fen decoyman); N. Phillips (laboratory assistant).

Major General C. B. Wainwright, C.B., who operates the ringing station at Abberton, is assisted by R. King and (temporarily) R. Dennis.

March 1960 marked the end of a five year period of grant aid by the Nature Conservancy. Detailed plans for the next quinquennium were therefore drawn up and submitted to the Conservancy. Subsequent action by the Conservancy is described in their Annual Report:-

" The Conservancy have followed other Research Councils in adopting the practice of appointing Visiting Groups, composed of members of the Conservancy or Committees or, in special cases, of other highly qualified individuals, to visit, report and advise on the work of institutes in receipt of grant-aid from the Conservancy. In January, the first of the Conservancy's Visiting Groups, consisting of Mr. A. B. Duncan, Professor J. E. Harris, Lord Hurcomb, Professor C. F. A. Pantin, Professor V. C. Wynne-Edwards, with the Director-General, spent two days at the Wildfowl Trust. They examined the research in progress and talked to all the research staff and discussed the future of the Trust's research programme with the Honorary

Director, Mr. Peter Scott, and the Assistant Director, Research, Dr. G. V. T. Matthews. As a result of their Report the Conservancy have renewed the grant to the Trust in an increased sum for a further five years. The report recommended that the link between Bristol University and the Trust on the research side should be strengthened and that specialised work on parasitology would more appropriately be centred at Bristol than Cambridge University. It was also recommended that application for inclusion in the Federated Superannuation Scheme for Universities should be made on behalf of the scientists engaged in this work, and this has been successfully done."

The grant for the year ending March 1961 was £9,775 (compared with £7,500 in the previous year) and for the year ending March 1962 will be £11,435. There is no need to stress the importance of such massive and increasing support of the research programme; without it nothing like the present breadth of investigation could be maintained. The Trust is indeed grateful. Members would perhaps wish to be reminded that a substantial contribution towards running costs still comes from the Trust's general funds, and all laboratory and other headquarters accommodation is provided by the Trust, together with the research facilities of the collections and decoys. Indeed this is a fine example of a typically British blend of private and government enterprise. The Trust's successful application for inclusion in the Federated Superannuation Scheme for Universities means more than the welcome fact that its officers will now receive superannuation benefits. Membership of the Scheme is restricted to University Departments and to a small number of non-University research institutes. The implicit recognition of the Trust's enhanced scientific standing is thus most gratifying.

As has been the case from the Trust's formation, an important part of our research has been based on the capture, marking and release of birds. 1959-60 was the best season ever for duck trapping (p. 18). Partly as a move to reduce the surplus Mallard population, some twelve hundred birds were released at various distances from Slimbridge. This has given rise to some fascinating observations on orientation behaviour which are summarised on pp. 137-9. Most of the ducks caught at Slimbridge and at Borough Fen were weighed and measured in great detail. These provided normal data to compare with post mortem material and, possibly, to discriminate between individuals of British and Continental origin and to distinguish age classes. A collection of Mallard skins of precisely known age has been built up to assist in the difficult task of discovering age criteria which are reliable after the first few months of life. There are several papers based on duck ringing studies in the present report, at pp. 125, 140 and 144. Under the increased Conservancy grant it has been possible to appoint a Ringing Assistant, Mr. M. A. Ogilvie (from 1st October 1960) at the Slimbridge headquarters to help speed up the correlation and analysis of the growing volume of ringing data. In October 1959 the catch of Pinkfeet fell back to the level before the bumper seasons of 1957 and 1958. As this completed ten years effort on this one species, a full analysis of the results was made. From this it was decided that the value of results was diminishing and the equipment and man-power could be more profitably used for catching other species. The experiments in wader-netting (p. 19) were the first outcome of the change of policy. A liaison visit was made to Gotland in the Baltic to

observe cannon-nets being developed by Swedish game biologists for use on the migrating Barnacle Goose flocks.

A very good idea of the numbers and distribution of the wintering flocks of Barnacle Geese in Europe was obtained by a co-ordinated effort under the auspices of the International Wildfowl Research Bureau (p. 116). The British and Swedish surveys were carried out from the air. The present season's flying (see p. 19) concluded the Trust's period of experimental investigation of aerial survey under British conditions and a very fully documented report was submitted to the Nature Conservancy. Based on 433 hours of flying, this showed that for coastal and riparian species survey from the air is effective and economic and recommends that such surveys should be employed for Barnacle, Brent and Greylag Geese, Shelducks and Swans. The duck population is best covered by the unique network of volunteer ground observers who make the National Wildfowl Counts. These have continued at full strength but with emphasis on the more important, ' priority ' waters. As explained in pp. 40-57, not only are we enabled to circulate a quick assessment of the status of each species *before* the next month's count, but at last it has been possible to arrive at a realistic appreciation of population trends over a long period of years.

The accumulated material of the wildfowl counts has formed the basis of a long series (now almost complete) of appreciations of the distribution of wildfowl stocks throughout the country. These appreciations in turn are the basis of a sound policy of conservation through strategically placed refuges which is now maturing (pp. 23). Co-operation with wildfowling interests has been close on this score (pp. 26). Another very concrete form of co-operation was the supplying of 585 viscera from shot birds for the continuing analyses of food contents. Sufficient material has now accumulated to justify the preparation of papers dealing with the main ecological habitats exploited by Mallard, Teal and Wigeon. Qualitative and quantitative assessments were made of the flora and fauna of the Kent marshes, from which the bulk of the material has come. Other areas were likewise investigated and an experimental planting of known food plants carried out. A complementary approach to the problems of wildfowl food is being made through the study of feeding behaviour and of nutritional requirements. This is possible through the appointment to the staff in October, 1959 of Dr. Janet Kear from the University of Cambridge Ornithological Field Station at Madingley.

Dr. R. B. Klopman, working at Madingley, completed a Ph.D. thesis on social behaviour in Canada Geese. The Trust provided the experimental flock of geese and facilitated and partly financed the field work in Norfolk. At Slimbridge itself the study of behaviour, especially in relation to systematics, received a great impetus from the work of Dr. Paul A. Johnsgard from Cornell University. He came in August, 1959 under a National Science Foundation Fellowship and additional support from a Public Health Fellowship has enabled his studies to continue to April, 1961. Some of the fruits of his efforts are incorporated at pp. 58 and 92. Mr. W. van der Wall from the Max Planck Institute, Seewiesen, W. Germany, spent five weeks at Slimbridge in the autumn of 1959 and another three in the spring of 1960 studying and filming behaviour, particularly of hybrids in relation to the genetics of innate behaviour patterns.

The collection of trachea/syrinx preparations that Dr. Johnsgard has built up for us provides yet one more use for those birds from the collections that die. The collection of skins continued to grow and an appeal for cabinets although answered will have to be repeated in the near future. The interesting method of mounting used by our preparator is illustrated in the photographic section. Mortality in the collection was kept, however, to a reasonably low level. This was largely due to the constant check by post-mortems which are now mainly carried out at the Trust, though Mr. A. R. Jennings, Department of Animal Pathology, Cambridge, continues to give invaluable advice. Weights, detailed measurements and notes of feathering stages were made and systematised. An important development was the progressive ringing or re-ringing of all the adult birds in the collections with the new, very durable, monel leg rings, and the card-indexing of each individual bird so that its history could be followed. This necessary development had hitherto been frustrated by the want of rings that would last as long as the birds.

Dr. F. Steiniger, of the Niedersachsisches Landesmuseum, Hanover, spent several days at Slimbridge taking two thousand specimens of droppings for his investigations of salmonellosis. His findings were reassuringly negative. Miss E. Corning, of Cornell University, spent six weeks at the Trust assisting in physiological research. Dr. P. J. Chapple, Bacteriology Department, Bristol, made a survey of soil and droppings to check on the occurrence of tubercule spores. Outside assistance in the preparation of material, most welcome in view of our limited laboratory facilities, came from Dr. Mary Lobban, Medical Research Council (endocrine organs), Dr. G. W. Storey, National Temperance Hospital, London (routine histological material) and Mr. R. H. Poulding, Pathology Department, Southmead Hospital, Bristol (aspergillotic material). Dr. A. S. King, Veterinary Anatomy Department, University of Bristol, prepared latex air sac casts of species used in the aspergillosis research of Dr. J. V. Beer, whose thesis for a Ph.D. has been accepted by Bristol University which had awarded the studentship under which he worked. The funds for the studentship and, subsequently, salary for two years were provided by the Bristol, Clifton and West of England Zoological Society.

From October, 1960, another Ph.D. student, Mr. R. A. Avery, is working in the Department of Zoology at Bristol University on the parasites of ducks, using material and facilities at Slimbridge. The exhaustive check list of the parasites of the *Anatidae* prepared by Dr. G. Lapage for the Trust on a grant from the Nuffield Foundation is in press.

Liaison with other workers was maintained by exchange of publications and by personal visits. The reference library continued to expand and a new method of binding journals is described (p. 157). Institutes in Sweden and Finland, in Holland and in the United States and Canada were visited by Trust personnel. Among visiting scientists from overseas were, in chronological order, Dr. Paul Errington (U.S.A.), Mr. Boomsang (Thailand), Mr. L-A. Esping (Sweden), Dr. K. Lorenz, Dr. J. Nicholai (Germany), Dr. H. Poulsen (Denmark), Dr. G. Bergman, Dr. L. von Haartman (Finland), Dr. E. Fabricius (Sweden), Dr. W. C. Dilger, Dr. G. Boucher (U.S.A.), Mr. R. Leveque (Switzerland), Dr. J. Koskimies (Finland), Mr. J. A. Eygenraam (Holland).

Wild Geese at the New Grounds, 1959-60

European White-fronted Goose *Anser albifrons albifrons*

67 arrived on 1st October, 1959. They increased rapidly to 130 on 3rd and 710 on 5th. There were 765 on 16th October and the number remained unchanged for nearly a month, increasing to 800 on 11th November, and to about 950 on 20th. By 10th December there were 1430, on 15th 1500. Another influx in mid-January 1960 took the total to 2500 on 16th, and to about 3000 on 22nd. Peak numbers were found in late February and early March—4200 on 21st February, over 4000 on 4th March. Over 3000 were still present on 16th March, dropping to 1600 by 18th and 600 by 22nd. 500 were seen flying off on 1st April and the last three left on 4th or 5th April, 1960.

Though the numbers seen were rather smaller than in 1958-59, 1959 had evidently been a better breeding season than 1958, with 33% of young birds in the early arrivals, 37% in December and still 31% in March, the mean brood size early in the autumn being 3.0.

Greenland White-fronted Goose *Anser albifrons flavirostris*

A group of five (four adults, one first-winter) present from 15th December, 1959 until 4th April, 1960. Another first-year bird seen 12th March, and two more adults from 1st to 4th April, 1960.

Lesser White-fronted Goose *Anser erythropus*

At least three adults seen: one from 27th January to 16th March, another on 11th and 21st February, the third from 7th February to 19th March, 1960.

Greylag Goose *Anser anser*

One on the Dumbles from 22nd to 31st March, 1960.

Pink-footed Goose *Anser brachyrhynchus*

Not seen until 20th October, 1959 when 22 appeared. There were 34 on 31st October, two on 11th November, 15 on 27th November and 18 on 4th December. On 4th March, 1960 a single wounded bird was seen on the river. These were the smallest numbers seen at Slimbridge for many years and their stay was abnormally short. As the rocket-netting teams discovered arrivals in Britain were unusually late and the breeding season had been exceptionally bad, with only about 14% of young birds in the flocks.

Bean Goose *Anser fabalis*

One first-winter bird seen from 17th January to 18th March, 1960. This appeared to belong to the tundra form *rossicus,* rather than the typical yellow-billed *fabalis* more frequently seen at Slimbridge.

Ringing 1959-60

Duck Ringing

Over 9200 ducks were ringed in 1959-60, by far the largest total yet ringed in Britain in a season, thanks especially to an extraordinary catch of Teal at Abberton by Major General C. B. Wainwright and to very good catches of Mallard at Borough Fen and Slimbridge (Table 1). There were no great changes in the marking of other species, except an unusual catch of Garganey at Abberton.

Table 1. Ducks ringed 1959-60.

Species	Abberton	Slimbridge	Borough Fen	Deeping Lake	Other stations	Total 1959-60	Total 1958-59
Shelduck	23	—	—	—	—	23	*38*
Pintail	—	11	2	2	—	15	*15*
Teal	4112	20	210	10	103	4455	*1112*
Mallard	532	1085	2589	—	302	4508	*2705*
Gadwall	2	9	—	10	—	21	*10*
Wigeon	32	2	10	48	—	92	*26*
Garganey	48	3	—	—	—	51	*10*
Shoveler	13	5	9	3	—	30	*51*
Eider	—	—	—	—	—	0	*34*
Pochard	13	—	—	—	—	13	*27*
Tufted Duck ..	25	—	—	3	1	29	*59*
C. Scoter	1	—	—	—	—	1	*0*
Total 1959-60 ..	4801	1135	2820	76	406	9238	—
Total 1958-59 ..	*1110*	*659*	*1866*	*158*	*294*	—	*4087*

No new permanent ringing stations were brought into use, though a sample of 87 Mallard marked at Boulston, Pembrokeshire by A. J. Birt Llewellin, promises to be of some interest. Trapping at Newburgh, Aberdeenshire by Miss E. A. Garden continued to be dogged by difficulties, yielding only 45 Mallard and one Teal. At Deeping Lake, Lincolnshire, too, the catch was small: though it included a welcome number of Wigeon, the numbers of diving ducks marked dropped almost to zero.

Goose Ringing

The tenth autumn expedition in October, 1959 to ring Pink-footed Geese in Scotland and northern England was a disappointing one. Only 1219 geese were caught. There were various reasons why only seven catches could be made: the geese were unusually late in arriving and they included unusually few young birds so that they were less plentiful and more wary than usual, and bad weather, particularly fog, spoiled several chances. The catch included 14 geese marked by the Trust in Iceland in 1953 and 77 marked in Britain between 1952 and 1958, six of the latter having been caught in two previous years.

Attempts to catch Whitefronted Geese at Slimbridge in February 1960 were unsuccessful.

Swan Ringing

The Trust staff made no large-scale attempts to mark Mute Swans during the season, but General Wainwright caught 17 at or near Abberton, Essex and Miss E. A. Garden continued her most interesting ringing in Aberdeenshire.

Wader Ringing

An exploratory catch on the Wash near Terrington, Lincs. in August, 1959, showed that in special circumstances large numbers of waders could be caught with rocket-nets. Further experiments were made in the same area in August, 1960, when seven catches resulted in 2893 waders being caught. The great majority (2110) were Dunlin *Calidris alpina,* but there were useful totals of Knot *C. canutus* (482), Redshank *Tringa totanus* (167), Oyster-catcher *Haematopus ostralegus* (93) and Turnstone *Arenaria interpres* (33), with odd individuals of four other species. The catch of Dunlin included no fewer than 38 already ringed: one from Finland, eight from Sweden, four from Norway, two from Denmark, the rest British, including 17 from the catch in the same area in August, 1959. A British-ringed Oyster-catcher and a British-ringed Turnstone were also retrapped.

The use of rocket-nets for catching waders other than Dunlin requires the development of special skills in the siting of nets, but it is clear that the technique is of great promise, holding out the hope that Britain may at last begin to do as much in this field as the Scandinavians have done. The experiments so far made were undertaken at the request, and with the very active assistance, of the Wash Wader Ringing Group, and have been observed by the Bird Ringing Committee of the British Trust for Ornithology. Future work in this field will also be co-operative, rather than wholly sponsored by the Wildfowl Trust.

Coot ringing

A novel technique was successfully used in the Rushy Pen when 57 Coots (fully capable of flight) were gently walked into a large funnel trap. Already there have been two recoveries in Denmark.

Aerial surveys 1959-60

S. K. Eltringham

OVER 118 flying hours were spent on aerial survey in the twelve months 1st September, 1959 to 31st August, 1960. The largest portion of this time, over 57 hours, was occupied in a further series of flights over the Bristol Channel and Bridgwater Bay, Somerset, to follow up the previous season's surveys of the breeding and moulting Shelduck populations. An important survey was flown in late November and early December, 1959, when 38 hours were spent on a nearly complete census of the Barnacle Goose throughout its range in Scotland and Ireland. The remainder of the flying time was divided between a variety of smaller projects. Some 8 hours were devoted to two surveys of Brents on the east coast of England in December and February, 1959, and a further 8 hours to experimental flights to test the utility of aerial counts of the Mute Swan. These various surveys will be discussed at greater length below.

As in previous years, most of the local flying was carried out from Staverton Airport, between Cheltenham and Gloucester, using an Auster 5D of the Cotswold Aero Club. Our previous experience having taught us that

it is unwise to take hired aircraft away from base because of the possibility of bad weather delaying the return, the Brent surveys in Essex and Norfolk were made with aircraft hired from flying clubs at Ipswich, Skegness and Fakenham. The Barnacle survey was flown with aircraft hired from Skycraft Services Ltd., Dublin. The survey was commenced with an Auster Aiglet but, following an accident, was completed in a de Havilland Rapide, a twin engined biplane which proved to be an effective survey machine. The risk of damage to light aircraft operating from unsuitable fields is such that in future only longer-range twin-engined aircraft will be used in Ireland. Their extra safety in the event of an engine failure and their greater power under turbulent conditions are also of considerable value over the sort of country in which the geese are found.

Details of surveys flown

Mute Swans

These surveys were made in May and June, 1960, and were intended to test the technique of counting nesting swans and non-breeding birds. A repeat census of the Mute Swan is planned for 1961, following the publication of the results of the 1955/56 census conducted by the British Trust for Ornithology, and it was hoped to find whether aerial survey could make an important contribution to the proposed census. The aerial method was found to be highly successful. The number and location of nests and breeding pairs, brood size and the distribution of non-breeding birds are easily assessed from the air. The method is most effective in studying the distribution along rivers, which are much less easily followed on the ground. An average of about 150 swans per hour were recorded on the surveys flown over rivers and canals in the midlands and southern England.

Barnacle Geese

The results of the survey are included in the paper on pp. 116-124 of this Report. The importance of this survey lies in the fact that it is the first time that a near-simultaneous count of the Barnacle Goose has been made throughout its entire wintering range.

Brent Geese

Some counts of the Atlantic Pale-bellied race of the Brent Goose were made during the Barnacle survey in Ireland. The census of the Irish wintering population of this race could not be completed because of operational difficulties, but the searches made formed a useful preliminary to combined censuses from the ground and the air to be carried out in the winter of 1960-61.

Two surveys of the Brent Geese (predominantly of the Dark-bellied race) in eastern England were attempted. This race is found chiefly on the Essex and north Norfolk coasts and the Wash. The first survey in December, 1959, was seriously affected by the weather. Greater success attended the second survey flown in late February, 1960, when the flying was completed as planned on two consecutive fine days. A total of 4,600 Brent were recorded of which 3,170 were in Essex. The existence of an extensive cover of the Essex coast by the Essex Bird Watching and Preservation Society has enabled interesting comparisons to be made between aerial and ground counts.

In general, agreement has been good; for instance the present aerial figure of 3,170 on 27th February, 1960 fits nicely between totals of 3,790 and 2,320 recorded on 14th February and 13th March by the Essex bird watchers. An attempt to follow this survey by an aerial census of Brents in Northumberland and Durham was abandoned after two fruitless days spent in watching the weather from Newcastle-upon-Tyne Municipal Airport. There did not appear to be many geese in northern England at that time since a ground search found only 120 Brents on Fenham Flats, Holy Island, and none at all at Teesmouth on the Durham/Yorkshire border, the only places where Brent might have been expected in any number.

Shelduck

The extensive series of flights over Bridgwater Bay in 1959 were reported in the *Eleventh Annual Report,* pp. 107-117. These results suggested that there were two or possibly three waves of immigrants in July, (August) and September of which the first left without moulting. Moulting birds were found from August with a peak in early September. There was evidence of a further concentration of moulting birds in October. The repetition of these surveys in 1960 has enabled us to put these early conclusions upon a firmer footing. There were, as in 1959, two well defined peaks in the total number of birds, falling in July and September. A smaller August peak, suggested in 1959, was more clearly seen this year. The concentration of birds in August tends to be obscured by a larger influx arriving throughout the latter part of the month and reaching a peak in mid-September. An interesting feature of the 1960 results was a prominent increase in numbers towards the end of October. Although numbers were high at this time in 1959, no definite peak was detected.

The concentrations of moulting birds were found chiefly in August and September although the first to be found were seen on 26th July. There was again no evidence to suggest that the majority of the Shelduck present in July were other than passage birds. There was less apparent fluctuation in the numbers of moulting birds in 1960 than in 1959, but this is probably a reflection of an improved technique in assessing them. The previous method of estimating the proportion of flightless birds from a low level run was abandoned in favour of a direct count of all birds that remained on the water as the aircraft passed over at 300 ft. It has been found from experience that Shelduck are in moult if they do not fly under these conditions. The 1960 results tend to confirm the 1959 conclusion that there were three peaks in the number of moulting birds, falling in August, September and October. The August and September concentrations occur within a few weeks of each other with the September birds arriving before the August flocks have completed the moult. There was, however, a pronounced gap between the September and October moulting populations since no flightless birds were seen between 15th September and 25th October. The Shelduck which are going to stay in the area must shed their flight feathers very soon after arriving in Bridgwater Bay, since the periods of maximum numbers of flightless birds coincided with those of the total population.

Although the pattern of Shelduck movements in Bridgwater Bay during 1960 was similar to that of 1959, the total numbers present were rather less. The maximum number recorded in September, 1960 was 2,000 compared with

the 3,300 counted in the same month in 1959. The maximum number of moulting birds was correspondingly lower (1,760 : 2,750).

The breeding populations in the Bay and the upper reaches of the Bristol Channel were again studied earlier in the season. The more frequent flights in 1960 revealed an interesting decline in numbers during May. This phenomenon can be interpreted as being due to the absence of females from the area on nesting duties, and raises the somewhat novel possibility of measuring the breeding intensity from negative evidence. This " breeding dip " was most marked along the northern shore, suggesting that this was the more important breeding area. The departure of the local Shelduck, presumably to the German moulting grounds, was clearly detected and occurred in the early part of July. The number of juvenile Shelduck in 1960 showed a decline in July and early August similar to that recorded in 1959. This decline is unlikely to be entirely due to mortality; dispersal may be of equal, if not greater, importance.

Miscellaneous flights

Few other flights were carried out during the period under review, but one survey of value was made of wildfowl and habitats on the shores of Cardigan Bay. The flight was made from Staverton with refuelling stops at Swansea and packed over 6 hours flying into a short January day. Its main purpose was to supplement data from areas of West Wales, for which information on wildfowl was incomplete, for a national review being prepared by G. L. Atkinson-Willes. The survey showed close agreement with ground counts in the better known localities but found no large, hitherto unknown, flocks of wildfowl. The advantages of aerial survey were clearly demonstrated on this flight which established information that would have required several days of difficult travel to confirm from ground observation.