WATERFOWL COLLECTION

THE collection has continued to improve during the year and now consists of 130 species and subspecies and some 920 birds altogether. One of the most attractive features is the increase in the numbers of full-winged birds. During the year it was possible to see the following species in flight :

SOUTHERN RED-BILLED WHISTLING DUCK (*D. a. discolor*).
WHITE-FACED WHISTLING DUCK (*D. viduata*).
COSCOROBA SWAN (*C. coscoroba*).
BARNACLE GOOSE (*B. leucopsis*).
DARK-BELLIED BRENT GOOSE (*B. b. bernicla*).
GREY LAG GOOSE (*A. a. anser*).
YELLOW-BILLED BEAN GOOSE (*A. f. fabalis*).
PINK-FOOTED GOOSE (*A. brachyrhynchus*).
WHITE-FRONTED GOOSE (*A. a. albifrons*).
BAR-HEADED GOOSE (*A. indicus*).
EMPEROR GOOSE (*A. canagicus*).
BLUE GOOSE (*A. c. cærulescens*).
LESSER SNOW GOOSE (*A. c. hyperboreus*).
GREATER SNOW GOOSE (*A. c. atlanticus*).
ROSS'S GOOSE (*A. rossi*).
BAHAMA PINTAIL (*A. bahamensis*).
MALLARD (*A. p. platyrhynchos*).
PINTAIL (*A. a. acuta*).
GADWALL (*A. s. strepera*).
WIGEON (*A. penelope*).
SHOVELER (*A. clypeata*).
MANDARIN DUCK (*A. galericulata*).
CAROLINA DUCK (*A. sponsa*).

As usual a large number of wild birds spent the winter in the pens. Most numerous were Pintails. Details of these will be found on pp. 21–22.

ADDITIONS TO THE COLLECTION

New Species

Eight new species and one new sub-species have been added to the collection during the past year :—

WANDERING WHISTLING DUCK (*Dendrocygna arcuata*).—A pair received as an exchange from Rotterdam Zoo.

INDIAN SPOT-BILL (*Anas p. pœcilorhyncha*).—A pair received in exchange from Rotterdam Zoo.

SMEW (*Mergus albellus*).—A pair from Hamburg Zoo ; the female unfortunately died on the night of arrival.

WHITE-EYE, or FERRUGINOUS DUCK (*Aythya n. nyroca*).—A pair from Rotterdam Zoo.

INDIAN PYGMY GOOSE, or COTTON TEAL (*Nettapus c. coromandelianus*).—Three males and one female from Herr F. Duyzend, of Zeist, Holland.

SOUTH AFRICAN BLACK DUCK (*Anas s. sparsa*).—A male and three females from Mr. M. Wocke, of Belleville, Cape Province.

AFRICAN WHITE-BACKED DUCK (*Thalassornis l. leuconota*).—A pair presented by Mr. M. Wocke.

HARTLAUB'S DUCK (*Cairina hartlaubi*).—Two pairs collected by Mr. K. Smith in the Southern Province of Sierra Leone. This is a species of particular interest, being, it is believed, new to British aviculture.

PACIFIC WHITE-FRONTED GOOSE (*Anser albifrons frontalis*).—A pair as a gift from Dr. Dillon Ripley.

Species Not New to the Collection

In addition to the new species, the following forms, already represented in the collection, have been acquired :—

MANED GOOSE (*Chenonetta jubata*).—Five pairs.

CHESTNUT-BREASTED TEAL (*Anas castanea*).—One pair.

AUSTRALIAN GREY TEAL (*Anas gibberifrons mathewsi*).—One pair.

This valuable collection was presented to the Trust by Major W. Winter Irving, of Victoria, Australia.

SPUR-WINGED GOOSE (*Plectropterus gambensis niger*).—Two pairs received in exchange from Major H. R. Hendy, in Swaziland, S. Africa.

SPUR-WINGED GOOSE (*Plectropterus g. gambensis*).—A pair given by Mr. R. H. Simcock, in Nigeria.

GREY LAG GOOSE (*Anser a. anser*).—Three presented by Mr. A. Stewart Dean.

MANDARIN DUCK (*Aix galericulata*).—Seven young ones as a gift from Mr. C. D. W. Savage.

BLUE-WINGED TEAL (*Anas discors*).—Three pairs from Mr. Calvin Wilson, of Saltlake City, Utah.

BLUE-WINGED GOOSE (*Cyanochen cyanoptera*).—Two males and one female.

ABYSSINIAN YELLOW-BILLED DUCK (*Anas undulata ruppelli*).—Three drakes.

SOUTHERN POCHARD (*Netta erythropthalma*).—Two males and one female.

The above three species presented by Major A. Irwin, at Addis Ababa.

WHITE-FACED WHISTLING DUCK (*Dendrocygna viduata*).—Two males and one female.

SOUTH AMERICAN COMB DUCK (*Sarkidiornis melanotus carunculatus*).—A pair.

BRAZILIAN TEAL (*Amazonetta braziliensis*).—A male and two females.

The above three species presented by Mr. C. R. Murray, of Rio de Janeiro.

BARROW'S GOLDEN-EYE (*Bucephala islandica*).—A male and four females presented by Prof. I. McT. Cowan, of Vancouver.

CAPE SHOVELER (*Anas smithi*).—One male and two females.

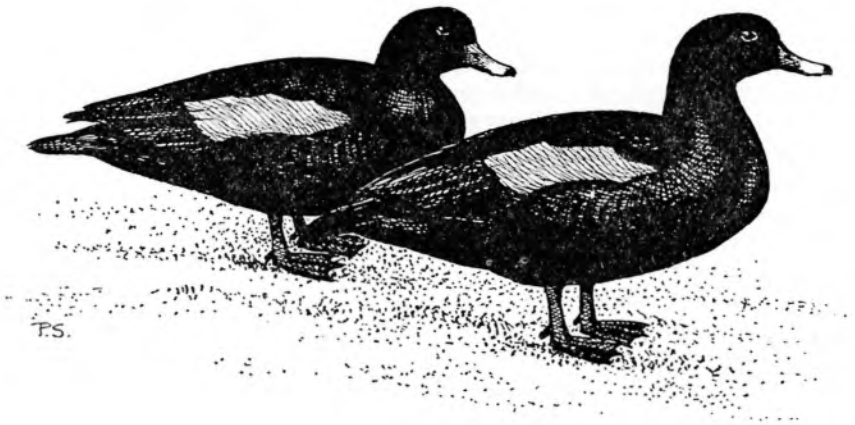
RED-BILLED PINTAIL (*Anas erythrorhyncha*).—Four females.

SOUTH AFRICAN YELLOW-BILLED DUCK (*Anas undulata*).—Four females.

The above three species presented by Mr. M. Wocke, of Cape Province.

HAWAIIAN GOOSE (*Branta sandvicensis*).—A male on loan from Mr. H. Shipman, of Hawaii.

COMMON SCOTER (*Melanitta n. nigra*).—A male presented by Miss Tucker, and a female by Mr. E. G. Holt.



LIST OF BIRDS (with Numbers of Specimens) IN THE COLLECTION AT 30th APRIL, 1951

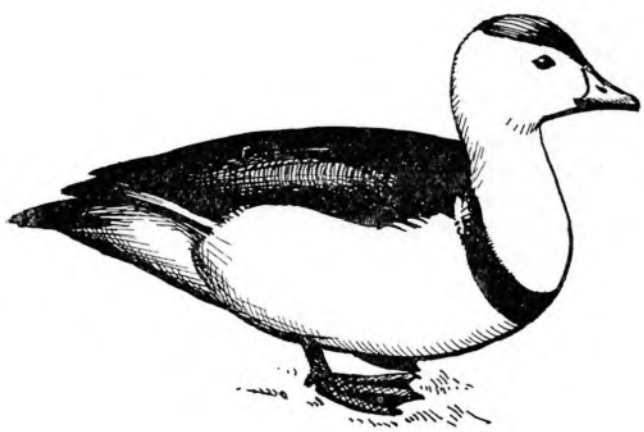
MAGPIE GOOSE (*Anseranas semipalmata*)	2
BLACK-BILLED WHISTLING DUCK (*Dendrocygna arborea*)	1
SOUTHERN RED-BILLED WHISTLING DUCK (*D. autumnalis discolor*)	8
FULVOUS WHISTLING DUCK (*D. bicolor*)	2
WANDERING WHISTLING DUCK (*D. arcuata*)	2
JAVAN WHISTLING DUCK (*D. javanica*)	2
EYTON'S WHISTLING DUCK (*D. eytoni*)	2
WHITE-FACED WHISTLING DUCK (*D. viduata*)	8
COSCOROBA SWAN (*Coscoroba coscoroba*)	4
WHOOPER SWAN (*Cygnus c. cygnus*)	3
WHISTLING SWAN (*C. c. columbianus*)	4
BEWICK'S SWAN (*C. columbianus bewicki*)	2
EASTERN BEWICK'S SWAN (*C. columbianus jankowskii*)	2
BLACK-NECKED SWAN (*C. melanocoryphus*)	2
MUTE SWAN (*C. olor*)	4
BLACK SWAN (*C. atratus*)	2
CANADA GOOSE (*Branta canadensis canadensis*)	2
CENTRAL CANADA GOOSE (*B. c. interior*)	2
LESSER CANADA GOOSE (*B. c. parvipes*)	1
WESTERN CANADA GOOSE (*B. c. occidentalis*)	6
TUNDRA CANADA GOOSE (*B. c. leucopareia*)	8
CACKLING GOOSE (*B. c. minima*)	10
HAWAIIAN GOOSE (*B. sandvicensis*)	3
BARNACLE GOOSE (*B. leucopsis*)	17
DARK-BELLIED BRENT GOOSE (*B. b. bernicla*)	9
LIGHT-BELLIED BRENT GOOSE (*B. b. hrota*)	3
BLACK BRANT (*B. b. nigricans*)	3
RED-BREASTED GOOSE (*B. ruficollis*)	19
SWAN GOOSE (*Anser cygnoides*)	2
GREY LAG GOOSE (*Anser a. anser*)	9
EASTERN GREYLAG GOOSE (*A. a. rubrirostris*)	5

YELLOW-BILLED BEAN GOOSE (*A. f. fabalis*) 2
BEAN GOOSE (*A. fabalis* ssp.) 7
PINK-FOOTED GOOSE (*A. brachyrhynchus*) 20
WHITE-FRONTED GOOSE (*A. a. albifrons*) 5
GREENLAND WHITE-FRONTED GOOSE (*A. a. flavirostris*) 8
PACIFIC WHITE-FRONTED GOOSE (*A. a. frontalis*) 2
PERRY RIVER WHITE-FRONTED GOOSE (*A. albifrons* ssp.) 2
LESSER WHITE-FRONTED GOOSE (*A. erythropus*) 10
BAR-HEADED GOOSE (*A. indicus*) 12
EMPEROR GOOSE (*A. canagicus*) 6
BLUE GOOSE (*A. c. caerulescens*) 6
LESSER SNOW GOOSE (*A. c. hyperboreus*) 4
GREATER SNOW GOOSE (*A. c. atlanticus*) 21
ROSS'S GOOSE (*A. rossi*) 15
RUDDY SHELDUCK (*Tadorna ferruginea*) 4
SOUTH AFRICAN SHELDUCK (*T. cana*) 6
AUSTRALIAN SHELDUCK (*T. tadornoides*) 3
NEW ZEALAND SHELDUCK (*T. variegata*) 6
RED-BACKED RADJAH SHELDUCK (*T. radjah rufitergum*) 2
COMMON SHELDUCK (*T. tadorna*) 2
EGYPTIAN GOOSE (*Alopochen aegyptiacus*) 4
ORINOCO GOOSE (*Neochen jubatus*) 3
ABYSSINIAN BLUE-WINGED GOOSE (*Cyanochen cyanoptera*) . . . 5
ASHY-HEADED GOOSE (*Chloephaga poliocephala*) 4
RUDDY-HEADED GOOSE (*C. rubidiceps*) 6
GREATER MAGELLAN GOOSE (*C. p. leucoptera*) 2
LESSER MAGELLAN GOOSE (*C. p. picta*) 3
CEREOPSIS GOOSE (*Cereopsis novae-hollandiae*) 8
ANDEAN CRESTED DUCK (*Lophonetta specularioides alticola*) . . . 5
MARBLED TEAL (*Anas angustirostris*) 6
CAPE TEAL (*A. capensis*) 7
VERSICOLOR TEAL (*A. v. versicolor*) 1
PUNA TEAL (*A. v. puna*) 3
RED-BILLED PINTAIL (*A. erythrorhyncha*) 6
BAHAMA PINTAIL (*A. bahamensis*) 10
CHILEAN PINTAIL (*A. georgica spinicauda*) 9
PINTAIL (*A. a. acuta*) *c.*30
CHILEAN TEAL (*A. f. flavirostris*) 6
COMMON TEAL (*A. c. crecca*) 5
GREEN-WINGED TEAL (*A. c. carolinensis*) 7
BAIKAL TEAL (*A. formosa*) 1
AUSTRALIAN GREY TEAL (*A. gibberifrons mathewsi*) 5
CHESTNUT-BREASTED TEAL (*A. castanea*) 3
NEW ZEALAND BROWN DUCK (*A. aucklandica chlorotis*) 1
MALLARD (*A. p. platyrhynchos*) *c.*120
HAWAIIAN DUCK (*A. p. wyvilliana*) 2
NORTH AMERICAN BLACK DUCK (*A. f. rubripes*) 6
FLORIDA DUCK (*A. f. fulvigula*) 2
MOTTLED DUCK (*A. f. maculosa*) 3
INDIAN SPOT-BILL (*A. p. pœcilorhyncha*) 2
AUSTRALIAN GREY DUCK (*A. superciliosa rogersi*) 7

South African Yellow-bill (*A. u. undulata*)	10
Abyssinian Yellow-bill (*A. u. rupelli*)	5
Cameroon Yellow-bill (*A. undulata* ssp.)	1
Philippine Duck (*A. luzonica*)	2
South African Black Duck (*A. s. sparsa*)	3
Gadwall (*A. s. strepera*)	25
Falcated Teal (*A. falcata*)	2
Wigeon (*A. penelope*)	20
American Wigeon (*A. americana*)	7
Chiloe Wigeon (*A. sibilatrix*)	6
Blue-winged Teal (*A. discors*)	5
Cinnamon Teal (*A. c. cyanoptera*)	10
Garganey (*A. querquedula*)	12
South American Shoveler (*A. platalea*)	2
Cape Shoveler (*A. smithi*)	3
Shoveler (*A. clypeata*)	17
Red-crested Pochard (*Netta rufina*)	6
Rosy-bill (*N. peposaca*)	6
Southern Pochard (*N. erythropthalma*)	13
Canvasback (*Aythya vallisneria*)	5
Common Pochard (*A. ferina*)	10
Red-head (*A. americana*)	8
White-eye, or Ferruginous Duck (*A. nyroca*)	2
Ring-necked Scaup (*A. collaris*)	2
Tufted Duck (*A. fuligula*)	8
Common Scaup (*A. m. marila*)	6
Lesser Scaup (*A. affinis*)	5
Brazilian Teal (*Amazonetta braziliensis*)	2
Maned Goose (*Chenonetta jubata*)	13
Mandarin Duck (*Aix galericulata*)	15
Carolina Duck (*A. sponsa*)	26
Indian Pygmy Goose, or Cotton Teal (*Nettapus coromandelianus*)	4
Indian Comb Duck (*Sarkidiornis m. melanotus*)	2
South American Comb Duck (*S. m. carunculatus*)	3
Hartlaub's Duck (*Cairina hartlaubi*)	4
Muscovy Duck (*C. moschata*)	3
Spur-winged Goose (*Plectropterus g. gambensis*)	4
Black Spur-winged Goose (*P. g. niger*)	3
Common Eider (*Somateria mollissima*)	7
Common Scoter (*Melanitta nigra*)	1
Barrow's Goldeneye (*Bucephala islandica*)	9
American Goldeneye (*B. clangula americana*)	1
Common Goldeneye (*B. c. clangula*)	1
Smew (*Mergus albellus*)	1
Goosander (*M. merganser*)	1
Red-breasted Merganser (*M. serrator*)	6
North American Ruddy Duck (*Oxyura jamaicensis*)	7
African White-backed Duck (*Thalassornis l. leuconota*)	2
Total	890

HYBRIDS

Andean Goose × Upland Goose	2
Grey Lag Goose × Barnacle Goose	2
Ross's Goose × Red-breasted Goose	1
Red-breasted Goose × Lesser White-fronted Goose	3
Lesser Snow Goose × Blue Snow Goose	3
Grey Lag Goose × Canada Goose	1
White-fronted Goose × Bean Goose	2
Tundra Canada Goose × Lesser Snow Goose	1
Andean Goose × Egyptian Goose	1
Rosy-bill × Yellow-bill	1
Chilean Teal × Carolina Duck	3
Red-crested Pochard × Chilean Pintail	2
Cape Teal × Tufted Duck	1
Chilean Pintail × Bahama Pintail	2
Falcated Teal × American Wigeon	1
Chilean Teal × Chestnut-breasted Teal	3
Blue-winged Teal × Cinnamon Teal	3
Total	32
Total number of birds at the New Grounds	922



THE BREEDING SEASON, 1950

By J. Yealland, Curator

FROM the tables which follow it will be seen that, in general, a greater degree of success was achieved with the rearing of goslings than with ducklings.

The summer was persistently wet and often cold so that the growth of grass and clover was maintained at a higher rate than would have been the case in a hot dry summer when grass grows little and becomes tough and unappetizing.

It may have been that this abundance and palatability of plant food more than compensated for the inclement weather by maintaining health and building up the goslings' resistance to chills. However that may be, there is no doubt that cold and wet are death to all but the strongest of ducklings, and it was evident from post-mortem examination that many of the deaths were traceable to chill.

There were some cases of paratyphoid and a number of ducklings were infested with tape-worms of the genus *Hymenolepis*, while others died at an early age through having failed to assimilate all the yolk of the egg. The cause of this has not been ascertained, but it occurred mostly in those which were late in hatching.

A disappointment was the failure to rear more than one Marbled Teal. These were extremely sensitive to cold, a condition which has been observed elsewhere.

The Southern Red-billed Whistling ducklings hatched very late in the year and, though they thrived until the end of September, all but four then developed rickets.

This year the parents, a full-winged pair, went to the other extreme and nested early in March. Up to the 30th of April, 31 eggs were laid, though only five of them have proved fertile.[1]

It would be almost impossible to reach more than general conclusions from the analysis, for some of the parent birds are elderly, others may be inbred or closely related, while it is possible that some, having been bred in captivity, are of slightly inferior physical quality and therefore tend to be unlikely to produce really healthy young.

This possibility was particularly noticeable in the Ross's Geese, the two young whose father was a wild-caught bird from the Perry River being far superior to those of entirely hand-reared parentage.

The food used for goslings was fine soaked biscuit-meal in addition, of course, to grass and clover growing in the pens. Food for ducklings included the biscuit-meal, dried milk, raw egg, meat-meal (believed to be made from dried liver or whale meat), dried and fresh ants' 'eggs', cod-liver oil, various small water-life (including small shrimps which are found in the Severn and which form the main food of the local wild Shelducklings), and duckweed. The Sea-ducklings were reared on minced sheep's heart, ants' 'eggs', a small amount of biscuit-meal, water insects and cod-liver oil.

[1]During the 1951 season the female laid 75 eggs from which only 5 young were reared.

TABLE IX

HATCHING AND REARING

Species	Breeding pairs	Date of first egg	No. of eggs	Taken by vermin	Infertile	Broken by hen	Addled	Dead in shell	Hatched	% Hatched of eggs laid	% in 1949	Crushed by hen	Killed by predators	Reared	Reared in 1949	% Reared of eggs hatched	% in 1949	Remarks
Southern Red-billed Whistling Duck	1	22.7	14	—	—	—	—	1	13	93%	—	—	—	4	—	31%	—	Plus 5 rachitic specimens destroyed
Coscoroba Swan ..	1	13.3	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	
Tundra Canada Goose	2	10.4	23	—	13	—	—	1	9	39%	17%	1	2	6	4	66%	100%	
Western Canada ..	2	20.4	9	—	5	—	1	—	3	33%	—	—	—	3	—	100%	—	
Barnacle	1	23.6	4	—	—	—	1	—	3	75%	50%	—	—	—	2	—	67%	
Red-breasted	1	15.6	5	—	4	—	—	—	1	20%	—	—	—	1	—	100%	—	
Greylag	1	18.4	7	—	6	—	—	—	1	14%	—	—	—	1	—	100%	—	
Lesser White-fronted	1+1f	1.5	11	—	7	—	2	—	2	18%	—	—	—	2	—	100%	—	
Emperor	2	30.4	16	1	9	1	—	2	3	19%	33%	1	1	1	4	33%	100%	
Bar-headed	2	15.4	13	2	2	—	—	2	7	54%	89%	—	—	7	6	100%	75%	
Greater Snow ..	3+1f	3.5	69	4	33	—	2	1	28	40%	50%	2	—	15	3	54%	30%	Several died from what appeared to be epilepsy
Lesser Snow	1	18.5	5	1	2	—	—	—	2	40%	—	—	—	1	—	50%	—	

Blue Snow	1+1f	29.4	9	—	6	—	—	—	4	44%	71%	—	1	3	6	75%	60%	
Ross's Snow	3	4.5	16	—	3	—	—	4	9	56%	23%	—	—	4	2	44%	50%	
Ruddy Shelduck ..	1	28.4	6	—	6	—	—	—	—	—	—	—	—	—	—	—	—	
N.Z. Shelduck ..	1	11.4	8	—	6	—	—	—	2	25%	14%	—	—	2	1	100%	100%	
Egyptian	2	14.3	31	—	16	—	1	1	13	43%	77%	—	—	13	9	100%	90%	
Upland	1	2.4	11	—	11	—	—	—	—	—	—	—	—	—	—	—	—	
Ruddy-headed ..	1	26.4	16	—	16	—	—	—	—	—	—	—	—	—	—	—	—	
Cereopsis	1	13.2	5	—	1	—	—	—	4	80%	50%	—	—	4	—	100%	0%	
Marbled Teal ..	1	?	9	—	—	—	—	—	9	100%	—	—	—	1	—	11%	—	
Puna Teal	1+1f	10.4	15	1*	5	—	2	2	5	33%	43%	—	—	1	—	20%	0%	*Taken by visitor
Red-billed Pintail ..	1	?	4	—	4	—	—	—	—	—	—	—	—	—	—	—	—	
Bahama Pintail ..	3	5.5	45	—	9	—	1	1	34	76%	88%	—	—	23	9	69%	64%	
Chilean Pintail ..	1	27.3	14	—	5	3	1	5	—	—	25%	—	—	—	2	—	50%	
Pintail	3	30.3	28	—	9	2	7	3	7	25%	43%	—	—	4	3	56%	33%	
Black Duck	2	26.3	24	—	4	—	—	—	20	83%	69%	—	5	3	11	15%	44%	
Mottled	1	24.4	6	—	—	—	2	—	4	66%	58%	—	—	4	5	100%	71%	
Florida	1	19.3	9	—	9	—	—	—	—	—	—	—	—	—	2	—	—	

[*continued*

TABLE IX—*continued*

Species	Breeding pairs	Date of first egg	No. of eggs	Taken by vermin	Infertile	Broken by hen	Addled	Dead in shell	Hatched	% Hatched of eggs laid	% in 1949	Crushed by hen	Killed by predators	Reared	Reared in 1949	% Reared of eggs hatched	% in 1949	Remarks
Spot-billed	1	19.3	12	—	5	—	—	—	7	58%	42%	—	—	—	3	—	23%	5 killed by Hen
Australian Grey Duck	2	19.3	28	—	12	—	—	1	15	55%	62%	—	—	11	4	73%	40%	1 m. 10 f. Two left with parents disappeared
African Yellow-billed	2+1f	21.3	30	—	12	3	5	7	3	10%	41%	—	2	—	3	—	25%	
Gadwall	3+1f	6.5	28	—	5	—	1	1	21	75%	83%	—	—	20	8	94%	19%	1 reared by the mother
Wigeon	3	24.4	30	2	11	4	3	—	10	33%	43%	—	—	10	6	100%	60%	
American Wigeon ..	3	18.5	21	—	10	—	4	3	4	20%	26%	—	—	—	8	—	89%	All weaklings
Chiloë Wigeon ..	2+1f	22.4	24	—	18	—	4	—	2	8%	53%	—	—	—	12	—	67%	
Cinnamon Teal ..	5	8.4	50	—	4	—	3	5	38	76%	63%	1	1	19	2	50%	8%	1 hatched by parent and disappeared
Garganey	1	?	?	—	?	—	—	—	6	—	29%	—	—	—	1	—	50%	Hatched by the mother and only 2 caught
Shoveler	3	18.5	40	—	9	1	9	—	21	52%	95%	1	—	10	12	49%	63%	1 died through swallowing a whole beech-nut
Red-crested Pochard	3+1f	26.3	32	—	6	2	—	—	24	75%	56%	—	2	2	14	8%	41%	

Rosy bill	3	13.5	38	—	6	—	—	6	26	69%	48%	—	2	8	14	34%	67%	
Pochard	2	18.4	9	—	—	—	2	—	7	77%	56%	—	—	7	2	100%	40%	
Red head	1	7.6	3	—	3	—	—	—	—	—	87%	—	—	—	10	—	77%	
Scaup	2	29.5	14	—	2	—	2	4	6	43%	0%	—	2	2	3	33%	0%	
Maned Goose ..	1	24.8	10	—	10	—	—	—	—	—	—	—	—	—	—	—	—	Arrived from Australia, 23.7.50
Mandarin	3	27.4	18	—	11	—	—	2	5	28%	—	—	—	3	2	60%	—	
Carolina	15?	22.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Experimentally incubated at 99°F.	..	..	47	—	16	—	10	16	5	—	—	—	—	—	—	—	—	Hatched on 39th–41st day
Incubated for 15 days at 99°F. and 18 days at 102°F.	..	..	40	—	14	—	7	1	18	—	—	—	—	8	—	—	—	Hatched on 33rd–34th day
Incubated by the mother	..	..	29	6*	9	—	—	—	14	—	—	—	—	9	—	—	—	*Taken by visitor. Rest hatched on 29th–30th day
Incubated by bantam	..	..	190	—	56	1	25	30	78	—	—	6	2	37	—	—	—	Hatched on 29th–30th day
Total Carolinas ..	..	..	306	6	95	1	42	47	115	—	38%	6	2	54	72	—	47%	
Red-breasted Merganser	1 f	2.6	7	—	7	—	—	—	—	—	—	—	—	—	—	—	—	
Ruddy Duck	2	26.5	11	—	1	—	—	—	10	—	91%	—	1	2	20	—	—	

[*continued*

TABLE IX—*continued*

Species	Breeding pairs	Date of first egg	No. of eggs	Taken by vermin	Infertile	Broken by hen	Addled	Dead in shell	Hatched	% Hatched of eggs laid	% in 1949	Crushed by hen	Killed by predators	Reared	Reared in 1949	% Reared of eggs hatched	% in 1949	Remarks
								BROUGHT AS EGGS										
Greylag	—	—	5	—	1	—	—	1*	3	60%	—	—	—	3	—	100%	—	*Deformed bill
Shelduck	—	—	4	4	4	—	—	—	—	—	—	—	—	—	—	—	—	
Gadwall	—	—	9	—	6	—	—	1	2	22%	—	—	—	—	—	—	—	
Wigeon	—	—	16	—	16	—	—	—	—	—	—	—	—	—	—	—	—	
Tufted	—	—	41	—	25	6	1	—	9	22%	—	—	2	5	—	56%	—	
Pochard	—	—	35	18	2	—	12	2	1	3%	—	—	—	—	—	—	—	
Goldeneye	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	Plus 10 broken in transit
Eider	—	—	4	—	4	—	—	—	—	—	—	—	—	—	—	—	—	
Red-breasted Merganser	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	Plus 5 arrived broken

EGGS FROM ICELAND																		
Scaup	—	—	12	—	3	—	1	1	7	58%	—	—	—	3	—	43%	—	
Barrow's Goldeneye..	—	—	14	—	5	—	2	3	4	29%	—	—	—	2	—	50%	—	
Scoter	—	—	11	—	3	—	1	—	2	18%	—	—	—	—	—	—	—	
Long-tailed	—	—	12	—	6	1	1	2	2	17%	—	—	—	—	—	—	—	
Merganser	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	
BROUGHT AS YOUNG																		
Greylag	—	—	3	—	—	—	—	—	—	—	—	—	—	1	—	33%	—	
Shelduck	—	—	20	—	—	—	—	—	—	—	—	—	1	13	9	65%	69%	
HYBRIDS																		
Swan x Domestic Chinese 1-1f	—	—	14	—	7	—	—	—	7	50%	—	—	—	7	—	100%	—	
Bean x White-fronted	—	—	4	—	2	—	—	—	2	50%	—	—	—	2	—	100%	—	
Blue x Lesser Snow	—	—	12	—	2	—	2	2	6	50%	—	1	—	3	—	50%	—	
Tundra x Lesser Snow	—	—	7	—	—	—	4	—	3	43%	—	1	—	1	—	33%	—	
GRAND TOTAL	—	—	**1371**	**39**	**524**	**24**	**119**	**112**	**551**	**40%**	**59%**	**14**	**24**	**282**	**274**	**52%**	**42%**	

PATHOLOGY

The Trust's thanks are due to Mr. D. W. Menzies and Mr. J. A. J. Venn of the Ministry of Agriculture Veterinary Investigation Centre, Langford, for post-mortem examinations and bacteriological investigations. With their help it has been possible to make a much more scientific approach to the problems of disease in the collection than had previously been possible. Much progress has already been made in finding cures for the ailments which have hitherto caused casualties. As more and more data are amassed it is confidently expected that deaths from many of the diseases will be greatly reduced.

The Trust is also most grateful to Mr. C. S. Adams for his services in veterinary surgery.

A tabular summary of the results of the post-mortem examinations performed is set out below. This does not purport to be a complete record of the deaths in the collection during the year : a small number of adults are omitted because of insufficient information, and the ducklings reported on represent only a sample of the total losses (practical difficulties in the handling of material in summer prevent more complete coverage).

It will be seen that, though the largest number of casualties is listed under 'Infectious and Parasitic Diseases', in no case did any disease attain epidemic proportions. The great variety of causes of death is perhaps the most striking feature of the summary.

In the table the class 'Young' comprises birds less than four months old.

Contributory causes of death are not included ; no individual appears more than once in the summary. Birds dying within two days of arrival in the collection are not included.

TREATMENT

Gizzard Worm (*Amidostomum anseris*)

Both Phenothiazine and carbon tetrachloride have been successfully used in the treatment of this parasite. The latter, in doses of 1 cc., acts more rapidly, but is more dangerous if the birds' general condition is much lowered. Few deaths occurred when infestation was correctly diagnosed in time.

Aspergillosis

So far as is known there is no cure for birds sufficiently affected by this mould disease for accurate diagnosis. Prophylaxis recommended by Biester and Schwarte (*Diseases of Poultry*, pp. 407–8) is confined to the avoidance of mouldy food and litter, but other observations indicate that the spores of *Aspergillus fumigatus*, the most pathogenic species, are airborne. Thus they are less likely to be inhaled if grain is wet when fed to the birds.

There is some reason to believe, as indicated by Yealland (Mycosis in Birds, *Avicultural Magazine*, Vol. 55, pp. 20–22), that potassium iodide is a prophylactic, and this is now being given to the Sea-ducks in the food.

Further scientific work on this disease is proposed.

TABLE X

CAUSES OF DEATHS IN THE COLLECTION

(May 1950—April 1951)

Cause of Death	Species	Young	Adult	Total
Infectious and Parasitic Diseases				
Paratyphoid (*Salmonella*) ..	Red-billed Whistling Duck	1+	—	
	Puna Teal	1	—	
	Bahama Pintail	1+	—	3+
Renal coccidiosis	Ross's Goose	—	1	1
Intestinal coccidiosis	Rosybill	1	—	
	Eider	—	1	2
Aspergillosis	Upland Goose	1	1	
	Andean Crested Duck	—	1	
	Red-crested Pochard	—	1	
	Maned Goose	—	1	
	Eider	—	1	6
Gizzard Worm (*Amidostomum sp.*)	Chinese Goose	—	2	
	Grey Lag Goose	—	1	
	Greater Snow Goose	—	1	
	Upland Goose	—	2	6
Cestode infestation (*Hymenolepis spp.*)	Bahama Pintail	1	—	
	Shoveler	—	1	
	Pochard	—	1	
	Carolina Duck	—	1	4
Trematode infestation ..	Shelduck	—	1	
	Bahama Pintail	1	1	3
Diseases of Circulatory System				
Inflammation of heart	Barnacle Goose	—	1	1
Lesion in spleen	Red-breasted Goose	—	1	1
Heart failure	Grey Lag Goose	—	1	1
Diseases of Respiratory System				
Acute congestion of lungs ..	Emperor Goose	—	1	
	Ruddy Duck	—	1	2
Pneumonia	Red-billed Pintail	—	1	1
Infection of syrinx	Barrow's Goldeneye	—	1	1
Diseases of Digestive System				
Impaction of intestine	Fulvous Whistling Duck	—	1	1
Impaction of gizzard	Florida Duck	—	1	1
Cirrhosis of liver	Richardson's Goose	—	1	1
Fatty degeneration of liver ..	Black Duck	1	—	
	Cinnamon Teal	1	—	
	Red-crested Pochard	1	—	3
Acute enteritis	Florida Duck	—	1	1
Diseases of Urino-genital System				
Nephritis..	Lesser White-fronted Goose	—	1	
	Barrow's Goldeneye	—	1	2
Nutritional Diseases	Red-billed Whistling Duck	3	—	
	Greater Snow Goose	1	—	
	Eider	—	3	7

[*continued*

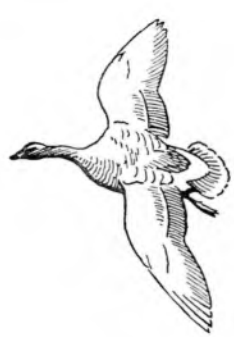
TABLE X—*continued*

Cause of Death	Species	Young	Adult	Total
Violent and Accidental Deaths				
Predators	Swan Goose	—	1	
	Greater Snow Goose	—	1	
	Shelduck	—	1	
	Abyssinian Blue-winged Goose	—	1	
	Puna Teal	1	—	
	Mottled Duck	2	—	
	Blue-winged Teal	—	1	8
Drowning	White-faced Whistling Duck	—	1	
	Swan Goose	1	—	
	Scoter	1	—	3
Fighting	Mottled Duck	—	1	1
Destroyed (because of senility, injury, etc.)	Australian Shelduck	—	1	
	New Zealand Shelduck	—	1	
	Red-billed Pintail	—	1	
	Bahama Pintail	1	—	
	Australian Grey Teal	—	2	
	Gadwall	1	—	
	Spur-winged Goose	—	1	8

TABLE XI

SUMMARY

Mortality Factors	Age of Birds		Total
	Young	Adult	
Infectious and Parasitic Diseases	7	18	25
Diseases of Circulatory System	—	3	3
Diseases of Respiratory System	—	4	4
Diseases of Digestive System	3	4	7
Diseases of Urino-genital System	—	2	2
Nutritional Diseases	4	3	7
Violent and Accidental Death	5	7	12
Destroyed	2	6	8
	21	47	68



THE SCIENTIFIC VALUE OF A GROUP COLLECTION OF LIVE ANIMALS

Konrad Z. Lorenz

Dr. Lorenz began a stay of six weeks at Slimbridge, the first, it is hoped, of a series of regular visits, during April, 1951. *The results of his particular studies will be reported fully in next year's report. Meanwhile he gives his impressions of the value of the Trust's collection in the following article.*—ED.

All biological science has begun its career with *collecting*, and it is worthy of psychological consideration that nearly all really successful biologists have, in their own lives, gone through a period in which they repeated, individually, the history of their science. There are very few of them, indeed, who have not been given to collecting, as a hobby, at an early stage of their scientific development. It is not only legitimate, but absolutely necessary, that the study of animals or plants should begin with simply and modestly collecting knowledge of 'all there is' before proceeding to the more ambitious task of causal analysis. If some modern physiologists show a certain tendency to look down on museum collections, systematics and comparative anatomy, they forget that these particular branches of biological science have given to all others their common fundamental—the theory of evolution.

For certain reasons, which need not concern us here, the study of animal behaviour did not, until a very recent date, introduce the evolutionary viewpoint into its consideration—very much to its own detriment. The fact that all the innate traits of animal behaviour can—and therefore must—be studied from the common viewpoint of phyletic descent, remained necessarily hidden from scientists who never studied the behaviour of a whole group of species, but confined themselves to just one kind of animal, chosen exclusively for the single reason that it was the easiest to obtain, to keep and to breed. The basic discovery which has since given rise to a new branch of behaviour study—Comparative Ethology—is, in itself, very simple : certain innate behaviour patterns are not only common to all the individuals of a species, but very often to much more comprehensive groups of animals as well. In other words, these innate behaviour patterns have, among the several species, genera, families, and still larger groups of animals, exactly the same type of distribution and, with decreasing relationship, the same grading of similarity into dissimilarity, as we find in the comparison of bodily characters.

From this the important inference is, obviously, that these behaviour patterns are just as old as any structural properties whose systematic distribution is about the same. To people who regard animal behaviour as something extremely variable and unrestrictedly modifiable these facts seem very surprising and even unbelievable. Yet, so far from being 'slippery stuff' to use in systematic comparison, innate behaviour patterns are, in most cases, extremely conservative characters, indeed, much more so than the specific form of bones and other hard structures. What is hardest and least perishable in the museum, need not necessarily be so in evolution.

Let us look at just one example: since the very beginnings of ornithological systematics, the structure and proportions of the skull and bill have been considered as characters of paramount importance and reliability. A group of

Anatidæ, the so-called 'Geese', were lumped together on the strength of just one character: in all of them the lamellæ of the bill have been converted into sharp, horny teeth in adaptation to grass-eating, while their skull has assumed, for the same reason, a typical high profile, calculated to heighten the chewing pressure of the mandibles. With the true geese, like the Greylag, Bean, White-front, Pinkfoot, Snow, Bar-headed, Canada, Brent, Barnacle, etc., were included the Andean, Upland, Kelp, etc. (genus *Chloëphaga*), the Abyssinian Blue-winged Goose (*Cyanochen*), the Australian Cape Barren Goose (*Cereopsis*), the Spur-winged Goose (*Plectropterus*), the Maned Goose (*Chenonetta*), and even the tiny Pygmy Geese of the genus *Nettapus*. All were considered as one family. Subsequent close investigation, in which the consideration of innate behaviour patterns played an important part, revealed the indubitable fact that these birds, so far from being closely related to each other, really belong to at least three different groups, the true Geese, the Sheldrakes and the Perching Ducks. The Genus *Chloëphaga*, the Abyssinian Blue-winged, and the Cape Barren Goose, have, all of them, evolved from the Sheldrake family, but, in all probability, independently from each other and in very different parts of the world. The Spur-winged Goose belongs to one group of the Perching Ducks and is allied to the Muscovy Duck, while the Maned Goose and the Pygmy Geese belong to another, and are closely related to the Mandarin and Carolina Ducks. All instinctive behaviour patterns of these birds, particularly those of courtship display, are quite typical of the respective groups to which they belong. None of these innate movements are common to all so-called 'Geese'. The fact that the latter do not, by any means, represent a phyletically coherent family is further emphasized by a great number of other morphological characters.

It is, on principle, impossible to attribute a fixed and constant systematic value to any single character, because one and the same structure may, in different groups, undergo evolutionary change at quite different speeds. What is an exceedingly conservative, slow-changing property in one family or order, may be very plastic in another. In the *Anatidæ*, for example, the colour markings of the downy young are evidently most resistant to evolutionary change, while the form of head and bill is extremely plastic; in the order of Rails (*Rallidæ*) the very opposite is true. The 'relative conservativity' of every single property must, therefore, be gauged in every single instance by a thorough comparison with as many other characters as possible. If, in a group of animals represented by a considerable number of forms, we amass as many comparable characters as possible, our conclusions become more reliable in geometrical proportion to the number of characters considered. The historical correctness of our conclusions increases not only with the number of agreeing 'documents' which point in one direction, but the significance of each document is increased with the number of others with which we are able to compare it, in order to ascertain its particular age and value.

This is precisely why the phylogeneticist is forever on the lookout for new, comparable characters; and also why he prefers to work on groups which are rich in species. A group consisting exclusively of one or two isolated species with nothing but 'missing links' to join it together, and on to other groups, is obviously not a favourable object for evolutionary studies. On the other hand, in a group with many species, every taxonomic character can be studied in many different forms and stages of differentiation. Charles Otis Whitman and Oskar Heinroth, the pioneers of Comparative Ethology, both chose for investi-

gation a group which fulfilled these requirements : the former worked on the pigeons, the latter on the ducks and geese. It is an interesting historical fact that both these scientists were primarily phyleticists rather than behaviour students and that it was their assiduous search for comparable characters that induced them to bring innate behaviour patterns into consideration. Thus, Comparative Ethology originated in the service of the study of evolution.

Thus we may infer that the studies of evolution in general and of comparative ethology in particular are dependent on a suitable object of study which possesses certain essential qualities. The discovery of a law of nature has always been dependent upon the selection or discovery of a favourable object of study. If we review these essential qualities we find ourselves simultaneously expounding the scientific value of collecting and keeping live animals belonging to one systematic group. For the purpose of the studies in question it is necessary to keep live animals in perfect condition, in order to investigate their innate behaviour patterns. It would be absolutely impossible to acquire an extensive comparative knowledge of these patterns by field observation alone, even if one genus were not, as it so often is, distributed all over the globe. The group chosen for an object of a study ought, therefore, to be technically easy to keep and to breed; only if the animals display the whole inventory of their instinctive activities are we furnished with a solid basis for our comparison of behaviour. The group must also be rich in innate behaviour patterns and, last but not least, it must contain an abundance of sub-orders, families, genera and species, and there must be enough gradations and transitions which link up the under-groups.

There can be hardly any doubt that, among all the groups of animals which are available in captivity at present, the order of *Anatidæ* is the one which fulfills all these requirements in the most ideal manner. Though C. O. Whitman worked on the order of pigeons and though valuable work has been done on Cichlid fishes, the *Anatidæ* still rank first as an object of evolutionary and ethological study. A number of prominent phylogeneticists such as Heinroth, Mayr, Delacour, von Boetticher and others have given special attention to this order. The writer of these lines, as a comparative ethologist, has found the unique collection of *Anatidæ* at the New Grounds a wonderful subject for his investigations. The word 'unique' is not used here in the complimentary but in the literal sense. There is not, in all the world, another collection of *Anatidæ* as complete, and what is more, there is no other collection of any group of live animals which could, for the type of evolutionary investigation sketched in this article, be exploited to such advantage as that of the Severn Wildfowl Trust.

Systematics and taxonomy are regarded by many people as tedious subjects. Some biologists even think that phylogenetic investigations performed by the method of systematic comparison are something rather antiquated, something that was all right in the days of Darwin and Wallace, but rather out of date at the present time. So far from having shot its bolt, however, phylogenetics is only beginning to get, from other branches of biological science, the consideration which it merits. The current modern physiology of the central nervous system, to cite only one instance, would do well to give more thought to phylogenetic considerations. The 'simple' reflex-arc, still regarded by many physiologists as *the* basic element of all central nervous structures and functions, is, in reality, a phyletically extremely 'young' acquisition which does not occur at a lower stage of evolution than birds and mammals. But apart from their everlasting scientific value, phylogenetic studies done by the good old method of

comparison of homologous characters are a superlatively alluring occupation. The attempt to disentangle the course which evolution has taken ages ago, by the simple means of comparing the similarities and dissimilarities of living animals, and thus delving into times a thousandfold more remote than the earliest dawn of human history, is among the most fascinating enterprises that the human mind can undertake. To me, at least, it always causes a truly reverential thrill, whenever comparative study leads to some real insight into the blood-relationship of different species and allows us, to a certain extent, to reconstruct their latest common ancestor!

PREENING STUDIES

By D. F. McKinney

As briefly reported in the 3rd Annual Report a study has been made, since November, 1949, of the behaviour of the *Anatidæ*, with particular emphasis on such everyday activities as preening, bathing, shaking, stretching, etc. Although the investigation is still incomplete, a record of its nature and scope may be of interest. The method has involved direct observation and description of the birds' movements, with the assistance of still and ciné photography. The results, largely of a detailed descriptive nature, are not yet sufficiently complete for generalization.

The Mallard has been selected for close study and the behaviour of this species provides a model with which to compare that of its relatives. Preening, bathing, shaking, stretching and other similar activities have been studied in the adult Mallard. Their development has been observed in ducklings. Their relations to one another and to various stages of the life history have been examined.

In order to cover one important part of the life history, observations have been made on the incubation behaviour of the Mallard. The most interesting period has proved to be at the time of hatching. As soon as the ducklings begin to move about in the nest, the duck performs very frequent oiling preens. The function of this behaviour would seem to be the distribution of oil over the ducklings before they leave the nest. It is hoped to extend these observations with a view to investigating the stimuli which elicit this interesting behaviour.

Although of considerable intrinsic interest, these 'everyday' behaviour patterns are not, however, particularly suitable as taxonomic characters for the determination of relationships within the *Anatidæ*. They are on the whole very deeply ingrained, and from an evolutionary point of view much 'older' than the display-movements which have been studied by Lorenz. It is possible, however, that such movements might prove to be very useful when examined in a number of the larger groups of birds. This has been done by Heinroth, notably with the scratching movements of birds. It is hoped that the descriptive material which is being collected may provide a basis for such comparisons.

Much recent research on animal behaviour has drawn attention to the 'displacement activity', and the existence of 'displacement-preening' is well-known in the *Anatidæ*. This group, moreover, is especially interesting in showing many states of the incorporation of such activities in the display. In some species, such as the Mandarin, the 'false-preening' movements are highly ritualized and form important elements in the display, while in other species it is often difficult to be sure whether one is watching 'false-preening' or not.

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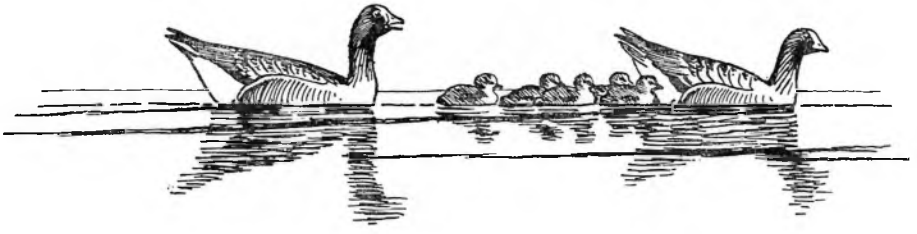
In the present study, the incorporation of other every-day movements in display is being investigated. For example, wing-shaking movements are highly developed in the aggressive behaviour of Canada geese. In the Common Sheldrake, the 'throw-up' movement used by the adult male in the breeding season is derived from the ordinary shaking movement.

The head-shaking movements are particularly interesting in *Anatidæ*. These are of several different types and their normal function is the removal of water, dirt or loose feathers from the head or beak. In many species, however, these movements are used during display, while they are also used in various forms in the well-known 'pre-flight' movements.



SWEDEN 1950

THE Trust was represented at the Xth International Ornithological Congress held in June, 1950, at Uppsala, Sweden, by the Director and the Assistant Secretary, Miss P. Talbot-Ponsonby. Two films were shown by the Director, one of the Trust's work and the other of his expedition to the Perry River region of Arctic Canada (recorded in the Third Annual Report).

After the Congress the Trust's delegates took part in excursions to Jämtland and Abisko in Lapland, and later, accompanied by a member, Dr. J. D. Mills and Dr. Finnur Gudmundsson, the Icelandic delegate, made a trip to the Lapland breeding and moulting grounds of the Lesser White-fronted Goose, *A. erythropus*. The principal object was to catch and bring back alive three male Lesser White-fronts for three hand-reared breeding females in the collection at the New Grounds. The success of this mission is described in the following note contributed by the Director.

Among the mountains of Torne Lappmark, near the border between Sweden and Norway, is the summer home of the most beautiful of the grey geese—known locally as the Mountain Goose, and to us by the much less romantic name of Lesser White-fronted Goose.

On 1st July we reached the highland lakes just above the line of birch woods and saw our first Mountain Geese—a party of fourteen, swimming below us on the smooth water of a small tarn. During the following week, with a Lapp hut as our base we walked over the surrounding moors and hills. Evidently the geese were not breeding extensively in this area ; we saw only one brood of 5 goslings with their parents, although many broods had been seen at the same spot by our Swedish guide, Knut Larsen, during the previous summer. About 200 adult geese, however, were living on these lakes and it seemed that as soon

as they became flightless we should have a good chance of catching the three ganders we needed. But in the days that followed we found that catching them was no easy matter even though they had moulted their flight feathers. The first bird which we managed to run down turned out to be a female. She was therefore ringed and released.

The daily technique was to cross the big lake by boat and then walk round the most likely tarns, stalking up to each in the hope of spotting the geese before they spotted us, usually quite a forlorn hope. When they did spot us they immediately began to run up the nearest and steepest available mountain.

Once, in pursuit of a flightless goose, I ran up a col and came over the crest upon the splendid sight of a pair of Rough-legged Buzzards diving in turn at a White-tailed Eagle. The eagle was sitting on a rock ducking its head at each attack by the mobbing buzzards. There were Long-tailed Ducks, Velvet and Black Scoters, Goldeneyes, Phalaropes, Long-tailed Skuas, Merlins, Lapland Buntings, Redpolls, Wood Sandpipers, and Red-throated Divers in the area, and we caught a Lemming.

Towards the end of our week, when Mills and Gudmundsson had already left, we came one evening round a point on the lake, in Knut's boat with his outboard motor on the stern. There on the water were about thirty geese and it was soon clear that many of them were flightless. They made for a huge cake of ice which lay at the foot of a precipitous cliff. After running across the ice some tried to hide in the narrow strip of open water along the shore, while others began to climb the cliff. Further up it became sheer; for once the geese were cut off. We landed in their rear, and for the next half-hour, rock climbing was added as a new ingredient to the pursuit of geese. One was caught trying to climb a near-vertical wall of rock and fluttered down stern first into my arms, another was caught by Knut, and a third made off back into the lake where, with oars, and later with the outboard motor, we pursued him. It was half an hour before he could be persuaded to go ashore again. The first time he did so I over-ran him and he got back into the lake again. After another half-hour he sneaked ashore for the second time and set off uphill. I followed him at lung-bursting speed up to a col. When I got there he had disappeared. I cast around and just as I was giving up the unequal struggle I flushed him from the dwarf birch. He went off down hill at full speed, I after him, taking giant strides on the steep hill side. I ran all out for 200 yards and overtook him only ten yards from the lake. We were both exhausted and I sank to the ground with the little gander in my arms.

One of the three we had caught, being a female, was ringed and released. We had only two ganders and we needed three. On the following day, which was our last, we surprised about twenty moulting geese at the head of a bay in the main lake. We had already walked nearly twenty miles and were returning empty-handed in the boat. By the time we had landed in pursuit, the geese had a good start, but the three of us divided, each to chase a separate bird. Yet another breath-taking all-out run was needed before we rejoined each other, each carrying a Mountain Goose. Two were males and one a female. But we only kept one—to make up the three we needed. The other two were ringed and released again.

And so we returned with wild-caught ganders to pair with the three hand-reared females at the New Grounds.

(NOTE.—Young have been reared from one of these pairs during the summer of 1951.)