# The Scottish Naturalist

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With which is incorporated

## The Annals of Scottish Natural History

EDITED BY

V. C. WYNNE-EDWARDS
*Regius Professor of Natural History*
*Aberdeen University*

AND

JAMES W. CAMPBELL

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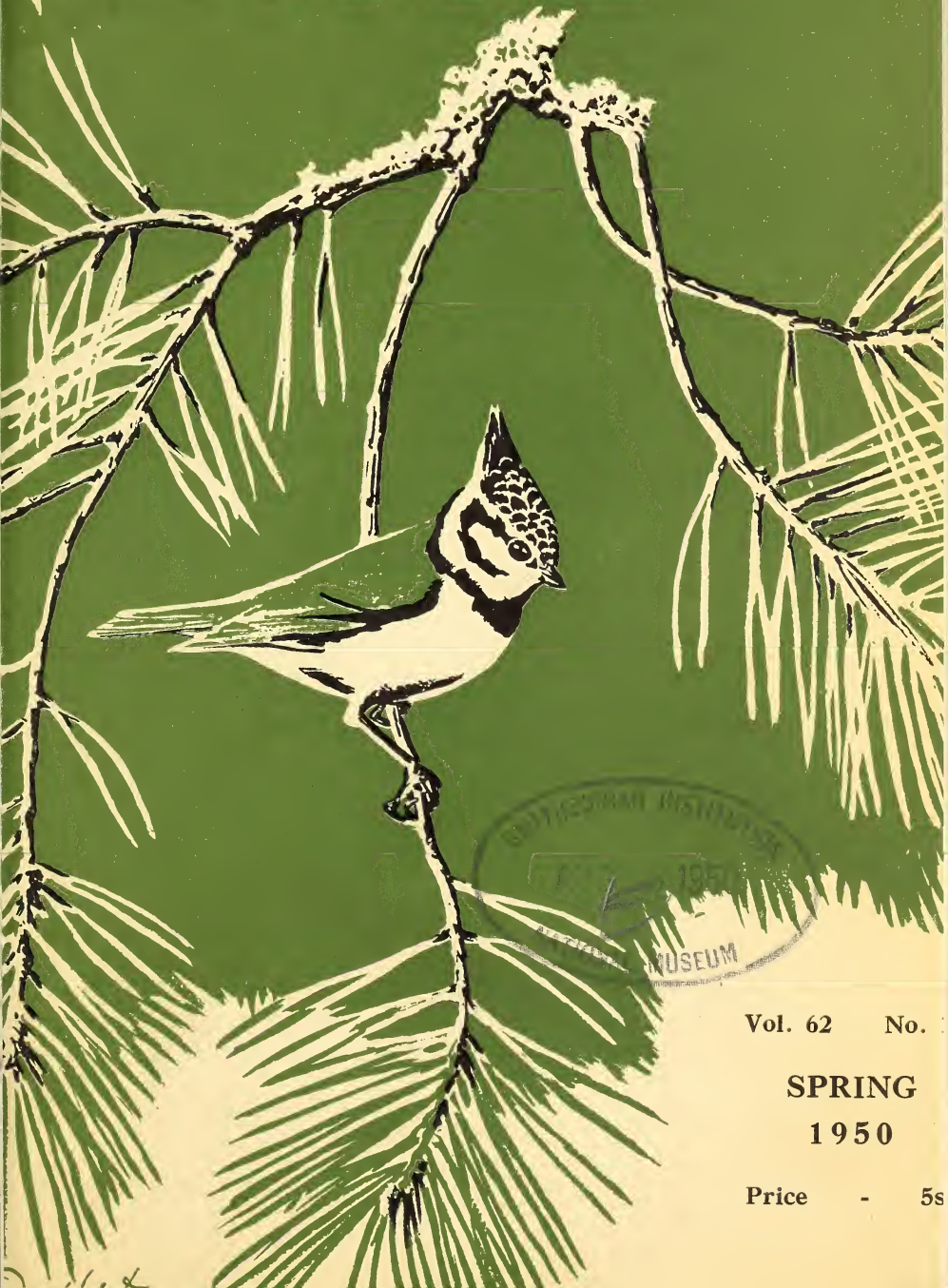
# THE SCOTTISH NATURALIST



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# The Scottish Naturalist

Volume 62, No. 1 Spring 1950

## NOTES ON THE BEHAVIOUR OF SOME DUCKS

Henry Boase
Invergowrie by Dundee

The following notes and the accompanying sketches are in some instances supplementary to articles dealing mainly with display which appeared in *British Birds* some twenty years ago. Since then, some additional notes have been made on behaviour, and opportunities have arisen to record the display of some other species which were not dealt with in the original series. Further, it has been found that description alone can give but a vague idea of the actual attitudes used during display, and the attempt has been made to draw these attitudes in a semi-diagrammatic form as a means of making more definite the verbal descriptions given, both in the earlier articles and in the present account.

Where a detailed account of display has been published, a short summary of the display action is given, giving reference to the appropriate diagram, and the reference to the previous article is detailed so that the full account can be found.

### Sheld-duck *Tadorna tadorna.*

*Display.*—The male uses a salute—a deliberate up-toss of the bill with neck extended vertically, used on land or afloat, on salt water or fresh, sometimes preceded by a dip of the bill, sometimes an extension of the neck horizontally.



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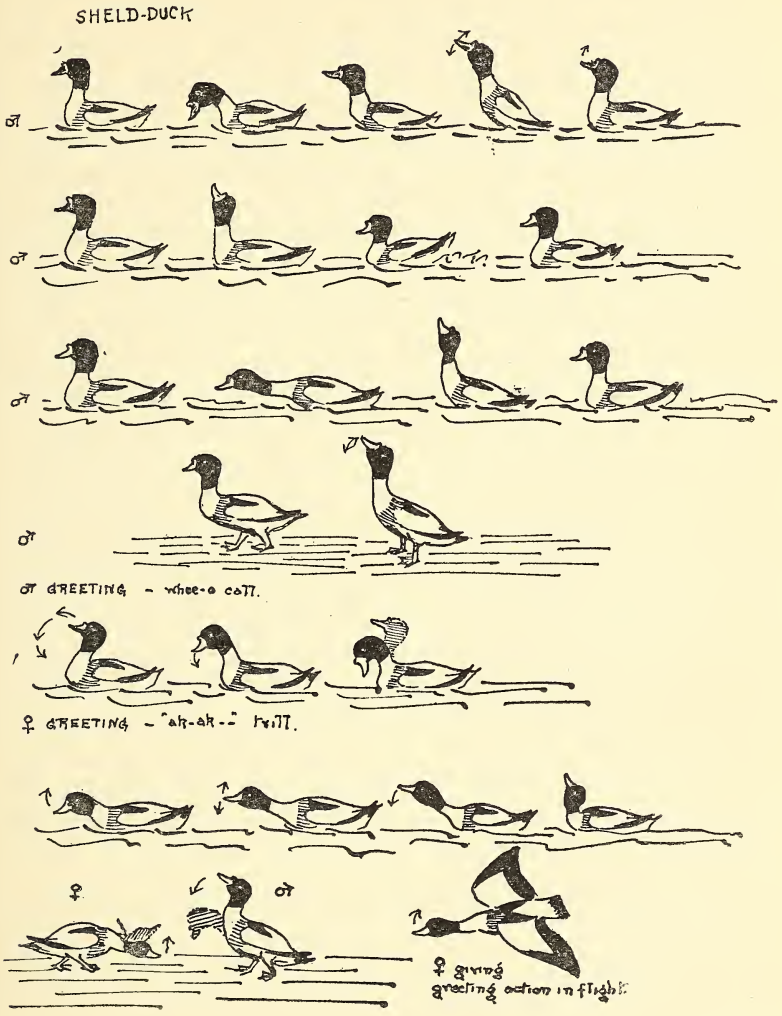
There is a greeting display between the members of a pair, differing for male and female : that of the male a repeated upward and forward bow, that of the female a scooping action with extended neck. These actions are accompanied by calls—a " whee " or " quee " note from the male, a trill " ak-ak . . ." from the female.

*Fighting*.—Male sheld-duck fight quite vigorously at times, commonly gripping each other at the base of the neck, and pushing, with open wings used as additional supports. The vanquished bird may fall over on its back, or may break away and take to flight, closely pursued by its opponent. In flight, an attacking male may try to drop on the other, and both may fall in a confused flurry of wings, disappearing under water with a splash. Once a male was watched as it tried to " down " the male of a pair it was pursuing. Commonly pairs show some jealousy when they meet on the flats, and both male and female may attack their opposite —male to male, female to female—the action generally ending in flight and chase, with the greeting ceremony between male and female when they alight.

*Treading*.—Only on one or two occasions, out of hundreds of watching periods, has actual pairing been seen on salt water. On 25th March 1945 various individuals in a party of sheld-duck were diving, remaining under water ten to twenty seconds. Two birds dived together and came up well apart ; these immediately stretched and preened. Later, a male was seen swimming after and overtaking a female : the male was dipping the head past the eye with a rapid motion difficult to follow. The female settled low in the water, and skated ahead when the pursuer got too close. No further behaviour was noted. Later, a female dived, followed by a male, without any preliminary display of any kind ; they came up well apart, to shake themselves and preen. In another instance, one bird dived and the other seemed to swim about as though watching the submerged bird. Once a bird came up alone from a dive : once two birds dived almost simultaneously, but at least four feet apart. In another instance, while a preliminary chase seemed to be developing, the male was attacked by the male of a nearby pair and the action was broken. On one occasion,


SHELD-DUCK
♂
♂
♂
♂
♂ GREETING - whee-o call.
♀ GREETING - "ah-ah-" call.
♀
♂
♀ giving greeting action in flight
H. BOASE 1949

treading was seen on fresh water. In this instance, the birds did not dive, and there were no obvious preliminaries. The female just dipped below the surface as the male mounted.

*Feeding*.—Although most food is obtained on the open flats by sifting the surface ooze, some is got by grubbing with head immersed in the few inches of water near the edge of the flood tide. Feeding by up-ending in the shallows along the edge of the sedges is usual. Some birds go into the sedges and feed there, either by sifting, grubbing, or up-ending, as the tidal conditions demand. The feeding of the downy young is mainly by sifting the surface ooze of the mudflats. Some do feed by diving in shallow water, both in salt water and fresh, but some juveniles either do not dive, or at times refrain from doing so. The feeding on the flats is very active, the brood or pack commonly sweeping in line to and fro on a broad front over a chosen area of the flats commonly near the edge of the sedges. The brood may feed right in among the sedges along with the attendant adult (or adults) ; they may rest there, as broods in a close huddle, with the adults nearby, have been found on drier patches. Even when full grown and fledged, the rate of sweep (side to side motion) and the rate of progress on the flats are noticeably more rapid than the like motions of the adult, sufficient indeed to make possible the separation of juvenile and adult at long range.

Diagrams.—The first four lines show variations of the male salute display. Once, a female was seen to give a " shadow " of this display. The fifth and sixth lines show the male and female greeting action while swimming, while the seventh set shows the action on the flats, and a greeting display given in flight by a female on one occasion.

References.—*Brit. Birds*, 27 : 218-224 (1935) and 31 : 367-371 (1938).

Mallard *Anas platyrhynchos*.

The display of the drake takes two forms—a bow and rise on the water varying in detail, and a spasm display when the neck is suddenly stretched upwards and the tail raised ; both forms are commonly accompanied by a call " pee-reek " given at the climax. The female also uses two forms

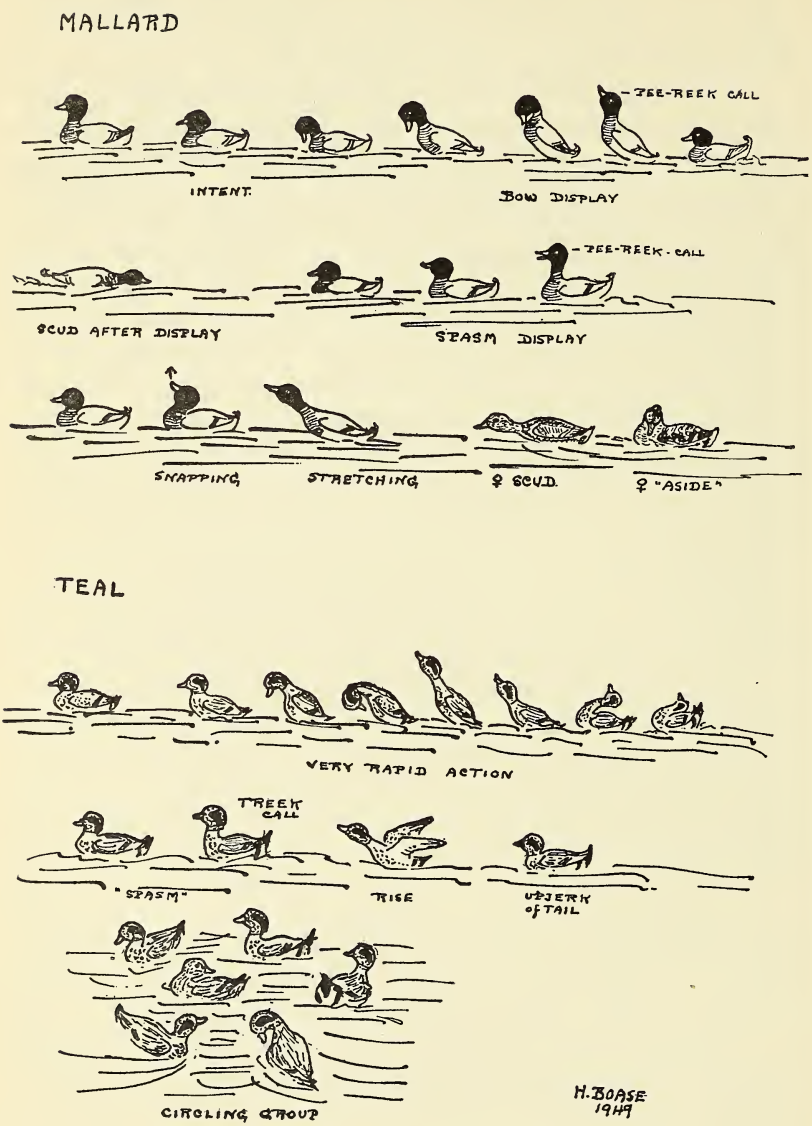
—a rapid swimming to and fro among the males with head and neck in line, sometimes swinging up and down, and rapid swimming with neck retracted with the bill pressed against the upper breast towards one side, perhaps in the direction of the greater male activity.

The drake may turn aside and scud a short distance after display : he may snap at passing insects with an upward toss of the bill : he may stretch—rising on the water without opening and beating the wings as is usual in less emotional occasions. The spasm display is very abrupt with only a slight raising of the head to mark its coming. The spasm may follow the bow. The sketches show a raising of the tail at the finish of the bow display and this may represent the " shadow " of the less usual spasm as a finish to the bow. The sketches show an " intent " attitude, an attitude used by birds which may give more active display later when the excitement has increased. All the ducks mentioned in these notes show this special attitude in some form and it is shown by both sexes ; sometimes in the female it shows only as a vague preening.

*Fighting.*—Mallard are comparatively peaceful in display. Perhaps the usual equality in numbers of the sexes may be the reason. Only once has a male seemed aggressive, charging at a rival with neck extended and open bill, assisting its progress with open wings. There is, of course, the flighting in threes, two males pursuing a female in swift flight, an association removed however from the bustle of open courtship in the flock, and which suggests a keener rivalry, yet the finish of these flights seems to the observer quite indecisive in most instances.

*Treading.*—Both male and female bob the head up and down with level bill, the male starting first and the female responding presently : the speed of bobbing increases slowly and after a time, which varies widely, pairing follows. On one occasion, a male associated with two females (this is not unusual) bobbed and paired with one without the other showing any interest.

Diagrams.—The first line shows the intent and forms of the bow display ; the second line the spasm display ; in


MALLARD
TEE-REEK CALL
INTENT
BOW DISPLAY
TEE-REEK-CALL
SCUD AFTER DISPLAY
SPASM DISPLAY
SNAPPING
STRETCHING
♀ SCUD
♀ "ASIDE"
TEAL
VERY RAPID ACTION
TREEK CALL
"SPASM"
RISE
UPJERK of TAIL
CIRCLING GROUP
H. BOASE 1949

the third line some minor mannerisms and two displays of the female.

REFERENCE.—*Brit. Birds*, 25 : 12-17 (1931).

TEAL *Anas crecca*.

*Display*.—The display of the male is similar to that of mallard—a bow and a spasm—but the speed of action is more rapid. The female shows no marked behaviour, merely showing pretence of preening when excitement runs high. There is a more marked tendency for the active birds to separate into groups and a party of four or five males may encircle a female, swimming and displaying as they pass before her. A minor display, where the male turns aside with a backward glance and an upward twitch of the tail, may serve to exhibit the deep velvety black and chrome yellow patches on the flanks near the tail (actually the outer tail coverts). When excited, the males show a definite raising of the plumage of the nape so that a step in the line of the feathering is clearly visible.

DIAGRAMS.—The first line shows progressive attitudes in the bow display ; the second line, the spasm display, stretching rise, and a minor form of the spasm where the tail only is twitched. Below is a group of males encircling a female.

REFERENCE.—*Brit. Birds*, 19 : 162-164 (1925).

WIGEON *Anas penelope*.

*Display*.—Although wigeon have been watched on many occasions, only now and then has any real display been seen. For the most part, wigeon appear to occupy much time during ordinary daylight hours in feeding, at least while on fresh water, and only very occasionally show any real excitement. The male uses quite commonly an attitude with neck retracted, bill slightly uptilted, with wings raised as from the wrist so that they rest inclined upwards over the back, and calls a clear " whee-oh," but this appears to be more an aggressive attitude towards other males than an attitude of display towards the females. On 14th January 1940 a group was watched in more active display. In it, a female was swimming to and fro, followed by six males, of which

only four appeared to be excited. The female attitude was little different from the normal, just the head held a little higher with level bill, with the neck straight and slightly inclined forward. Once or twice it nodded, or turned from side to side. The males used a rather vague bow, almost dipping the bill, then the head rising and swinging back until the bill is rather up-tilted, with a momentary upthrust of the tail. At times, one or more of the males used the attitude with raised wings and head held low, calling the " whee-oh " note. On another occasion, when only one male was active among several females, the male used the " raised wing " attitude, calling, and turning from side to side among the females, while they wheeled and jostled, calling a hoarse " urth " note. In another instance, several males swam around with wings up, calling, while a female in which they were interested wheeled and preened.

On 5th April 1942, a male and female were swimming in line ahead, the female leading. The male started to bob the head up and down, in the same manner as mallard. The female stopped and turned to face the male, and also started to bob. The pace of the male's bobbing increased, but presently the female turned away and stopped bobbing, and the male also ceased.

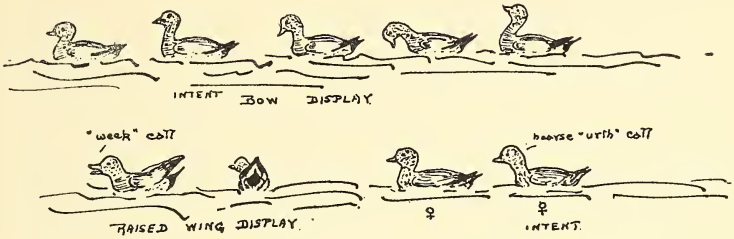
*Feeding.*—Wigeon seem to prefer the hard slub of the outer Tay Estuary to the soft mud of the upper tidal water ; they appear to pick from the surface rather than sift. On fresh water, wigeon commonly feed in association with other species—with whooper swan, mute swan, pochard, coot, but only casually with tufted duck or goldeneye. Coot seem to be the favourite provider, often three wigeon to one coot, the ducks feeding on the weed left by the coot after it has picked the insects, etc., from it.

Diagrams.—The first line shows the vague bow of the male ; the second line the male with raised wings, and two attitudes of the female.

Shoveler *Spatula clypeata.*

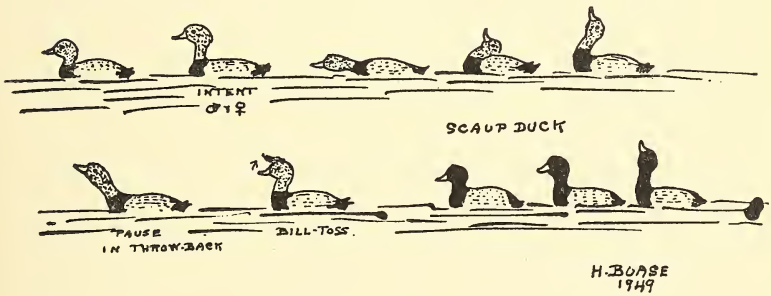
The shoveler is a summer visitor to the lochs in the Tay area and does not arrive there until the middle of March. Some

WIGEON




SHOVELER

POCHARD



may linger in flocks on the larger lochs until December but seem to show very little excitement, although sometimes in pairs. Apparently the males come to the marshes before the females but this is made uncertain by the difficulty of detecting the females among the withered sedges.

*Display.*—The only action noted has been a bobbing of the head up and down by extension and retraction of the neck, the bill held horizontal ; on occasions, the bill has been dipped to touch, or almost touch, the water in the lower position, and raised to about twenty degrees in the upper position. This bobbing action is used in various circumstances —drake bobs to drake as well as to the female, and the female may also bob. The male and female have a mutual act of " bibbling," as it is called, when the two birds circle or move together with head low, with retracted neck, bill almost horizontal and immersed to the base, and with the rear portion of the body raised an inch or more above its normal level. This action appears at first sight to be a form of feeding, but it seems actually to be a ceremonial, as normally feeding is done by up-ending in the shallows or sifting among the sedges, etc.

The following reports of behaviour will give some indication of the display. A pair and one male were watched on a patch of open water on 19th April 1924. The paired male scudded at the other male, which immediately took to flight, followed by the pair. The paired male attempted repeatedly to jostle the other male in the air, threatening to drop on it. All three presently alighted and the paired male renewed his attack. Again the second male took flight followed by the pair. Presently the solo male dropped into the patch of open water and the pair landed in the sedges. The two males could see one another, and they sat, with extended neck and level bill for a short period, neither moving. Presently the paired male began to bob, and his mate also bobbed, the pair meanwhile passing to open water where they began to feed.

On 10th April 1944, a male feeding alone was joined by a second male and almost at once a swimming chase began. The chaser bobbed at intervals as it slowly overtook the other. The last foot or so was covered with a rush and

the pursued male then rose and flew a few feet, sometimes followed by the other also in flight. Presently another male came out of the sedges and joined in the chase, but merely tailed along and did not bob. Finally, when the original pursuer had almost overtaken the first intruder, the latter had to turn into the wind to rise at the last moment, and the aggressor seemed to stretch the neck to reach up, but did not snap at the other. There the action ended.

A later record of display was made on 5th June 1925, which seems a late date for such activity. Several males were seen together and these were bobbing to each other, for the most part with the bill held horizontal, but at times the bill was dropped so that the tip touched, or almost touched, the water and at the top of the bob was raised 15-20 degrees upward inclination. Presently a female appeared and was greeted by one of the males with the bob, sometimes swinging the bill up and down. The female also bobbed, but only with level bill, when close together, the pair swam round bibbling. After a few turns, the pair began to feed by up-ending in the shallows.

Bobbing has been seen in late autumn—on 7th November 1937 ; there appeared to be one pair at least in the flock.

Diagrams.—These show the two forms of bobbing, and also the bibbling attitude.

Common Pochard *Aythya ferina.*

*Display.*—The display is in two forms—a salute in which the head is thrown back until the nape touches the back, or may stop short of that final position, and a lure position, with extended neck with head in line held low but not awash. There are minor displays—bill-tossing, and bobbing. The following accounts of display will indicate the use of these forms.

At Thriepley Loch on 19th February 1923, there were a male and female together, and nearby a male asleep. Presently the second male awoke, extended the neck vertically, with level bill, and joined the other two ; it bobbed once or twice. All three swam around, and one male (which, was

not certain) swung back the head so that the nape touched the back. This was repeated—probably both males were displaying, but the movement made it difficult to be certain —and once it appeared that there was a momentary pause with the head and neck in line at a steep angle before the swing back. Both males bill-tossed, and gave the rising stretch common to ducks. Presently both males left the female and swam to a third male which had come up, and one male displayed to it—nape to back. Presently all three males returned to the female and gave further display, and after a few minutes all four began to feed.

A more active display was seen at Lintrathen Loch on 23rd April 1939. The group consisted of two males and two females, of which only one female was interested. All were swimming about in a restricted space in open water, and when first seen were in active display. The males were using an intent attitude with extended upright neck and level bill, and some raising of the plumage of head and neck. They also used a luring attitude—head and neck in line held low, chin almost touching the water, and the bill rather up-tilted—neck only moderately extended. The main display was a back throw of the head and neck from the intent attitude, either partial, stopping with neck at about sixty degrees over back and bill vertical, or with nape touching back, with bill vertical. The female used an intent attitude like the male.

There was little formality about the display. The males swam around and after the active female, sometimes one intent, the other in lure, sometimes both in the same attitude, while the female wheeled and turned to one or other male and threatened him when he came too close. Now and then, one or other male gave the salute, generally the high form ; only twice did a male give the second attitude with the nape touching. One male was more active than the other. When in the intent attitude, the males sometimes bobbed the head up and down by extension and retraction of the neck, and the female also bobbed at least once.

*Breeding*.—In one instance, a female which had been seen with a male up to 7th March, was always alone after that date, and was with a brood on 5th June. The downy young

had a "jump" dive like the adult, and all dived together, in contrast to the rather ragged diving of a brood of tufted duck.

*Feeding.*—On salt water, will feed in moderate depths by diving in the usual manner, but will also grub in the shallows and up-end like a surface-feeding duck. A drake fed on weed brought up by a coot and made no attempt to dive on its own account. Pochard will share weed, brought up by diving, with wigeon. Pochard is not a very active feeder during ordinary daylight hours and may associate with resting mallard on both fresh and salt water.

*Fear.*—A full grown juvenile seemed frightened at the approach of a dabchick and swam away with backward glances.

Diagrams.—The first line shows the intent attitude, the luring attitude, and the salute in two forms ; the second line a variant of the salute, the bill-toss, and bobbing pose.

Tufted Duck *Aythya fuligula.*

*Display.*—The chief form of display is a throw back of the head so that the nape touches the back. No intermediate forms, such as have been noticed for pochard, have been seen. The intent attitude of both male and female is similar—erect extended neck with bill held level, with the head feathers of the male at least expanded. There are minor displays—bill-tossing, bobbing, stretching with closed wings, and scudding swiftly on the surface similar to the behaviour of other ducks. A paired male, when its mate is courted by a rival male, assumes an attitude with head down level with the back, with level bill, giving a hunched appearance, and keeps on the far side of the female, well away from the direct attention of his rival.

*Display on salt water.*—Although tufted duck are common on salt water in winter, on one occasion only has display been noticed. On 23rd January 1943, a pair swam together and both bill-tossed several times, and presently flew away together.

*Anger.*—On 29th May 1935, at Lochendores, two pairs of tufted duck approached one another. The male of one pair rushed at the other male and he skated aside. Immediately the mate of this second male drew aside and took wing, followed by her mate. The aggressive male seemed the more

angry and swam about, with head held high, tossing the bill and calling, looking from side to side. He rushed at his mate and she scudded out of the way, and he continued to hunt around for a further few minutes.

*Forceful treading of female.*—On 5th June 1925, a male tufted duck made a most determined effort to tread a female, which resisted with the utmost vigour, diving and struggling with open wings when gripped by the male. Once the drake got over the duck, holding on to the nape feathers, but was shaken off after repeated dives. On another occasion, on 26th June 1948, at Duns Dish, a pair of tufted duck alighted on the water. The female immediately turned and snapped at the male. He approached repeatedly and she turned about and bit him each time. He bit in return, and held on when he got a grip, whether neck or wing. Finally he got a grip of the nape and struggled to tread the female. Presently, they drew apart and preened quietly.

*Feeding.*—Some tufted duck have been feeding regularly at sewer outfalls at Dundee in winter, diving in the tide stream. During low tide, some grub in the shallows of runnels in the mudflats with the head submerged. Tufted duck have not been seen up-ending or sifting mud.

Diagrams.—The first line shows the intent attitude, the main display, the bill-toss, and the stretch ; the second line, the scud, and the intent and bobbing of the female. The group shows a mated male keeping well away from another male displaying to his mate.

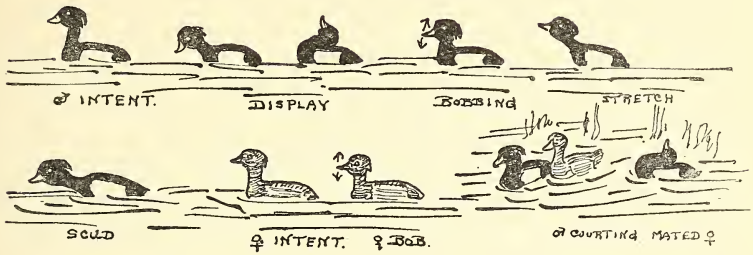
Reference.—*Brit. Birds*, 19 : 226-230 (1926).

Scaup-duck *Aythya marila.*

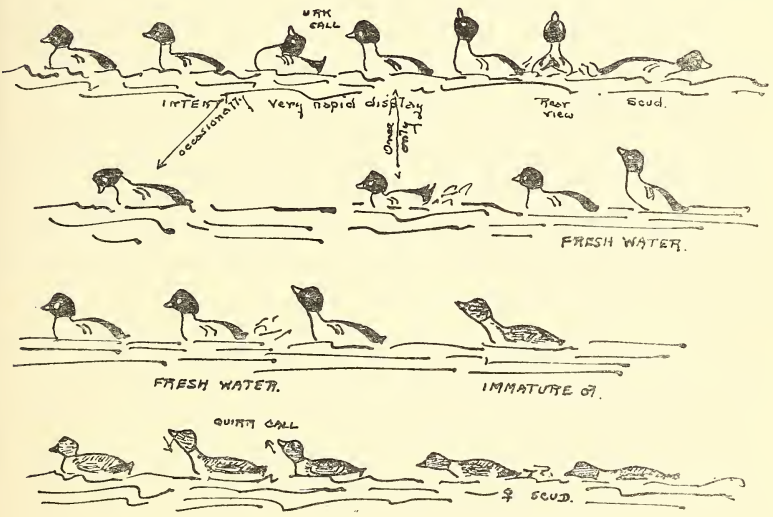
*Display.*—The following display was seen on salt water of the upper Tay Estuary on 19th January 1947—one male in a group assumed an intent attitude with extended erect neck, and bill level, and presently bill-tossed once only : on the same water, on 22nd March 1947, a male in company with a female raised head and neck in line very erect in one abrupt movement. The female made no response.

*Feeding.*—Has been found feeding at sewer outfalls, grubbing in shallows with head submerged, and sifting mud on the flats.

TUFTED DUCK




GOLDENEYE




H. BOASE
1949

GOLDENEYE *Bucephala clangula*.

*Display*.—The display varies in its details. The original notes in *British Birds* dealt with display on salt water during winter. Since then some display has been seen on fresh water in April, and while this has been for the most part similar to that seen on salt water, two additional forms were seen at the Long Loch of Lundie in Angus on 2nd April 1949. The one was a sudden rise on the water with a throw up of the bill, as if snapping at a passing fly almost out of reach, the final position exposing all the breast with the bill pointing up at about seventy degrees. Two males gave this display to two females, which immediately took flight, followed closely by the males. Later the other form was seen probably from the same birds ; the group was very restless, taking wing and pitching again repeatedly. The display began with a sudden back-kick from both feet throwing water up in two spurts, perhaps with an up-thrust of the tail, followed by an up-swing of head and neck in line, apparently with the " urk " call. There was no throw-back of head or rise on the water.

*Feeding*.—The goldeneye has become a regular feeder at sewer outfalls at Dundee. Numbers present are difficult to count. On one occasion repeated counts gave a figure of 24-25, yet on the sudden arrival of a cormorant among them, the goldeneye rose in flight, and the count was then found to be sixty-three.

DIAGRAMS.—The first line covers the normal display and scud, with two variations indicated in the second line—one a dip of the bill before the swing back of the head, the other a sudden retraction of the neck following the nape on back position, with an upthrust of the tail and up-kick of water. The remaining figures in the second row and three in the third line show additional forms of display seen on fresh water. The remaining figure shows a common display attitude of the immature male—that is, brown-headed males with the white cheek-spot showing clearly. The fourth series shows attitudes of the female.

REFERENCE.—*Brit. Birds*, 18 : 69-71 (1924).

# FAIR ISLE BIRD OBSERVATORY

## Notes on Selected Species

### Spring 1949

Compiled by
Kenneth Williamson, Director

Despite the prevalence of easterly weather during the latter part of May 1949, spring migrants were disappointingly few. Nevertheless, the splendid ornithological tradition of Fair Isle was upheld by the appearance of several interesting and important species, and the present abstracts from the Observatory's " Notes on Species " book are concerned mainly with placing on permanent record the observations made on these birds.

Two of the birds—the black-browed albatross and Kentish plover—are new to the Scottish fauna. The greenish warbler constitutes the third British, and the nightingale the fourth Scottish, record.

Unless otherwise indicated, the observations are those of the Director : a key to observers' initials is given below. References to *The Handbook of British Birds* (H. F. Witherby *et al.*, 1938-1941) are styled *The Handbook*, with volume and page number in parentheses.

A report entitled " Notes on selected species, Autumn 1949 " has appeared in *British Birds*, 43 : 48–52.

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GREENISH WARBLER *Phylloscopus trochiloides viridanus*.

*Occurrence*.—A *Phylloscopus* with a single white wing-bar was seen in the Gully trapping-area by K. W. and J. P. on the morning of 2nd June. It was captured, and proved to be the greenish warbler—the second known occurrence of this bird in Shetland, and only the third for the British Isles.

The previous records are of a female shot at North Cotes, Lincolnshire, on 5th September 1896 (G. H. Caton Haigh, *Bull. B.O.C.*, 6 : 8), and of one collected by Mr. Sam Bruce at the Skaw of Whalsay on 12th September 1945 (see below, 20).

The present specimen was ringed D8140 and released in the Gully, where it was watched for notes on field-marks and habits.

*Taxonomic*. The bird was taken to the laboratory for examination. The wing measured 62 mm. and the weight was 6·68 g.

*Wing-formula*.—The 3rd to 6th primaries were emarginate ; 1st primary 6 mm. longer than longest primary covert ; 2nd primary 8 mm. shorter than 3rd and 2 mm. shorter than 7th ; 4th primary longest with 3rd and 5th very slightly shorter ; 6th primary 3 mm. shorter.

*Soft parts*.—The bird had the stout, rather flattish bill characteristic of the sub-genus *Acanthopneuste*, with nasal hairs reaching beyond the distal ends of the nasal grooves. The bill measured 6 mm. from the feathers and was dark brown above. The lower mandible was yellow-brown distally, becoming orange at the base. The tarsi and toes were purplish-horn, soles brownish-orange. Iris dark brown.

*Plumage*.—Mantle olive-green, head and tail browner. A streak from bill through eye and lores brownish, surmounted by a strong yellowish superciliary stripe. Yellow ring round eye. Cheeks and ear-coverts yellowish. Breast pale yellow,

becoming whitish on belly and vent, but with a slight yellowish tinge. Flanks greyish-white. Axillaries and under-wing coverts pale yellow. Outer webs of brown flight-feathers fringed green. Greater coverts greyer brown each with a whitish spot at tip of outer web, forming a white wing-bar. Outer web of outer tail-feathers brownish-white.

*Race.*—The wing-formula, in which the second primary falls between 7th and 8th (and is much nearer to the 7th) establishes the race as *Ph. t. viridanus.* According to C. B. Ticehurst, *A Systematic Review of the Genus Phylloscopus* (London 1939), all other races except *Ph. t. plumbeitarsus* have the 2nd primary falling between 8th and 9th, or shorter. *Ph. t. plumbeitarsus* has a second slight wing-bar on the median coverts except in very worn plumage, and as there is a complete moult in the early spring this additional bar would have been evident in D8140 had it belonged to this race.

*Field-characters and behaviour.* –Immediately upon release the bird flew to some willows and began to feed briskly. It moved from the willows to the stony bed of the stream and hopped about there for some time before going to a heather-covered slope above to continue its quest for food. Occasionally it took small dipterous flies with deft " flycatcher " sallies, presenting an orange gape as it snapped them up. It also resorted to sandy and stony banks bare of vegetation. It was seen on one occasion to pick up a small worm and beat it vigorously against a stone whilst eating it. It wiped its bill regularly with quick motions against stones, heather-stems or willow-twigs. The bird seemed much attracted to the immediate vicinity of the water.

A restless flickering of its wings and tail accompanied its movements on the ground and in the willows. Its flights from place to place were short and very erratic, but on one long flight down the Gully on 3rd June the bird proceeded in shallow undulations. When confined in the trap-funnel on the 2nd it gave a marvellous exhibition of superbly controlled flight, persistently hovering for several seconds at a time in front of the catching-box, often turning in the air as it did so.

The white wing-bar, though so slight when the bird was held in the hand, was an excellent field-mark and could be

distinguished in 9 × 35 glasses at a range of 30-40 yards. The yellowish breast was not very obvious except at close quarters and in good light, the bird usually presenting the impression of a small *Phylloscopus* with greenish upper and dull whitish underparts. The olive-green mantle made a slight but quite noticeable contrast with the brown of head and tail, and when a good close view was obtained the upper tail-coverts were seen to lack the greenish tinge and the outer webs of the outer tail-feathers appeared dusky-white. The yellowish supercilium and cheeks contrasted well with the dark eye-stripe. The legs appeared to be black.

Summary. The distinct dark eye-stripe offset by the clear yellowish cheeks and superciliary band, the white wing-bar, blackish legs, and contrast between greenish mantle and brown tail were the most distinctive features in the field.

*The Whalsay specimen.*—The Whalsay specimen of the greenish warbler, which I have been able to examine through the courtesy of Mr. Samuel Bruce of Lerwick, who collected it on 12th September 1945, shows some slight plumage differences from the Fair Isle bird. The upper-parts are more uniformly greenish-olive, darkening on the head ; the underparts are more suffused with yellowish, the throat and breast pale greenish-yellow and the belly and vent creamy. The supercilium and wing-bar are yellower and the latter less obvious than in the Fair Isle bird owing to abrasion, a fact which suggests that the specimen, which is unsexed, is an adult bird. The outer webs of the emarginated portions of the 2nd to 6th primaries are whitish, and the outer webs of the outermost tail-feathers brownish-white. The wing measures 59 mm.

Song Thrush *Turdus ericetorum.*

*Wintering.*—A song thrush (race unknown) caught at the Haa trap on 16th November 1948 was ringed SP020 and released at North Haven 3 miles distant. It was recaptured at the Haa on 22nd January 1949, having apparently wintered on the island.

*Moult.*—A song thrush, believed to be of the continental race *Turdus e. philomelus*, was trapped on 3rd June. Abrasion had made the upper-parts rather reddish-brown, except for

the rump and upper tail-coverts, which retained a marked greyish-olive tinge no different from that of skins of this race kept in the laboratory. The 2nd primary in the right wing was new, and also the right outer tail-feather. According to *The Handbook* (2 : 117) there is no spring moult in this species.

Blackbird *Turdus merula.*

*Breeding.*—A pair of blackbirds reared three young (out of four hatched and leaving the nest) in late May 1949. The nest was conspicuously placed on a wooden beam in an old storehouse at the South Harbour.

Wheatear *Oenanthe oenanthe.*

*Song.*—That the song of the wheatear is " to some extent imitative " is mentioned in *The Handbook* (2 : 146). On 22nd April a singing male gave almost perfect mimicry of the notes of the redshank, the *tu* and *tu-hu-hu* sequence being introduced into the normal song as a group of several seconds' duration. On dates in May another male sometimes included the redshank's *tu* and the spring call of the lapwing in its song.

Common Redstart *Phoenicurus phoenicurus.*

*Moult.*—A female redstart trapped at the Haa on 25th May 1949 was in heavy moult on body, tail and wings. New feathers were growing on the breast, mantle and rump ; one primary, the 6th in the right wing, was new and not fully grown ; all the greater coverts were new—blackish-brown fringed buffish-brown—and this moult was nearly complete in the right wing. Some lesser coverts were moulting, and the two new dark brown central tail-feathers were about 5 mm. long. There is normally no spring moult in this genus.

Nightingale *Luscinia megarhyncha.*

*Occurrence.*—A nightingale was trapped at the Haa by R. R. on 22nd May 1949. The bird was in its first summer, having slight buffish-brown tips to some of the greater coverts, and the wing-measurement of 78 mm. agrees with the minimum

given in *The Handbook* for the female sex. The bird, which was ringed D8106, weighed 20 g.

This constitutes the first record of this species for Fair Isle, and the second spring record of the four known for Scotland. Two of these occurrences were at the Isle of May (9th May 1911, 26th-29th August 1931) and the third in G. T. Kay's garden at Lerwick, Shetland (5th September 1929).

The wing-formula was checked and the bird compared with skins in the laboratory. The 1st primary was rather broader than in the two skins examined, and the emargination of the 4th primary was not very noticeable, owing to abrasion.

Bluethroat *Luscinia svecica.*

A female bluethroat was trapped in the Gully by G. H. O. and K. W. on 20th May 1949 and was watched after being released at the North Haven. At a distance of 40-50 yards the most striking feature was the breast patch, which showed clear white when the bird was facing the observers, or standing in profile. The white eye-stripe was very pronounced when the bird faced us, but was less distinct in profile. The bird stood up well in the short heather, and, as in the case of male birds watched in the autumn of 1948, the slenderness of build and long tarsi gave the species an unmistakeable appearance when perching. The reddish-chestnut tail with black terminal bar stands out only at fairly close quarters and in good view.

Robin *Erithacus rubecula.*

*Wintering.*—An immature robin taken in the Gully trap on 11th December 1948 was ringed D8251 and released at North Haven where it was recaptured on 22nd January 1949.

Dunnock *Prunella modularis.*

*Occurrence.*—A bird trapped at the Haa on the evening of 14th May was apparently of either the British or Hebridean races, *Prunella m. occidentalis* or *hebridium*, and the first specimen of other than the typical form to come under notice at Fair

Isle. In the wing-formula, which was carefully checked by G. W. and K. W., the 2nd primary was equal to the 7th.

Hoopoe *Upupa epops*.

*Occurrence*.—A hoopoe was watched by several observers on 21st May 1949. It preferred close-cropped sheep pasture for feeding, and was very wild, defeating all attempts to trap it. The occurrence constitutes the fourth record for Fair Isle, the last one being noted on 21st October 1910.

? Black-browed Albatross *Diomedea melanophris*.

*Occurrence*.—What is believed to be a black-browed albatross was seen on 14th May 1949 by G. W., J. H. O. and W. P. V. circling about in the vicinity of the Sheep Craig. Later in the morning it was seen again, actually over the land at the south of the isle, by the same party and J. A. S. Two islanders, J. W. and A. S., reported having seen it off the north-west cliffs in the afternoon, and G. T. A. saw it in the evening off Malcolm's Head.

According to *The Handbook* (4 : 83) this would appear to be the first albatross recorded for Scotland, and the first in Britain since an exhausted bird was picked up near Linton, Cambridgeshire, on 9th July 1897.

*Field-characters*.—Attention was immediately attracted by the noticeably large size of the bird compared with the herring and great black-backed gulls which were mobbing it. When first seen it was soaring off the south face of the Sheep Craig and glided over towards the party in a slanting attitude, the wings held in the shape of a bow, with the wing-tips lower than the belly of the bird.

The breast and underparts were pure white, and the head was slightly greyish in colour. The upper parts of the wings and mantle were black. The rump and upper tail-coverts were white, and the lower part of the tail to the tip black. The undersides of the wings were white with a black margin all round, and black wing-tips. The fine, strong bill was very noticeable, but it was not bright yellow as depicted in *The Handbook* plate, but horn-coloured, a fact which, in combination with the greyish head, suggests immaturity. The legs appeared to be pinkish horn-colour.

The long slim wings were a striking feature, as was the soaring and circling flight on motionless wings. It was not heard to call. It was continually attended by gulls, and according to A. S., who saw it in the afternoon, it was ruthlessly mobbed by the ravens nesting at West Lother.

G. W.

It seems wisest to prefix this identification with a question mark. There is no doubt whatever that the bird was an albatross ; but the smaller species of *Diomedea* known as " mollymauks " are closely similar to one another, and there is no conclusive evidence in the observers' description that this bird was *D. melanophris*. In the North Atlantic area this species has been recorded most often, but the yellow-nosed albatross *D. chlororhynchos* is recorded from Quebec and Maine, and the grey-headed albatross *D. chrysostoma* from Norway. Any of these three might be fairly contained in the above description, and while the " horn-coloured " bill (bright yellow in mature *melanophris*, mostly black with yellow stripe along the culmen and some yellow at base and tip in the others) may not seem dark enough, the " slightly greyish " head fits with *chlororhynchos* and *chrysostoma* as well as with the immature *melanophris ;* the darker border on both edges of the underside of the wings appears to exclude *cauta* and *bulleri*.—Editors.

Kentish Plover *Leucopolius alexandrinus*.

*Occurrence*.—A Kentish plover, the first to be recorded in Scotland, was observed in the south of the island on 14th May 1949 by G. H. O., W. P. V., G. W., G. T. A., P. R., and K. W.

*Field-characters*.—The bird had an altogether paler appearance and more upright carriage than a ringed plover, the latter probably due largely to the shorter tail and habit of standing with the head retracted. It had the characteristic short, quick run and " freeze " of the ringed plover, and its call was well described by G. H. O. as " double-sanderling " with an appreciable short pause between the two " wick "s. In flight a wing-bar was prominent, but not so clearly defined as in the ringed plover.

The plumage was a clean sandy-brown above and pure

white beneath. The head was rufous, dark on the forecrown and with a narrow white line above the bill (much less evident than in *The Handbook* plate), and narrow white supercilium above the black eye-stripe. There was a white collar on the nape, and the broken pectoral band was dark brown, not black, suggesting a female bird. The bill and legs appeared to be blackish.

Iceland Gull *Larus glaucoides*.

*Feeding-habits.*—A single immature Iceland gull which remained on Fair Isle during the first fortnight of May 1949 was often to be seen following the "iron horse" motor-ploughs with herring and lesser black-backed gulls. As a general rule it rested apart from the other gulls, and on other occasions, when ploughing was not in progress, did not seek their company but fed alone on the broken soil.

It permitted fairly close approach and the distinctive characters of the species—small, dark horn-coloured bill and long wing-point with the wing-tips meeting but not crossing beyond the tail—were easily observed.

# NOTES ON EILEAN BULGACH, SUTHERLAND

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Eilean Bulgach, or Am Balg, often called Bulgie Island, lies off the west coast of Sutherland 7 miles south-west of the Cape Wrath lighthouse, opposite Sandwood Bay. The nearest point to it on the mainland of Scotland is a mile to the east-south-east, Rudh'a'Bhuachaille, a cliff-promontory with a prominent detached stack, Am Buachaille. This coast is lonely, and Bulgach is surprisingly inaccessible. We spent three hours on it on 6th July 1948.

We can trace few previous ornithological visits to this island. It is small, a somewhat pudding-shaped knob of rock, with several stacks and skerries on north, east and south. The landing on the east side, guarded by a skerry upon which sit large numbers of grey seals *Halichoerus grypus* (but where they do not breed) is difficult in bad weather ; and the top of the island is reached by scrambling a " staircase " up a cliff of about 120 feet. The highest point of the island is 146 feet above sea level.

J. A. Harvie-Brown visited this island towards the end of June 1882, and landed on it. W. Norrie, Harvie-Brown's photographer, landed on it on 12th May 1904 (his remarks are confined to shags). On 19th June 1914 the Duchess of Bedford approached closely to and circumnavigated the cliffs in a boat but was unable to land. On 7th July 1927 W. and A. B. Duncan landed and spent some time ashore surveying the birds ; apart from a mention of their observation of fulmars in the subsequent *Report on Scottish Ornithology*, and the publication of the recovery of a razorbill which they ringed, their notes have never been published, and we are very grateful to Mr. Arthur Bryce Duncan for having disinterred them from his files and given us full use of them. The changes in the bird-life are best illustrated by treating each species separately ; as no two parties have landed in

the same year the observers can be identified simply by dates —1882 : Harvie-Brown ; 1904 : Norrie ; 1914 : Duchess of Bedford ; 1927 : Duncan and Duncan ; 1948 : Fisher and Piercy.

## Mammal

Grey Seal *Halichoerus grypus.* On the 1948 visit about a hundred, some first-year animals, were basking on the rocks at the east landing-place and to the south-west. The fishermen who landed us say that they do not breed on Bulgach.

## Birds

Rock Pipit *Anthus spinoletta.* 1882 : " Rock pipits were not abundant . . . of birds the ordinary rock species * were present and fairly abundant, but rock pipits were, curiously enough, rather scarce." 1927 : " One observed." 1948 : Five pairs occupying apparent territories.

Peregrine *Falco peregrinus.* 1882 : " The remains of one or two seabirds, with the flesh picked clean from the bones, suggested the periodical visit of the peregrine falcon." Nobody has ever *seen* a peregrine on Bulgach, though it may well be that peregrines occasionally use it as an eating-place.

Cormorant *Phalacrocorax carbo.* 1882 : " Cormorants and shags—the former scarce, the latter common—were drying their wings in the light air." 1914 : " I saw 3 cormorants in full breeding plumage." 1927 : No mention ; A. B. Duncan was quite definite, when questioned, that in this year the cliff-tops were occupied by shags. 1948 : A cormorantry along the top of the west-facing cliffs was estimated to contain at least 50 nests ; young were in various stages —some flew as we disturbed them—and some nests also had eggs.

Shag *Phalacrocorax aristotelis.* 1882 : See cormorant. 1904 : " An extensive colony of shags populating the entire east face and slopes—certainly not less than thirty nests—some with eggs in different stages of incubation, and others

* What does Harvie-Brown here mean ?

with eggs and young." 1914 : " On the south-west side were . . . some shags. The visible population . . . was a little under a hundred, including young ones." 1927 : Colony in west cliff-top, more nests on steeper cliff below, unable estimate numbers, many had young already on wing, others eggs. 1948 : Nesting all round the cliffs (but not on west cliff-top) ; young in every stage, difficult to see into all cracks and crevices, but estimated at least 100 nests.

Fulmar *Fulmarus glacialis.* 1882, 1904 : None seen. 1914 : " A very few " breeding. 1927 : " Breeding all along the cliffs " on west and east sides ; 10 nests examined (7th July) had eggs just chipping, 2 had new-hatched young. 1948 : (Plate I) 80 nests seen in thorough search of whole island from land and sea ; 29 were closely examined, birds being put off if necessary ; of these 26 had eggs, 3 were " incubating " on empty nests ; one egg was chipping (6th July). This agrees entirely with other information we have about dates in the fulmar's breeding-cycle, which is remarkably rigid.

Oyster-catcher *Haematopus ostralegus.* 1882, 1904, 1914 : No mention, unless among " ordinary rock species " of 1882. 1927 : Probably 2 pairs breeding, 1 young marked. 1948 : 2 pairs on the island, demonstrating possession of territories.

Herring Gull *Larus argentatus.* 1882 : " Occupied the grassy top and interior of the island." 1914 : " The grassy top of the island was covered with . . . herring gulls." 1927 : Mixed colony of herring and lesser black-backed gulls of 40-50 pairs, slight majority herring gulls. 1948 : Only one pair detectable on the island.

Lesser Black-backed Gull *Larus fuscus.* 1882, 1914 : No mention. 1927 : See herring gull. 1948 : None.

Great Black-backed Gull *Larus marinus.* 1882 : " Two pairs . . . were perched on the topmost pinnacles of the [outlying] skerries." 1914 : " A few " on top of island. 1927 : One pair. 1948 : An immense colony, estimated at about 150 pairs, 15 young marked.

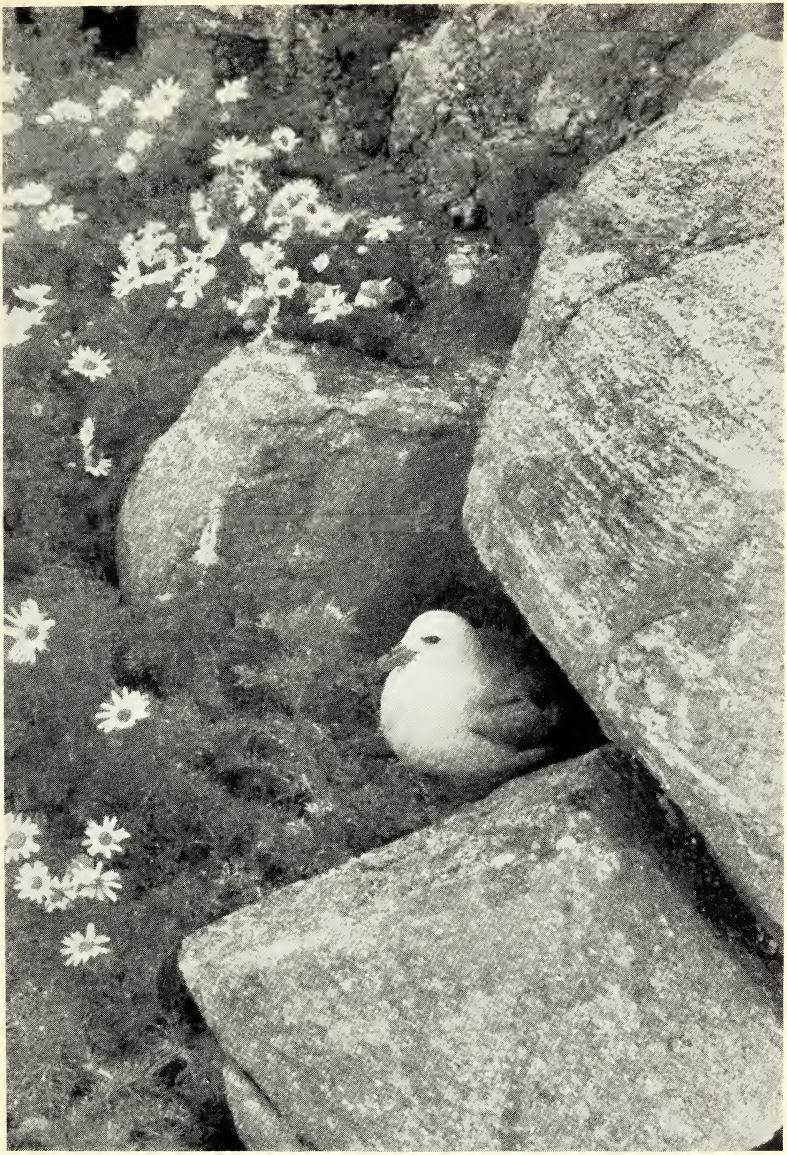

PLATE 1.—Fulmar incubating among fairly dense growth of scentless mayweed *Matricaria inodora*, Eilean Bulgach, 6th July 1948.

*Face p. 28*

Kittiwake *Rissa tridactyla.* 1882 : " In a large colony but with many immature birds, principally on the north-west and west cliffs, or resting on the skerries," and, of north-west Sutherland kittiwakes generally, " there are many roosting-places unoccupied by nests, such as one on Bulgie Island." 1914 : " The north-west precipitous side is inhabited almost entirely by kittiwakes . . . on the south-west side were great numbers of kittiwakes." 1927 : Colonies in positions noted 1914, of at least 150 pairs each ; other small colonies. 1948 : Colony of about 100 nests on south side, and another nearby of about 40 ; another under north-east cliffs of about 75 nests. Well-fledged young in most nests.

Razorbill *Alca torda.* 1882 : Plentiful on east side. 1914 : Great numbers on south-west side. 1927 : Breeding among rocks and boulders of east ascent, and in all suitable cover ; abundant ; nestling ringed 7th July recovered Oslo Fjord, Norway, 16th October of same year. 1948 : Between 2 and 3 thousand birds estimated present, some in raft on sea, rest on cliffs breeding abundantly. 8 marked.

Guillemot *Uria aalge.* 1882 : Plentiful on west, less plentiful on east side. 1914 : Great numbers on south-west side. 1927 : Climbed to nesting-ledge on south-west side, 3 out of about 12 eggs hatched ; breeding in fair numbers though not as many as razorbill. 1948 : Not a large breeding population, less than 200 seen on ledges, 13 bridled to 126 unbridled, i.e. bridled 9·3 per cent. of whole.

Black Guillemot *Uria grylle.* 1882 : No mention. 1914 : " I saw a few black guillemots." 1927 : No mention. 1948 : One seen on the sea off the island.

Puffin *Fratercula arctica.* 1882 : Very abundant along clifftops and slopes, and crevices in cliff-face. 1914 : " The grassy top of the island was covered with puffins." 1927 : Top of island and boulders full of puffin-burrows. 1948 : Many in raft on sea ; with those visible on cliff-tops estimated at between 600 and 1000.

### Insect

Magpie Moth *Abraxas grossulariata.* One on the island's top, flying.

Bulgach Island is scarcely ever visited by man (though in the last century three or four sheep were run on it) and changes in the numbers of birds on it have probably little to do with him. That there have been changes is clear; fulmars, cormorants and great black-backs have remarkably increased, the two last in twenty years, all forming substantial colonies. The cormorants appear to have driven shags from their present breeding-grounds at the tops of the west cliffs, though the shags continue to prosper on other, less open parts of the cliff. The great black-backs have ousted herring gulls and lesser black-backs from the top (and from the island), and have guanoed their breeding-ground so that Scotch lovage *Ligusticum scoticum* grows very thick. The other species cannot be proved to have changed in status, though it is possible the rock pipit may have increased.

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# THE POSSIBLE OCCURRENCE OF *SOMATOCHLORA ALPESTRIS* IN SCOTLAND

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I was very interested in Miss Cynthia Longfield's article in Volume 60 of *The Scottish Naturalist*, and especially her remarks on *Somatochlora alpestris*.

I immediately wrote to Miss Longfield and she sent me a copy of Col. F. C. Fraser's article in the *Entomologist's Monthly Magazine* of 28th March 1947. From this it appears that the facts were as follows :—

Col. Fraser had asked K. J. Morton for Scottish specimens of *S. arctica* and had received two insects from him. One was labelled " Inverness 28.6.26, coll. K. Morton " and was in fact *S. arctica* ♀. The other was labelled " Inverness 7.7.26, coll. K. Morton " and after Morton's death was discovered by Col. Fraser to be *S. alpestris* ♂. Col. Fraser had previously received from Morton an *alpestris* ♂, taken in Austria, with which he was able to compare the second specimen.

Being resident in the Highlands I hoped it might fall to my lot to establish fully the claim of *alpestris* to a place on the British list. My first step was to try to find the probable locality of the two captures, so one day when I was in Edinburgh I called on Miss Morton to see if I might be allowed to consult her father's diary for 1926. I should explain that I knew K. J. Morton well and when I lived in Edinburgh, prior to August 1914, I was a frequent caller at his house.

I regret to have to say that the results of my investigations were very different from what I had hoped or expected. Miss Morton surprised me by saying that the family had spent their 1926 holiday in the Pyrenees but that she would look out the diary and send it to me. She very kindly did so and she also sent me all the diaries from 1924 to 1939 with the exception of one for 1929 which has been lost or mislaid. The first entry for the year 1926 is, curiously enough, on 28th June. It is " Left Edinr." The entry for 29th June is " Left London for Paris " and for 30th June

" Itxassou." The entry for 7th July is " Dull and showery. Onych. found teneral at little stream nr. hotel. One or two interesting Trichoptera."

Itxassou is about 20 kilometres from Bayonne and 7 from Cambo. The family remained in the Pyrenees till 24th August and there is no mention anywhere in the 1926 diary of either *arctica* or *alpestris*.

The two insects sent to Col. Fraser were accordingly not collected by Morton on the dates stated on their respective envelopes. They may have been collected in Scotland on these dates by some unidentified correspondent, but to put *alpestris* on the British list on the facts as they have now emerged is, I think, quite inadmissible. This is a very disappointing result of my investigations but, despite the negative evidence I have unearthed, it is quite possible that *alpestris* does in fact exist in Scotland, and I entirely agree with Col. Fraser that all supposed *arctica* specimens taken in future should be most carefully examined in case *alpestris* may turn up.

I have scanned the diaries most carefully in the hope that a mistake had been made in the year of capture but I cannot connect the dates 28th June or 7th July with any entries. The nearest approach is in 1930 when two *arctica* ♀ were noted on 7th July from the Mallaig district. There is however no note of a male having been taken on that date. Otherwise, neither insect is mentioned on any 28th June or 7th July in the whole series of diaries. There remains only the year 1929, but Miss Morton informs me that her father spent June of that year at Rannoch and was with the family in Corsica during July and August.

Morton's most successful year with both species was 1928 when he visited the Austrian and Italian Tyrol. He collected them on both sides of the frontier and had a good surplus available for distribution. This is shown by an entry at the end of the diary which gives the names of five friends who were to receive specimens. Col. Fraser is allotted one *arctica* ♂ and one *alpestris* ♂. The latter is probably the *alpestris* first received by Col. Fraser and sent to him as such. If, however, Morton carried out his intentions, the specimen is Italian and not Austrian as Col. Fraser believes. It is noted as having been taken at San Martino di Castrozza.

# FLEAS (*SIPHONAPTERA*) FROM BIRDS IN NORTH-EAST SCOTLAND

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## 1. Introduction

As the bird fleas in the North-east of Scotland have had scant attention from entomologists, it may be of some interest to record the occurrence of the species of fleas in this area ; a few notes and observations on their natural history are also included in this account. Altogether, of the thirteen species of bird fleas recorded from Scotland, nine have been found here during 1949. A species of flea not previously recorded in Britain was also obtained in numbers. In all probability one or two other species of flea occur around Aberdeen but the nests of the hosts on which they are known to occur were not examined.

## 2. Methods

*Collecting*.—As it was found that bird fleas are more inclined to inhabit the nest of the host than the body, only the former was examined for fleas. The nests were examined either just before eggs were laid, or just after the young had flown. In order to obtain the greatest number of fleas, the complete nest was usually placed in a tin or other insect-proof container and examined later under more favourable conditions. If the nest was too large to be treated in this manner, the fleas were shaken out of the nest on to a sheet of white paper, and then transferred to a tube of 70 per cent. alcohol by means of a fine paint brush or slender piece of grass. The tube was then labelled with the host, date and locality.

*Rearing of larvae*.—Flea larvae were frequently found in the nests and in order to identify them they were reared into the adult stage. Keys for the identification of Siphonapteran larvae do not exist. The larvae were placed in a tin along

with nest material and kept in normal " room " conditions, though it was found necessary to prevent the drying up of the material. In six weeks or so, if the nest material was disturbed at intervals, most of the larvae passed through the pupal stage and assumed the adult form.

*Clearing and Mounting.*—It was found from experience that lactic acid and phenol were the best clearing agents. The specimens were placed in test-tubes containing lactic acid and immersed in a water bath at 100° C. for twenty minutes. This was repeated with phenol. The fleas were then transferred to 70 per cent. alcohol and left for half an hour. They were then mounted in Swan's medium which is a modification of Berlese's mountant. It was not found necessary to ring the medium with balsam.

## 3. Catalogue

All identifications were done with the aid of Rothschild's paper (1915). Dr. H. E. Karl Jordan of the British Museum, Tring, kindly checked some of the identifications and identified the species not previously known from Britain.

*Ceratophyllus styx* Rothschild.

This species is very common in the nests of the sand martin *Riparia riparia.* Specimens were obtained from all of the five nests searched at Scotstown Moor, Aberdeen, and at Skene, Aberdeen, in May, i.e. during the breeding season of the bird. Large numbers of adult fleas were congregated round the entrance to the nesting burrow and also occurred in profusion in the nest material.

Later in the year, in the middle of June, before the young birds had flown, many adults and larvae were found in the nest.

During the early winter of 1949, on 2nd December, a visit was made to the nests at Scotstown Moor, and in the sand and straw at the back of the nest burrow three live females of *C. styx* were found in company with one tick, a female of *Rhipicephalus sanguineus.*

2 ♂ and 2 ♀ were found on bank voles *Clethrionomys glareolus* at Whitestripes, Aberdeen, and also 1 ♂ from a

pigmy shrew *Sorex minutus* caught on grassy cliffs at Nigg, Aberdeen, on 5th December. Sand martins normally nest about 200 yards away from the latter.

*Ceratophyllus hirundinis* Curtis.

According to Rothschild (1915) this flea is "common and widely distributed in the nests of the house martin, *Delichon urbica*, in Scotland."

Unfortunately *C. hirundinis* was not found in any of the seven house martin nests searched in the Aberdeen area during the summer of 1949.

*Ceratophyllus dalei* Rothschild.

5 ♂ and 6 ♀ of this flea were taken from the nest of a house martin *Delichon urbica*, on 21st May.

Later, on 1st June, 3 ♂ and 3 ♀ were found in another house martin's nest. Both of these nests were situated on the roof of a cave facing the sea near Newtonhill, Kincardineshire.

*Ceratophyllus farreni* Rothschild.

This species is fairly common in the nest of the house martin *Delichon urbica* in Kincardineshire.

A single female was found in one nest of the house martin and 2 ♂ and 3 ♀ in another, at a cave near Newtonhill, Kincardineshire, about the end of May.

*Ceratophyllus garei* Rothschild.

A few specimens of this flea were obtained from two nests of the skylark *Alauda arvensis* at Newtonhill, Kincardineshire, during the summer. One of these nests containing 1 ♂, 1 ♀, and 4 larvae, was found on a moor on 31st May. The other, which contained a single male and a number of larvae, was found among heather near the top of a cliff on 5th June. This nest had been recently vacated by four young larks.

*Ceratophyllus columbae* Walckenaer and Gervais.

A few specimens of both sexes of this flea were found in the nest of a rock dove *Columba livia* in a cave near Portlethen, Kincardineshire, on 17th May.

No specimens were found in any of the nests of the wood pigeon *Columba palumbus* or any of the domestic doves searched during the breeding season of these birds. In all, seven nests of the wood pigeon and about a dozen nests of the domestic dove were searched.

*Ceratophyllus vagabunda insularis* Rothschild.

*C. insularis* seems to be quite common in the nests of the herring gull *Larus argentatus* in the north-east of Scotland. 7 ♂ and 5 ♀ were taken from 12 nests of the herring gull examined at Whinnyfold, Cruden Bay, Aberdeenshire, on 4th May. Of the 12 nests examined, six were on bare rock and six on sandy or earthy patches among thrift and scurvy grass. *C. v. insularis* was obtained only from those on sandy patches. This may indicate some preference on the part of the flea.

8 ♂ and 5 ♀ were taken from three nests of the herring gull at Portlethen, Kincardineshire, on 11th May. A number of larvae were seen in the nests. *C. v. insularis* was also obtained from the nests of the same host at Muchalls, Kincardineshire.

Three young herring gulls which had left the nest but still could not fly were searched for fleas at Muchalls on 20th June, but none were found.

*Ceratophyllus gallinae* Schrank.

This species seems to be very common in the nests of most passerine birds in Aberdeenshire. A number of adults were taken from stored nest-boxes of the starling *Sturnus vulgaris* during April. These boxes had been indoors over winter. One adult and a few larvae were obtained from a newly completed nest of the common wren *Troglodytes troglodytes* and a number of larvae, pupae and adults were also taken from a nest of the blue tit *Parus caeruleus* at Danestone, Aberdeen, during May. *C. gallinae* was also found in numbers (37 ♂ and 42 ♀) in the nest of a house sparrow *Passer domesticus* at Pittodrie, Aberdeen, on 24th May, and in the nest of the same host at Scotstown Moor in the middle of June.

*Orneacus rothschildi* Waterston.

The only previous Scottish record of this flea is " Cliffs, Todhead, near Kinneff, Kincardineshire, mid-September, 1909,

nest of *Delichon urbica*" (A. McInnes). Jordan and Rothschild record 2 ♀ of this flea from Zermatt, in the Swiss Alps.

7 ♂ and 8 ♀ of this very rare flea were obtained from two nests of the house martin *Delichon urbica* in a cave facing the sea at Newtonhill, Kincardineshire, on 21st May. There were 2 ♂ and 3 ♀ in one nest, and 5 ♂ and 5 ♀ in the other.

*Dasypsyllus gallinulae* Dale.

This flea was not to be found in any of the 17 coot *Fulica atra* and waterhen *Gallinula chloropus* nests examined at the Loch of Skene, Aberdeen, during May, but two isolated females of this species were obtained. The first was found crawling on the writer's hand at Newtonhill, Kincardineshire, on 21st May, and the second among litter in a greenhouse on 3rd September. The true hosts of these fleas are unknown, but the recognised host is the waterhen.

*Frontopsylla laetus* Jordan.

16 ♂ and 14 ♀ of this new British species were first found in the nests of two house martins *Delichon urbica* on the roof of a cave facing the sea at Newtonhill, Kincardineshire, on 21st May 1949. 6 ♂ and 6 ♀ were taken from one nest and 10 ♂ and 8 ♀ from the other. On 20th June more specimens of this flea, in company with five specimens of a ked *Stenepteryx hirundinis* (2 ♂, 2 ♀ and 1 pupa), were found in the nests of the same host at Newtonhill.

Correspondence with Dr. H. E. Karl Jordan of the British Museum, Tring, revealed that in 1920 a single specimen of this flea, a male, probably taken from the nest of a European dormouse *Eliomys quercinus*, was found at Zermatt in the Swiss Alps ; but it was suggested at the time that the true host of *F. laetus* was probably *Delichon urbica.* This is the only previous record of *F. laetus.*

A nest of the house martin searched at Wildbichl, Kufstein, in Austria at about 2,100 feet during August 1949, yielded about 20 specimens of *C. hirundinis*, but no *F. laetus* were found.

As *Frontopsylla* is a new British genus, a few notes on it might be appropriate. The genus is evidently descended from rodent fleas, but has a large number of spines on the pronotal comb, as in the ordinary avian *Ceratophylli.* This is

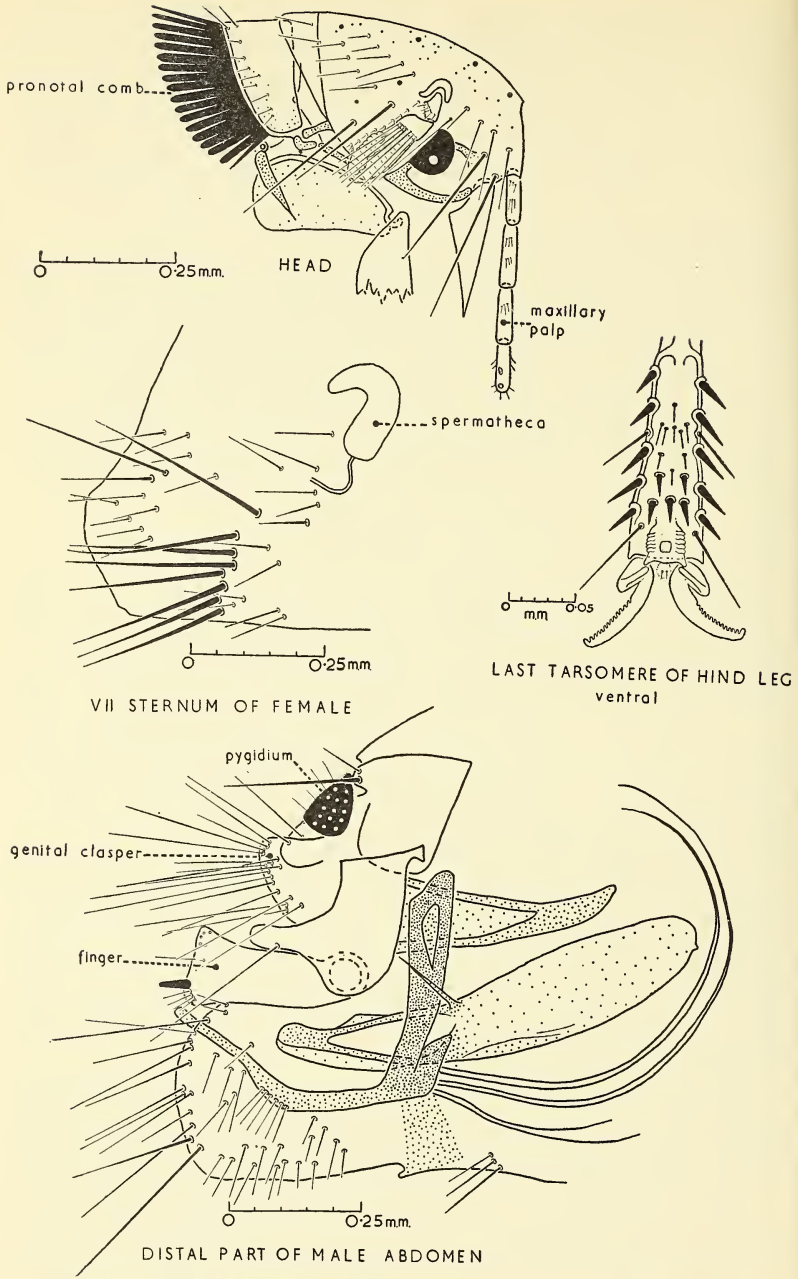


FIG. 1.—Camera lucida drawings of the essential characters of *Frontopsylla laetus*

a most interesting convergence. The genus is abundantly represented in Central Asia. A closely related species, *F. lapponica*, has been described from Finland ; it has only 26-27 spines in the pronotal comb, while *F. laetus* has 36-37. Also, the Finnish flea, known only from a single female, has a deep sinus in the seventh sternite which is not present in *F. laetus*.

The distribution of the genus, as far as is known at present, appears to be rather disrupted, but further searching may reveal its presence in other localities.

## Characters of *Frontopsylla laetus*

A large, pale, very distinct species. (See Fig. 1.)

Head. Rather hairy, broadened in the male towards the occiput, in the female relatively wider anteriorly as in *Orneacus rothschildi*.

*Frons*. With a small tubercle in both sexes. In front of the eye, one row of 4-5 bristles.

*Occiput*. With 2 rows of bristles above the level of the first antennal segment, also one row of 2 bristles parallel to the upper edge of the antennal groove.

*Pronotum*. With a comb of 36-37 teeth on the average in the female and 33-34 in the male. In the specimens examined the largest comb consisted of 40 teeth and the smallest 32 in the female ; in the male the greatest number was 36 and the smallest 30. Anterior to this comb is a row of bristles between which and the comb itself are some very minute hairs.

Last Tarsomere of Hind Leg. With 4-5 spines on the underside. In the fleas examined, two had 5 spines and nine had only 4. These spines are characteristic of *F. laetus* and *F. lapponica*.

VII Sternum of Female. The 7th sternum is irregularly rounded without a sinus (Fig. 1). It bears many bristles, there being about 32 on each side. The strongest of these form a row of 8 bristles.

*Spermatheca*. Distinct from all the known British *Ceratophylli*, being comma-shaped and having no neck.

The male of this species has already been described by

Jordan and Rothschild, 1920, "A preliminary catalogue of the *Siphonaptera* of Switzerland," *Ectoparas.*, 1 : 78-122.

## 4. Host-parasite Relationships

Frequently only one species of flea is found per host, but some birds support a number of different species of the parasites : e.g. the only flea found on the sand martin was *Ceratophyllus styx*, while four different species were taken from the house martin. The same situation is found with regard to the parasite. Thus *Ceratophyllus columbae* occurred only on the rock pigeon while *C. gallinae* was recorded from a large number of passerine birds.

Table 1

| Species | Nest A | | Nest B | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| *Ceratophyllus dalei* . . . | 5 | 6 | 0 | 0 |
| *Ceratophyllus farreni* . . . | 0 | 1 | 2 | 3 |
| *Orneacus rothschildi* . . . | 2 | 3 | 5 | 5 |
| *Frontopsylla laetus* . . . | 6 | 6 | 8 | 10 |

Table 1 shows the occurrence of fleas in two nests of the house martin examined at Newtonhill during 1949. Despite the small number of nests examined the results were sufficiently unexpected to indicate that the distribution of Siphonaptera needs further investigation in the north-east of Scotland. The flea new to Britain was the commonest species in the nests. *O. rothschildi* was the second most common and *C. dalei* the third.

The rarest species was *C. farreni* which, according to Rothschild (1915), "is a fairly common species in the nest of the house martin" (in Britain). *C. hirundinis*, which from previous records should have been the commonest species, was completely absent.

The writer intends to carry out a full investigation of the distribution in the coming year.

### 5. Overwintering

The overwintering of bird fleas presents a considerable problem to the naturalist, as the fleas are found chiefly in the nest. It is understandable that fleas should spend the winter there when birds breed in the same place year after year, but, when the nest is used for one season only, it is not. Are they found on the bodies of the birds to a greater extent at this time or do they overwinter in the nests as pupae or as adults? Little work has been done on this problem, and the answers are not available.

Two observations were made during the investigation.

A large number of living adults of *C. gallinae* were collected in the early spring from nest-boxes of the starling which had been stored indoors during the winter. Unfortunately the boxes were not examined for pupæ and so the fleas may have survived the winter as either pupae or adults.

On 2nd December 1949 the remains of the nest of a sand martin were removed from the nest-burrow and examined for fleas. Three live females of *C. styx* were found but there was no sign of pupae although these were especially looked for.

A much more intensive study of this problem is required, and it is hoped to pursue this line of investigation along with the other problems demanding attention.

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# FLEAS (*SIPHONAPTERA*) FROM MAMMALS IN ABERDEENSHIRE

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Isolated records of fleas have been reported in *The Scottish Naturalist* from time to time, but no survey of the populations of fleas parasitic on the hosts of a particular area seems to be available for any part of Scotland. Little is known of the relative abundance of different species of flea on any one host species. Work to determine these facts has been carried out on the populations of fleas and other parasites of wild mice in Bagley Wood near Oxford, by Elton, Ford and Baker (1931). The present communication deals with the fleas recorded from about 500 small mammals caught in Aberdeenshire during 1948-49. The aim is not to produce new host-parasite records but to determine the frequency of different species of fleas on different host species in this region.

The fleas were obtained from the dead bodies of small mammals, occasionally immediately after death but usually a considerable time later. Fleas tend to leave the host after its death ; but, for two main reasons, the animals were not caught alive in order to avoid the resulting loss in numbers. Firstly, there is no more or less fixed number of fleas permanently associated with the host, as there is, for example, with lice. The association between parasite and host is much looser : fleas feed for some time on the host and then drop off, so that the number of fleas existing on any individual host varies considerably with time. The second reason is that fleas do not leave the body of the host immediately after death. The external conditions are important in controlling this. When the atmosphere is warm they readily leave and are active off the host. In cold frosty weather, however, the external temperature may quickly inactivate the parasites which can later be obtained from the frozen body in a torpid condition. In winter the flea-rate from dead hosts is frequently higher than in summer (see Elton *et al.*, 1931 : 720

and 721) perhaps in correlation with the temperature. Humidity, too, may be important.

Any individual host may carry a number of different species of fleas. One bank vole trapped in April yielded 1 *Malaraeus penicilliger*, 4 *Megabothris rectangulatus*, 2 *Leptopsylla spectabilis* and 5 *Ctenophthalmus agyrtes*. The largest number of fleas found on one " mouse " was seventeen from a bank vole. Moles, hedgehogs and other larger mammals usually support larger numbers.

The complete records of the investigation are given in Table 1.

TABLE 1

The occurrence of fleas on small mammals in Aberdeenshire as recorded from dead specimens of hosts. The number in column 2 is the number of hosts examined. The number in column 4 is the number of that species of flea obtained from the particular host species, and the percentage is the minimum percentage of the mammals caught which supported the species of flea. The percentage is a minimum one because many fleas may have left the dead hosts, but it is unlikely that any should come on to them.

| Species of Host | No. Examined | Species of Flea | No. of Fleas | Percentage of Hosts Parasitised |
|---|---|---|---|---|
| *Sorex araneus* Common Shrew | 97 | *Ctenophthalmus agyrtes* | 17 | 8 |
| | | *Nosopsyllus fasciatus* | 1 | 8 |
| | | *Leptopsylla spectabilis* | 1 | 1 |
| | | *Palaeopsylla sorecis* | 13 | 9 |
| | | *Palaeopsylla minor* | 1 | 1 |
| | | *Doratopsylla dasycnemus* | 30 | 17 |
| | | *Hystrichopsylla talpae* | 2 | 2 |
| *Sorex minutus* Pigmy shrew | 13 | *Palaeopsylla sorecis* | 2 | 8 |
| *Neomys fodiens* Water shrew | 7 | *Palaeopsylla sorecis* | 1 | 14 |
| | | *Doratopsylla dasycnemus* | 5 | 28 |
| *Talpa europaea* Mole | 4 | *Palaeopsylla minor* | 56 | 75 |
| | | *Ctenophthalmus bisoctodentatus* | 18 | 75 |
| | | *Hystrichopsylla talpae* | 2 | 50 |
| *Erinaceus europaeus* Hedgehog | 1 | *Archaeopsylla erinacei* | 290 | 100 |
| *Mustela nivalis* Weasel | 4 | *Rhadinopsylla pentacanthus* | 1 | 25 |
| | | *Palaeopsylla minor* | 8 | 25 |
| *Microtus agrestis* Short-tailed vole | 32 | *Ctenophthalmus agyrtes* | 32 | 38 |
| | | *Malaraeus penicilliger* | 3 | 8 |
| | | *Megabothris rectangulatus* | 3 | 8 |
| | | *Leptopsylla spectabilis* | 9 | 13 |
| | | *Rhadinopsylla pentacanthus* | 1 | 3 |
| | | *Palaeopsylla sorecis* | 1 | 3 |
| | | *Hystrichopsylla talpae* | 3 | 9 |

TABLE 1 (*continued*).

| Species of Host | No. Examined | Species of Flea | No. of Fleas | Percentage of Hosts Parasitised |
|---|---|---|---|---|
| *Clethrionomys glareolus* Bank vole | 116 | *Ctenophthalmus agyrtes* | 26 | 26 |
| | | *Malaraeus penicilliger* | 130 | 49 |
| | | *Megabothris rectangulatus* | 5 | 1 |
| | | *Leptopsylla spectabilis* | 8 | 6 |
| | | *Rhadinopsylla pentacanthus* | 4 | 4 |
| | | *Hystrichopsylla talpæ* | 8 | 7·5 |
| | | *Ceratophyllus styx* | 4 | 2 |
| *Arvicola amphibius* Water vole | 2 | *Ctenophthalmus agyrtes* | 3 | 50 |
| | | *Malaeus penicilliger* | 3 | 100 |
| *Apodemus sylvaticus* Long-tailed field mouse | 176 | *Ctenophthalmus agyrtes* | 43 | 20 |
| | | *Malaraeus penicilliger* | 5 | 1·7 |
| | | *Nosopsyllus fasciatus* | 11 | 4 |
| *Mus musculus* House mouse | 50 | *Leptopsylla segnis* | 15 | 8 |
| | | *Nosopsyllus londiniensis* | 1 | 2 |
| *Rattus norvegicus* Brown rat | 16 | *Nosopsyllus fasciatus* | 9 | 25 |
| | | *Rhadinopsylla pentacanthus* | 1 | 6 |
| | | *Ctenophthalmus agyrtes* | 14 | 19 |
| | | *Ctenocephalus canis* | 1 | 6 |
| *Oryctolagus cuniculus* Rabbit | 6 | *Spilopsyllus cuniculi* | Many | 100 |
| *Lepus europaeus* Brown hare | 1 | *Spilopsyllus cuniculi* | Many | 100 |
| *Canis familiaris* Dog | | *Ctenocephalus canis* | Locally abundant | |
| | | *Ctenocephalus felis* | Locally abundant | |
| *Homo sapiens* Man | | *Pulex irritans* | Locally abundant | |

From these records it is evident that some species of fleas occur only occasionally on certain hosts, e.g. the flea *Hystrichopsylla talpae* on the bank vole. These occasional associations are inevitable considering the habits of the fleas and the large degree of overlap in the habitats of the different host species. Bank voles, wood mice and pigmy shrews have all been caught in one particular hole in a dyke and any flea dropping from one of these species is liable to be picked up by one of the others, whether or not it feeds on this second species. Isolated records of host-parasite relations must therefore be treated with caution as they may indicate a condition which is not general throughout the population. By means of these "occasional" associations it may be possible to detect some overlap in the ecology of host species. One specimen of *Palaeopsylla sorecis* was obtained from a mole and it might be inferred that this flea dropped off a shrew

(the usual host) using the mole tunnel, and was later picked up by the mole. The occurrence of bird fleas on mammals in winter may be significant ; e.g. *Ceratophyllus styx*, the parasite of the sand martin, was recorded from bank voles and a pigmy shrew during early spring and winter. At this time the sand martins are in their winter quarters.

When one species of flea is restricted to one species of host it is " specific " to that host. The degree of host specificity encountered in the records given above is very variable. The extremes are represented by *Archaeopsylla erinacei* which occurs only on the hedgehog, and by *Ctenophthalmus agyrtes* which occurs on a large number of different hosts.

Three degrees of host specificity are considered here.

1. Fleas found on one host species only :—

*Archaeopsylla erinacei.*
*Ctenophthalmus bisoctodentatus.*
*Leptopsylla segnis.*

2. Fleas found only on closely related hosts :—

*Spilopsyllus cuniculi.*
*Malaraeus penicilliger.*
*Nosopsyllus fasciatus.*
*Nosopsyllus londiniensis.*
*Megabothris rectangulatus.*
*Doratopsylla dasycnemus.*
*Palaeopsylla sorecis.*
*Palaeopsylla minor.*
*Leptopsylla spectabilis.*

3. Fleas found on a wide range of hosts :—

*Hystrichopsylla talpae.*
*Ctenophthalmus agyrtes.*
*Rhadinopsylla pentacanthus.*

This classification is derived entirely from the records given in Table 1, omitting the " occasional " (see pp. 43 and 44) associations. The literature does not supply any data in this connection as all the host-parasite associations known are recorded with equal significance.

Only seven specimens of *Rhadinopsylla* were obtained : one on the short-tailed vole, four on bank voles, one on a weasel, and one in a shrew's nest. This is a nest-dwelling species and appears to parasitise a wide range of hosts. The above records, however, are not sufficient to warrant conclusions being drawn. Similarly, only one specimen of *Nosopsyllus londiniensis* was obtained. (Six other specimens of *N. londiniensis* were obtained from house mice trapped indoors by R. M. Allan. None was obtained from rats.)

A relationship seems to exist between the fleas and the type of pelage of the host. Closely related fleas appear in many cases to parasitise hosts which have a similar pelage whether or not these hosts are closely related.

It should be pointed out that an adult flea has two habitats, namely, the surface of the host, on which it feeds, and the nest of the host, in which it reproduces. Both habitats are important and either could present factors limiting the association, but only the former is considered here.

The three species of shrew obtained here, *Sorex araneus*, *S. minutus* and *Neomys fodiens*, have very similar coats ; all three have a dense pelage of short fur placed perpendicularly to the surface. All three share the flea *Palaeopsylla sorecis*. *Doratopsylla dasycnemus* occurs on the common and water shrews, and is probably a parasite of the pigmy shrew as well. The mole *Talpa europaea*, which has fur fairly similar to that of the shrews, is parasitised by *Palaeopsylla minor* which is very similar to *P. sorecis*. *P. minor* is also found on the weasel which has a very thick under-fur beneath the longer and sparser guard hairs. The species of the genera *Malaraeus* and *Megabothris* appear to be characteristic of the coarse sparse fur of the Microtine mice, while the genus *Nosopsyllus* usually parasitises animals with a softer and more compact pelage, namely the Murine mice and rats.

The habits of the host have little effect on the species of flea present. The water shrew spends much of its time in and under water, where it finds its food, in this respect differing very markedly from the other two shrews. Yet they share the same species of flea. *Malaraeus penicilliger*, the commonest flea on the bank vole, occurs on the water vole also. Whether caught in a stone dyke, a young coniferous

forest, or any other habitat, bank voles usually carry a number of this species of flea. However, Waterston (1910), considering the distribution of *Ceratophyllus garei*, suggests that its distribution is limited by topographical factors. This flea parasitises a number of widely different birds which nest near water.

There seems to be some localisation of flea populations within apparently continuous populations of the host species. Trapping in a golf course in the mature zones of sand dunes produced bank voles and short-tailed voles with *Megabothris rectangulatus*. Eight specimens were obtained in two nights. No other specimens were obtained during the investigation although about 150 other voles were caught in other localities. On 18th September 1949 R. M. Allan obtained one from a bank vole trapped at 1,600 feet above sea level at Braemar. In the sand dune area just mentioned, during the same two nights, eight specimens of *Leptopsylla spectabilis* were found on the voles. In December 1949 three more specimens were found on short-tailed voles caught on grassy cliffs on the coast at Aberdeen. Only four other specimens were obtained. A number of *Nosopsyllus fasciatus* was obtained from a few long-tailed field mice in different places but the flea was not generally distributed on this host. These instances could often be correlated with the proximity to rats bearing the flea.

There are certain discrepancies between the results of this work and those of Elton *et al.* (1931).

1. The flea *Megabothris turbidus* occurred on 12 per cent. of the bank voles trapped in Bagley Wood, but it was not recorded at all by us in Aberdeenshire.
2. *Ctenophthalmus agyrtes* was not obtained from the common shrew in Bagley Wood but occurred on 8 per cent. of those taken here.
3. *Leptopsylla spectabilis* was obtained from 6 per cent. of the bank voles here but did not occur on this species in Bagley Wood.

It is possible that the first of these differences is local in nature, like the distribution of *M. rectangulatus* here. The situation with *C. agyrtes* on shrews and *L. spectabilis* on bank voles is

not so readily explained, however. Since the flea is present in both areas on one species it is diffiult to understand why it is found on a coexisting species in one area and not in the other.

A few nests of small mammals were investigated and the fleas in them were examined. The results are summarised below, all the fleas in the nests being enumerated.

Nest of a shrew (almost certainly *S. araneus*) under an old log :—

| | |
|---|---|
| *Hystrichopsylla talpae* | 15 |
| *Ctenophthalmus agyrtes* | 17 |
| *Malaraeus penicilliger* | 2 |
| *Rhadinopsylla pentacanthus* | 1 |

Nest of a shrew beneath a large stone :—

| | |
|---|---|
| *Ctenophthalmus agyrtes* | 21 |

Nest of a house mouse in an oat stack :—

| | |
|---|---|
| *Ctenophthalmus agyrtes* | 2 |

Nest of a mole in a large mole hill : –

| | |
|---|---|
| *Ctenophthalmus bisoctodentatus* | 15 |
| *Palaeopsylla minor* | 1 |

It is interesting to notice that, though they were found in the nests of shrews, neither *Rhadinopsylla* nor *Malaraeus* was recorded from their bodies. Moreover no *Hystrichopsylla* (the mole flea) was obtained from the mole's nest, and very few from moles' bodies. This species was abundant in one of the shrew nests. Although house mice usually carry only *Leptopsylla segnis* or *Nsopsyllus londiniensis* when living indoors, *Ctenophthalmus agyrtes* occurred in a nest in an oat stack.

The following selected records of mammal fleas were made by R. M. Allan :—

*Spilopsyllus cuniculi* (the rabbit flea) from a long-tailed field mouse in garden plots, Aberdeen.

*Monopsyllus sciurorum*—one specimen from a bank vole was caught at 1,600 feet above sea level near Braemar on 19th September 1949. No other specimens were obtained from " mice," and red squirrels were not examined.

*Orchopeas wickhami*—one specimen from a bank vole caught near Braemar on 19th September 1949. This flea is a parasite of the grey squirrel, *Sciurus carolinensis*, and from this evidence appears to be spreading more quickly than its true host.

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## ZOOLOGICAL NOTES

**Early Dates for Lepidoptera in the Solway Area.**—The following dates are earlier than any previously recorded for this district : *Theria rupicapraria*, 21st January 1949 ; *Orthosia incerta*, 3rd March 1949 ; *Drepana falcataria*, 9th May 1949 ; *Argynnis selene*, 19th May 1949.—David Cunningham, Dumfries.

**Immigrant Lepidoptera in the Solway Area in 1949.**—The painted lady and red admiral butterflies, *V. cardui* and *atalanta*, have both been fairly common this autumn. One humming-bird hawkmoth *Macroglossa stellatarum* was seen on 12th July, and one pearly underwing *Peridroma saucia* on 16th September. Silver-Y moths *Plusia gamma* have been not uncommon throughout the summer and autumn. Three pupæ of the death's-head hawkmoth *Acherontia atropos* were brought to me in October by potato-diggers ; two of these had been damaged in the lifting.—David Cunningham, Dumfries.

**Peacock and Painted Lady Butterflies.**—The peacock butterfly *Nymphalis io* has, for some years, been quite common in parts of the west of Scotland and it is now increasing in the east. In Fife this summer we have seen it at Largo, where one came into the drawing-room at Balsusney, at the East Neuk and at Guardbridge ; we were also told of one having been seen on Tentsmuir. Two, in beautiful condition, were on the Isle of May on 6th September. Painted ladies *V. cardui* have been fairly plentiful this summer in Fife ; all we have seen were in perfect condition.—Evelyn V. Baxter and Leonora Jeffrey Rintoul, Largo.

**Observations on the Peacock Butterfly** *Nymphalis io*.—The following records are from personal observations, together with some others communicated to me by friends :

| Year | Spring | Autumn (new brood) |
|---|---|---|
| 1940 | 26th May-10th June | 11th August-30th September |
| 1941 | 4th May-3rd June | 30th August-30th September |
| 1942 | 14th May only | 26th August-2nd September |
| 1943 | 1st May only | 9th August-9th September |
| 1944 | 13th April-17th May | 26th August-7th October |
| 1945 | 18th April-4th June | 13th August-13th September |

| Year | Spring | Autumn (new brood) |
|---|---|---|
| 1946 | 4th May-25th May | 27th August-25th September |
| 1947 | 12th April-10th May | 19th August-21st October |
| 1948 | 26th March-9th June | No notes taken |
| 1949 | No notes taken | No notes taken |

*Spring.*—One of four seen at Gallingad Bridge (vice-county 99) on 6th May 1946 was laying eggs on nettles. I have never seen spring specimens visit flowers.

*Autumn.*—Chiefly in gardens, especially those in which the blue buddleia grows. While buddleia is undoubtedly the favourite nectar plant, other garden favourites are dahlia, privet and aster. In the country the butterfly is usually found in open situations but these are seldom far from trees. There it visits devil's-bit scabious, angelica and spear-thistle. I have only one note of its occurrence in an open treeless situation and this was on 28th August 1942, when, walking over a 1,500-foot hill summit in this parish (Largs, vice-county 75), I saw one flying sufficiently close to make identification certain.

On 19th August 1940 I found a specimen sheltering in the garden shed here. The next day was somewhat cold and as the butterfly was in a comatose state I brought it indoors, where it recovered with the warmth, and I heard it giving its characteristic " hiss." The 22nd was a fine day and it was released and took to the wing at once. On 25th September I saw one chased by a blackbird, but the insect escaped. On 23rd August 1946 I found one sheltering in the tomato-house ; on the 25th it was still there but caught in a spider's web from which it was soon released. The autumn storms must cause enormous casualties, judging by the small number of specimens seen in spring and which carry on the breed.—J. Boyd, Largs.

**The Forester, Saxon, and Triple-spotted Clay Moths in the Stewartry of Kirkcudbright.**—Except for a report that it occurs at Rockcliffe in a locality which I have not visited, nothing has been seen or heard of *Procris statices* in this area since Lennon (1862) recorded it as uncommon. It was with great pleasure, therefore, that I chanced on a small colony of this moth in the Mabie area, 17th June 1949. At sugar, 24th June 1949, I took in the same locality *Hyppa rectilinea* and *Amathes ditrapezium*. Neither has, to my knowledge, been previously recorded for the Solway area. Mr. Arthur B. Duncan tells me he has taken both in mid-Nithsdale, Dumfriesshire.—David Cunningham, Dumfries.

***Sirex juvencus* in Fife.**—On 6th September 1949 a specimen of this wood wasp was brought to us by three boys who had found it on the road about three miles north of Largo.—Evelyn V. Baxter and Leonora Jeffrey Rintoul, Largo.

**Wasp Attacking Butterfly.**—On 27th August 1949 a wasp was eating the body of a large cabbage white butterfly *Pieris brassicae*, which was lying on the ground below a buddleia in Upper Largo. There was not much of the body left and only two of the wings were still attached to it. Next day I saw another large cabbage white butterfly whirling and flopping round on the pavement below the buddleia evidently in great distress. I thought the kindest thing was to kill it, so put my foot on it and then saw that a wasp was holding it tightly and had got killed too. The wasp proved to be *Vespa vulgaris*, a worker, and under the microscope I could see that it had taken a large bite into the junction of the butterfly's fore-wing and body. Taken in conjunction with the previous observation it looks as if the wasps were killing the butterflies.—Evelyn V. Baxter, Largo.

**Giant Squid *Architeuthis* in Shetland.**—On 2nd October 1949 a giant cephalopod, at first reported to be an octopus, was stranded on the beach at the head of Whalefirth Voe, Shetland. Unfortunately the specimen was cut up for bait before it could be secured for examination, but a few small parts were saved.

Dr. Peterson of Camb very kindly presented the horny jaws to the Museum and also sent a description of the animal and a rough sketch. Mr. J. Inkster, Mid Yell, presented two of the toothed horny rings, with which the suckers are armed.

The cephalopods may be divided into two main groups : (*a*) those with eight short arms and (*b*) those with eight short arms and two very long ones (squids, etc.). From the description and parts received it was seen that this animal was not an octopus but an *Architeuthis*, the genus to which the giant squids belong. Dr. Peterson measured the animal. The body was about 4 feet in length, the short arms about 6 feet and one of the long arms about 20 feet.

These giant squids are not uncommon on the north-eastern shores of North America and the Grand Banks, but are only very occasionally reported from the British coasts. Several species have been described, but only two are recorded from Scottish waters (Stephen, A. C., 1944. The Cephalopoda of Scottish and Adjacent Waters. *Trans. Roy. Soc. Edinburgh*, 61 : 263-264) namely :

*A. monachus* Steenstrup, between Scalloway and Hillswick, Shetland, in 1860 or 1861.

*A. harveyi* Verrill, reported on a number of occasions from the northern and western coasts of Scotland and the Outer Hebrides.—A. C. Stephen, Royal Scottish Museum, Edinburgh.

**The Terrestrial Mollusca of Aberdeenshire and Kincardineshire.**—Over a century ago Professor William Macgillivray published the first account of the slugs and snails of the North-east of Scotland (*A History of the Molluscous Animals of the Counties of Aberdeen, Kincardine and Banff*, London, 1843 ; later list, with additions, in *The Natural History of Deeside and Braemar*, London, 1855). He recorded 37 terrestrial species from Aberdeenshire and Kincardineshire. The official census conducted by W. Denison Roebuck and published in 1921 (*Journ. Conch.*, 16 : 165-212) includes 49 species from this area.

During the last two years I have found 40 species here, 4 of which are new records for South Aberdeenshire (vice-county 92) : *Trichia striolata* from Ballater, and *Oxychilus lucidus*, *Milax gagates* and *Agriolimax caruanae* from a garden in Aberdeen ; *Limax flavus*, found in an old house in Old Aberdeen, has not been recorded here since the middle of last century. Many of the species found by Macgillivray a hundred years ago still occur in the same situations : for example, *Carychium minimum* in Rubislaw Den, *Trichia hispida* among the ruins of Dunottar Castle, and *Euconulus fulvus*, *Lauria cylindracea*, *Vallonia pulchella* and *Oxychilus alliarius*, often found together, among moss on the links near Don-mouth. The most obvious change since Macgillivray's time is an increase in the number of species of slugs ; many of these seem to be extending their range, possibly helped by agricultural transportation ; at least thirteen species occur here now, whereas only six were found by Macgillivray.—Aileen Forrest, Aberdeen.

**Fries' Goby in Ross-shire and in Argyllshire.**—Two specimens of Fries' goby *Gobius friesii* were taken at a depth of 20 metres in Loch a' Choire, Argyllshire, on 22nd August 1949, and three specimens of the same species were caught at a depth of 33 metres in Little Loch Broom, Ross-shire, on 9th September 1949.

This species has been described (Jenkins, 1936, *The Fishes of the British Isles*) as an Irish species, where it is not uncommon off the west and north-west. Three records exist outside Ireland,

one from Norway and two from Sweden. The fact that several specimens were taken in the deeper waters of lochs as far apart as Loch a' Choire and Little Loch Broom suggests that it may be a not uncommon representative in the fauna of the Scottish west coast.—H. J. Thomas, Marine Laboratory, Aberdeen.

**Common and Pigmy Shrews Occurring Together.**—With reference to the notes on shrews in Strathspey (*Scot. Nat.*, 61 : 117) it may be of interest to record that the pigmy shrew *Sorex minutus* occurs in the Elgin district. On 26th January 1949, within a few hours, I caught both pigmy and common shrews at points 50 yards apart. The locality was a tongue of flat ground 250 yards long and between 3 and 6 yards wide between the outflow channel from a distillery and a stream running practically parallel with it.

Near Lympstone, Devon, I have also taken common and pigmy shrews within a few yards of each other.—R. Hewson, Black Muir, by Invergordon.

My observations in Aberdeenshire corroborate those of Mr. Hewson in Morayshire. During 1948-49, 130 common shrews and 20 pigmy shrews were trapped in this county and both species occurred together in all the types of habitats investigated—rough grass, woodland, stream sides, dunes, etc. On one occasion two individuals, one of each species, were caught simultaneously in the same trap ; and both shrews, as well as voles and mice, were obtained from one trapping site in a stone dyke in woodland.

The common shrew appears to be much more abundant than the pigmy shrew, but any difference in numbers which may exist tends to be exaggerated, as the traps used were not so effective against the smaller species.

The occurrence of the two species in the same area is noted for the Oxford area by Elton *et al.* (*Proc. Zool. Soc. Lond.*, 1931 : 661) and by Middleton (*ibid.*, 1931 : 135).—George Dunnet, Aberdeen.

**The Tongue Badgers.**—Both Darling (*Natural History in the Highlands and Islands*, London 1947) and Neal (*The Badger*, London 1948) record the presence of the badger *Meles meles* in the Tongue area of North Sutherland, but it may not be generally realised that the badgers found there are from a re-introduced stock. They were extinct in Tongue in Harvie-Brown's time, none having been seen since 1870 (Harvie-Brown and Buckley, *A Vertebrate Fauna of Sutherland, Caithness and West Cromarty*, Edinburgh, 1887), but were introduced, probably accidentally, about 1925. The

late Mr. John Mackenzie of Tongue Hotel kept several badgers in confinement, which escaped to the Rhean Wood and soon began to multiply and spread. Exactly how many escaped is not known, and more than one lot may have got loose.

On Kinloch the first was trapped about 1930 and in another five years they became quite numerous, spreading several miles into the hill as far as Dithreibh and Achaidh Mor. They were noticed in Strathmore, on the far side of Ben Hope about ten years ago, but whether or not they came from Tongue is uncertain as the stalker at Gobernuisgeach is positive that the indigenous badger was never exterminated on his ground.

They have also spread as far as Skelpick, where they are said to have appeared about 1933, and down Strath Naver. They are present at Dionach-caraidh and at Grumbeg on Loch Naver, and have recently been reported from one or two places on the east side of the River Naver between Loch Naver and Syre.

Many badgers become road casualties, being deliberately run over by lorry drivers on account of their alleged propensity for raiding hen-houses.—I. D. Pennie, Tongue.

**Tree-Creeper in Harris.**—A solitary tree-creeper obtained at Rodil, South Harris, on 29th October 1949 proves to be a male of the northern race *Certhia familiaris familiaris*, and is believed to be the first record for the Outer Hebrides.—R. Meinertzhagen, London.

The northern tree-creeper is a very rare visitor to Great Britain, and this is the first record for the Outer Hebrides.—Editors.

**Chiffchaff in North Perth.**—On 12th June 1949 I found a chiffchaff *Phylloscopus collybita* in full song on the north side of Loch Tay within a mile of Kenmore. The bird sang repeatedly from the trees overhanging the main road, and was within a few yards of me. The presence of this species near Kenmore in 1949 is interesting as birds were reported in the area in 1936 (*Scot. Nat.*, 1936 : 172, and *British Birds*, 30 : 83). The chiffchaff is an occasional visitor to North Perth, but there is no satisfactory evidence of breeding.—James W. Campbell, Strathtay, Perthshire.

**The Sylviidae in North Sutherland.**—Apart from the willow warbler *Phylloscopus trochilus*, the recorded distribution of the warblers in North Sutherland is not entirely accurate. The willow warbler is extremely common and may be heard singing wherever there is a patch of birchwood. Fisher (*Bird Notes*, 1949 : 253) has recorded the occurrence of the wood warbler *Phylloscopus sibilatrix* in a birch wood in Coigeach, West Ross. I have

seen and heard them in the Tongue beech woods since 1947 in small numbers, and on 29th May 1949 heard a single one singing in the wood along the south shore of Loch Naver, which consists almost entirely of fine old birch trees. One was seen and heard at Reay on 27th June 1949 by Mrs. Traill-Clouston, apparently the first record for Caithness.

The sedge warbler *Acrocephalus schoenobaenus* is a regular although not plentiful summer migrant to the north coast. I have seen and heard them regularly during the past three years at Skerray, Strath Tongue, Ribigill and Kinloch. Whitethroats *Sylvia communis* are also regular visitors to the Tongue area where, unlike the rest of the north coast, there is suitable cover for them in the tangled masses of brambles and whins bordering the woods, and in which they may be seen regularly and presumably breed. —I. D. Pennie, Tongue.

**The Scarcity of Wintering Redwings and Fieldfares in South-west Scotland in 1949-50.**—I think it advisable to draw attention to the virtual absence of wintering redwings *Turdus musicus* and fieldfares *Turdus pilaris* in parts of east Renfrewshire and west Lanarkshire during the present winter (1949-50)—areas which in normal years maintain a sizable wintering population of these thrushes.

In early October 1949 a considerable passage movement of *T. musicus*, and to a lesser degree of *T. pilaris*, took place, but by the third week of the month they were decidedly scarce, and since mid-November have been virtually absent from the area under consideration.

It would be interesting to ascertain if other parts of Scotland witnessed a similar scarcity of these *Turdidae*, and whether or not it can be correlated with some wholesale failure on the breeding-grounds, as a result of unfavourable climatic conditions.—P. A. Clancey, Glasgow.

This is an interesting note, and further observations on the present status of both species in Scotland would be valuable. Personal observation during the post-war period, 1946-50, chiefly in N. Perth, Kinross, E. Inverness and E. Ross, support the view that while both species are still abundant on autumn passage, they are now virtually absent as winter visitors.—Editors.

**House Martins Settling on Ash Trees.**—I watched a large flock of Hirundinæ on 3rd September 1949, about 80 per cent. house martins *Delichon urbica*, the rest swallows *Hirundo rustica*, circling round an ash tree in full leaf in Upper Largo and picking some-

thing off the leaves as they passed. Some house martins and one or two swallows lit on the twigs and continued to pick something off the leaves. There appear to be few recorded instances of house martins settling on trees and feeding.—Evelyn V. Baxter, Largo.

**Buzzard in East Lothian.**—In view of the scarcity of the common buzzard *Buteo buteo* in East Lothian, it might be worth recording that I saw one in a valley between Gifford and Garvald on 30th November 1949. The local gamekeeper informed me that he had not seen one here for at least ten years.—D. R. Anderson, Edinburgh.

**The Breeding of the Heron in the Outer Hebrides.**—The following information on heronries in the Outer Hebrides was received too late to be included in the report published in the *Scottish Naturalist*, 61 : 73-100 :—

South Uist—(1) Loch Bein : In June 1949 Miss Mary Henderson estimated that there were seven occupied nests, built in stunted trees on the steep slope of the west shore, and possibly two more on an island in the loch.

(2) Loch Druidibeg : In June 1949 Mr. A. E. Billet found eight to ten nests built in rhododendron bushes on an island in the loch.

(3) Loch Coragrimsay : Mr. A. E. Billet counted sixteen nests at this site in June 1949.

The following ringing record was omitted : one ringed as nestling in North Uist on 12th June 1934 by Midlothian Ornithological Club, recovered where ringed on 21st June 1937 (*British Birds*, 31 : 117).

It is important that information concerning the breeding of the heron in the Outer Isles should be kept up to date, and therefore I will be grateful for any notes on the subject.—James W. Campbell, Strathtay, Perthshire.

**Steller's Eider in Orkney.**—For over an hour I watched a male Steller's eider *Polysticta stelleri* at Sandside Bay, Deerness, Orkney, on 13th November 1949. It was in company with a party of common eiders and seemed not to be shy at all as it stayed very near for this time. Only when I walked along the beach it swam slowly out to sea, leaving the flock of eiders. It showed no chestnut on flanks and breast, being uniformly white on these parts. Its beak was a medium blue, showing no other change of colour even at the tip. The greenish patch on the nape stood out very well indeed against the white head. The throat was

black and the black collar was extremely distinctive, also the black patch on centre of back. Wing pattern was rather more white than black but showed a good deal of black on primaries and coverts. Only once did it stick its head up when a wave rather bigger than usual struck it. I was struck again by the thinness of the neck when stretched, the head looking rather bigger than it should be on such a thin neck. I noticed this peculiarity in the two I reported in *British Birds*, 40 : 253, seen in January 1947. I would like to suggest that the only other duck it might be confused with, and it would need a very bad light indeed to do this, would be an immature male long-tail of which we possess an abundance each winter.—GEORGE ARTHUR, Kirkwall.

**Reflex Actions as Forms of Distraction Display.**—In a note on the common eider *Somateria mollisima* in the *Scottish Naturalist*, (Volume 61 : *Fair Isle Observatory Report*, p. 28, Kenneth Williamson records the covering of the eggs with green slimy excreta when flushed from the nest. This, in my experience, is extremely common, almost an invariable happening ; and I have also seen the same thing with a red-breasted merganser *Mergus serrator*. On 17th June 1949 I disturbed a merganser from her nest under an upturned boat, and as she left she covered the eggs with a stream of extremely foul-smelling excreta. The large quantity and offensive nature of the excreta of an incubating bird may be seen in the domestic fowl, which defæcates only when taken off the nest to feed, normally once in twenty-four hours.

The involuntary voiding of urine and fæces due to fear is well known in mammals. Ducks flushed from water will often defæcate, and Thomson (*The Biology of Birds*, London, 1923) cites " the squirting out of nauseous stuff when startled " as an example of a reflex action which plays an important part in the life of birds. The fouling of the eggs as a means of protection has evidently evolved from this and a variation of this development is seen in the shag *Phalacrocorax aristotelis*, of which both adults and young when startled will retreat hastily into the depths of the evil-smelling holes they inhabit, ejecting towards the intruder a jet of fæces which is squirted out a distance of about eighteen inches. However, just as a fulmar *Fulmarus glacialis* will vomit its stomach oil even though it may be prevented from directing it towards the intruder, so the fæcal squirt of the shag is incidental to the position assumed by the bird, but all the same an effective means of defence. Vomiting is usually a reflex action in mammals and presumably also in birds, and in the petrels has evolved into a form of distraction display.

Involuntary emission of nauseous fluid from the musk glands, when startled, is characteristic of the Mustelidæ, and in the badger *Meles meles*, according to Neal (*The Badger*, London, 1948) emission will occur in connection with excitement of various kinds. The skunk's *Mephitis mephitis* gas attack is notorious, but the wolverine *Gulo luscus* carries this a stage further, for the use of the musk glands has evolved into a means of protecting food from other animals, and is analogous to the fouling of its own eggs by the eider duck as a means of protection from predators.—I. D. Pennie, Tongue.

The fouling of the eggs and down, when the brooding bird is flushed from the nest, occurs almost invariably with the eiders that we have found nesting in the Outer Hebrides, and west and north coasts.—Editors.

**Wader Migration in Midlothian.**—The autumn of 1949, which proved so favourable for passerine migration, also saw an unusually heavy passage of waders inland in Midlothian. The low water-level, with an abundance of suitable mud, and predominantly easterly winds were undoubtedly responsible for this. A list is given of the more unusual waders seen during this period at Gladhouse Reservoir, in view of the few occasions on which they seem to have been recorded inland in this area.

Bar-tailed godwit *Limosa lapponica :* One, probably adult, 27th August ; one, certainly a different bird, 4th to 15th October.
Turnstone *Arenaria interpres :* Party of four flew over, 27th August.
Knot *Calidris canutus :* One, 9th October.
Curlew-sandpiper *Calidris testacea :* One, 25th September.
Ruff *Philomachus pugnax :* Two, 4th October ; five, 9th to 15th October ; two, 23rd October. These seem to be unusually late birds.—M. C. Maw and D. G. Andrew, Edinburgh.

**Black-tailed Godwit in North Perth.**—On 7th May 1949 A. B. Baillie-Hamilton brought me a black-tailed godwit *Limosa limosa* which he had picked up near a loch in the Upper Tay area, North Perth. It appeared to have a broken neck, but there were no other external signs of damage, and from its condition the bird could not have been dead for more than twenty-four hours at the most. There were no overhead wires near where it was found with which it could have collided. This specimen, which was an adult in summer plumage, has been preserved. I understand from the article, " A Century's changes in Scottish Ornithology " (*Scot. Nat.*, 60 : 19), that the black-tailed godwit is no

longer a rarity, but it is more than likely that this was a bird on passage, and therefore the record may be of some interest in connection with migration times and routes. It is just possible, of course, that this bird intended to breed in the area, and for this reason the precise locality has not been disclosed.—R. E. Hayes, Glenalmond, Perth.

In North Perth the black-tailed godwit is an autumn passage migrant, and has wintered. This appears to be the first inland record for the area, and also the first spring occurrence.—Editors.

**Black-tailed Godwit in Skye.**—At noon on 10th December 1949, following a blizzard, I saw a black-tailed godwit *Limosa limosa* on the moor about 100 feet above the sea and almost a mile inland from Portree. It came down on some land with ditches. I have never before seen this bird in Skye.—Seton Gordon, Isle of Skye.

There appears to be no previous record for Skye.—Editors.

**Sanderling and Bar-tailed Godwit in Sutherland.**—As these waders seem to be uncommon in West Sutherland, it may perhaps be worth putting on record that I saw a sanderling *Crocethia alba* in a sandy bay near Balchladish, north-west of Lochinver, on 5th September 1937, and a bar-tailed godwit *Limosa lapponica* in another sandy bay at Clashnessie, a little further north, later on the same day.—R. S. R. Fitter, Burford.

**Passage Birds at Lintrathen Reservoir.**—Records of passage migrants at Scottish reservoirs are not reported in anything like the numbers given for England. Some records at Lintrathen are of interest ; those for 1949 may be the result of the low water there, giving a wide area of mud.

Whimbrel *Numenius phaeopus*—two, 20th August 1949.
Phalarope *Phalaropus* sp. ?—one, 22nd October 1949. The clear blue-grey of the back and wings suggests the grey phalarope rather than the red-necked phalarope, in winter plumage.
Dunlin *Calidris alpina*—four, 12th September 1949.
Ruff *Philomachus pugnax*—two, 12th September 1949.
Ringed plover *Charadrius hiaticula*—six, 25th September 1949.
Black tern *Chlidonias niger*—three, 21st September 1947.—Henry Boase, Invergowrie.

**"Injury-feigning" of Oyster-catcher.**—I visited a gravel bank near Ballantrae, south Ayrshire, on 2nd June 1949, to find

and ring three young oyster-catchers *Haematopus ostralegus*. On my approach the parent birds began circling round me, piping loudly. After a few minutes one of them alighted about forty feet away, and the other remained flying overhead. On my nearer approach the bird which had alighted rose, gained height, and flew straight at me, veering off about ten feet from my head. This happened several times before it touched down about thirty feet away and began to scuttle along the gravel, one wing flapping stiffly in typical " injury-feigning " manner. This lasted only a few seconds, then the bird flew to join its mate, which had landed not far away.

I returned to the bank on 4th June and watched the oyster-catchers return to their young. Immediately I showed myself, one of them rose and flew straight at me. The other at the same time began " injury-feigning," heeling on its side, then scuttling along with tail depressed and both wings flapping stiffly—similar to the display of the ringed plover *Charadrius hiaticula*. On this occasion the performance lasted for four or five minutes, as I encouraged the bird to repeat these actions several times in order to obtain notes on its behaviour.

When I was ringing the young, the same bird flew closer, alighted and crept into a depression in the gravel, nestling down until it was nearly out of sight. As I approached it, the " injury-feigning " began immediately.

A similar occurrence took place on 11th June 1949 while a friend and I were examining the newly-hatched young of another oyster-catcher about two hundred yards farther along the same gravel bank.—Scott Nelson, Ballantrae, Ayrshire.

**Distraction Behaviour of the Oyster-catcher.**—Distraction behaviour of one type or another among oyster-catchers is apparently widespread and perhaps more frequent in Britain than the paucity of records suggests. Mr. Nelson's account is of value since it includes observations (apparently for the first time in this country) of the more commonly reported lure-display or " injury-feigning " alternating with aggressive and false-brooding activities ; in this respect, the behaviour agrees in its essentials with that of the moorland nesting-birds of the Faeroe Islands, among which all three patterns are highly developed (Williamson, 1943).

Distraction behaviour in this species is highly complex, and many more field observations are required before a proper understanding of the nature and value of the various patterns can be achieved, and the implications of certain pronounced regional differences understood. Nelson's note suggests that there is

probably good material in the close study of the inland-nesting birds of Scotland, and the present note is written as a plea that the points embodied in it may be looked for and reported upon by other observers who are suitably placed.

In Faeroe, the aggressive flight sometimes leads to actual striking of the observer ; false-brooding normally interrupts the furtive run away from the position of eggs or young, and these two patterns persist throughout the nesting-cycle from the laying of eggs up to and even beyond the fledging of the young, when all biological need for such behaviour has ceased to exist. The lure display, on the other hand, matures gradually during incubation and is normally at its best towards the hatching period, tending to decline as the young birds grow. Characteristically, it is a forwards creep in a huddled, crouching posture with the tail depressed and both wings arched and spread, beating rhythmically. Often, especially in Britain (and also in Faeroe early in the incubation period), it occurs in an undeveloped state, with the wing-action asymmetrical as described in Nelson's note. Sometimes the pattern is so ill-defined as to be little more than a perfunctory lifting and partial opening of the wings during the furtive run, exhibiting the white in wings, rump and tail. In the mature performance there is also a stationary version in which the bird lies spread-eagled, with head hanging and bill open as though on the point of collapse, on top of a prominent rock or hummock. This " exhausted bird " posture is common to many of the Charadriiformes, and has been recorded in English oyster-catchers by Brown (1946). Other observers, in particular Haverschmidt (1946), Roberts (1947), Cawkwell (1948) and Benson (1948), have given accounts of the moving lure display in Dutch, English and Orkney birds, whilst G. K. Yeates (pers. comm.) found it frequent on Fetlar in Shetland. An earlier reference often overlooked is that of Bonar (1931), who claims that an angler friend actually captured an " injury-feigning " bird on a shingle bank of the Tummel !

The so-called " butterfly-flight "—apparently an advertising flight—in which the amplitude of the wing-beat is increased so that it seems much slower than in the " whirr-flight " which normally accompanies disturbance, sometimes occurs as a substitute or displacement activity under circumstances when the lure display would appear to be the more appropriate response. Brown (1946) gives an excellent account of lure display, culminating in the " exhausted bird " figure, succeeding the " butterfly-flight," and I have several times seen this flight as a reaction to disturbance on Fair Isle. Another pattern which occurs in this context,

but apparently always at a lower emotional level than the others (as when one is close enough to the young to raise active suspicion, but not actually threaten their safety), is the "pseudo-sleeping" atttitude described in other contexts by Makkink (1942) and Edwards, Hosking and Smith (1948). In this posture the bird turns the head sharply and stabs its bill among the scapulars, but often remains standing on both legs (instead of one, as when resting normally), and always has the eyes wide open : indeed, far from appearing restful to the critical observer, the pose is one of tense alertness. This, too, appears in the distraction-behaviour complex as a displacement activity, as it is primarily a pose adopted against other oyster-catchers either before or during aposematic behaviour.

The South American pied oyster-catcher *Haematopus o. leucopodus* is also very aggressive in defence of its nest and young, according to Crawshay (1907) and Cobb (1910). These observers also report a lure display similar to that of the European bird except that the tail is raised over the back, not depressed, showing the white beneath. The New Zealand black *Haematopus unicolor* and pied oyster-catchers *Haematopus o. longirostris* also indulge in a form of lure display, the former being very vigorous, according to Buller (1888) and others. Similar behaviour has been recorded in the North American black oyster-catcher *Haematopus bachmani.*

*References.*—Benson, S. V., 1948, *Brit. Birds*, 41 : 222 ; Bonar, H. N., 1931, *Scot. Nat.*, 101-111 ; Brown, R. H., 1946, *Brit. Birds*, 39 : 60 ; Buller, 1888, *The Birds of New Zealand*, London ; Cawkwell, E. V., 1948, *Brit. Birds*, 41 : 93 ; Cobb, A. F., 1910, *Birds of the Falkland Islands*, London ; Crawshay, R., 1907, *The Birds of Tierra del Fuego*, London ; Edwards, G., Hosking, E. and Smith, S., 1948, *Brit. Birds*, 41 : 236-243 ; Haverschmidt, Fr., 1946, *Brit. Birds*, 39 : 59 ; Makkink, G. F., 1942, *Ardea*, 31 : 23-74 ; Roberts, E. L., 1947, *Brit. Birds*, 40 : 284 ; Williamson, K., 1943, *Ibis :* 486-490.

Kenneth Williamson, Fair Isle Bird Observatory.

**Chick Survival in the Kittiwake.**—In July 1936 H. N. Southern made a count of some of the kittiwake nests on the Isle of May ("A survey of the vertebrate fauna of the Isle of May," *Journ. Anim. Ecol.*, 7 : 144-154, May 1938) in order to obtain some idea of the rate of chick survival. A similar count was made on 5th July 1949 by me, and the results are compared below :—

| | 1936 | | 1949 | |
|---|---|---|---|---|
| | No. | % of Total | No. | % of Total |
| No young . . | 10 | 11·4 | 23 | 10·5 |
| 1 young . . . | 28 | 31·8 | 74 | 33·6 |
| 2 young . . . | 50 | 56·8 | 118 | 53·6 |
| 3 young . . . | — | — | 5 | 2·3 |
| Average no. of young per pair : | 1·45 | | 1·47 | |

In a few cases in 1936 the nests still had eggs, whereas the 1949 count excluded nests with eggs. Because of this it might be expected that the survival rate in 1949 would be rather lower than in 1936. In fact it is slightly higher, although the general picture for the two years is remarkably similar. The number of young fledged per pair would be less than the above figures, but in both years the majority of the young were large and would have had a reasonable chance of fledging.—Stanley Cramp, London.

## ERRATUM

The date of capture of a male *Coenagrion pulchellum* in Dumfriesshire, recorded by E. S. Brown in Vol. 61, page 175, should be 30th June 1944 instead of 1934.—Editors.

# NOTICE TO CONTRIBUTORS

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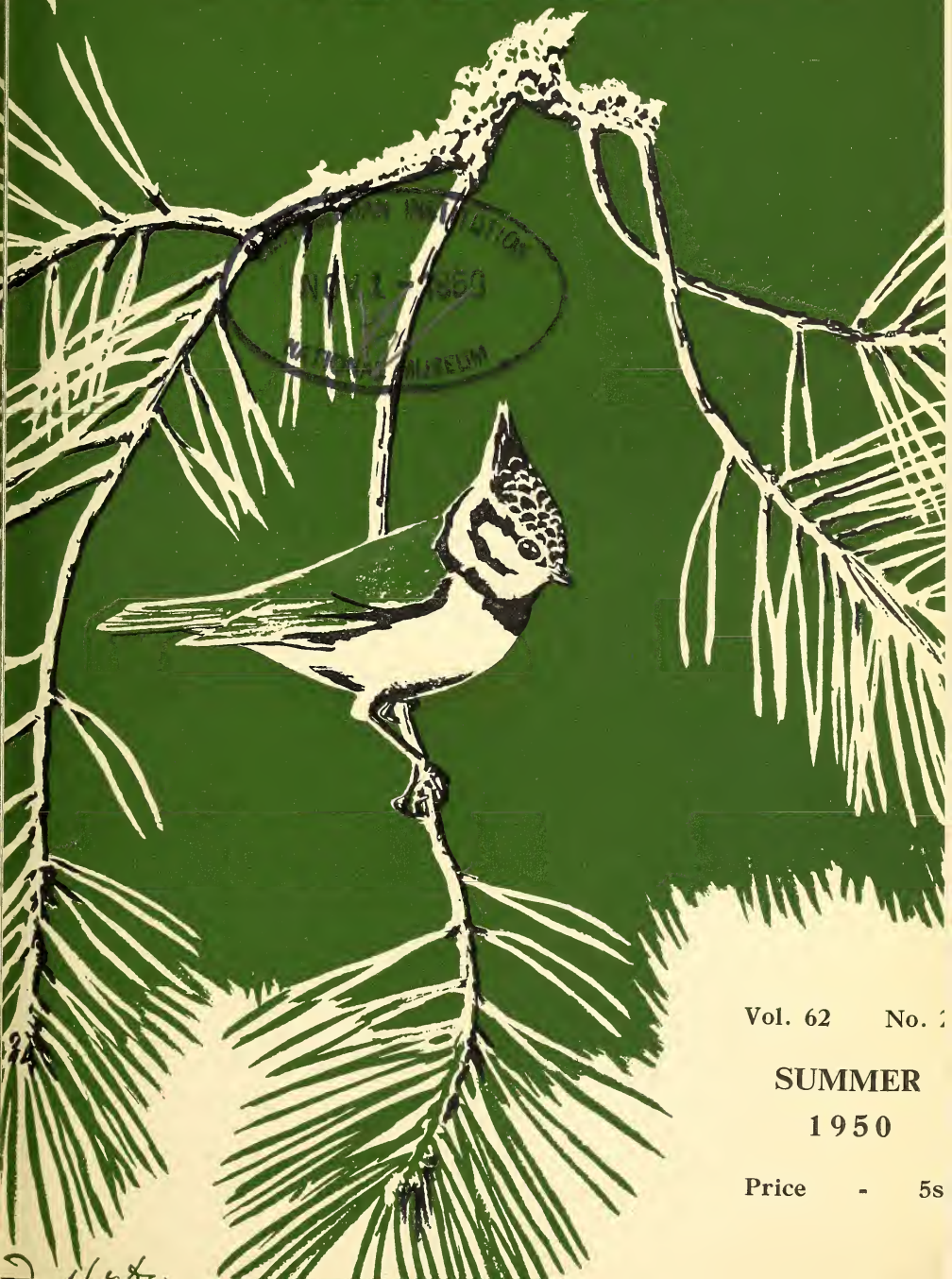

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# The Scottish Naturalist

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## THE HISTORY AND DISTRIBUTION OF THE CAPERCAILLIE IN SCOTLAND *

Ian D. Pennie
Tongue

### Part 1

### Introduction

In 1879 J. A. Harvie-Brown published, in his book *The Capercaillie in Scotland*, an account of the advance of the species from the time of its reintroduction. In order to collect details of the advance from 1879 onwards, and to determine the present status of the capercaillie, especially in view of the recent widespread felling of coniferous woods, a new enquiry was undertaken in 1948 and 1949.

A questionnaire was sent out to all members of the Scottish Ornithologists' Club, and also to every forester in Scotland by the director of the Forestry Commission, Scotland, without whose valuable co-operation the scope of the enquiry would have been greatly limited. In addition the matter was publicised in the press, and cards were also sent by the organiser to lairds, factors, gamekeepers and other private individuals throughout the country. A representative return has been received from most parts of the country. From the Forestry Commission every card sent out was returned, a remarkable and most generous contribution. Certain members

* *Received for Publication, November 1949.*



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of the S.O.C. also went to a great deal of trouble to assist in the collection of data and to furnish names of persons likely to provide information. So many persons have contributed to the enquiry that individual acknowledgment is not possible, and the writer wishes to express his indebtedness to all those who have provided material for this paper.

The capercaillie *Tetrao urogallus* is a palaearctic species with a wide distribution throughout the coniferous forests of Europe and Asia. In amplification of the statement of distribution given in *The Handbook of British Birds* (Witherby *et al.* 1941) it is noted : that the separation of the Vosges and Jura and the Pyrenean stocks is of comparatively recent origin, for the capercaillie was found in several localities in the Auvergne Mountains, central France, until the close of the eighteenth century ; and that in the Pyrenees and Cantabrian Mountains it is now very scarce (Ingram 1915). There are no proofs of its occurrence in Denmark in historic times and the reintroductions there have not been a great success. It was introduced into Rold Skov—Rold forest—in north Jutland in about 1870 and some years later to Djursland, eastern Jutland. In 1914 thirty-eight birds were introduced to Silkeborg, central Jutland ; also to Tisvilde in north Sealand in 1924, Almindingen in Bornholm and, more recently, to the plantations of west Jutland. At each attempt the same thing happened. In the first few summers a few clutches were hatched and reared but soon the whole population disappeared, probably killed off by the moist weather which prevails in the country. There are still a few left in the large forest of Almindingen in Bornholm, which is an island with a slightly more continental climate than the rest of Denmark. There are also a few in western Jutland where the introduction is more recent, and possibly one or two at Tisvilde (Dr. Finn Salomonsen, personal communication).

The only other species is *Tetrao parvirostris*, found in Mongolia and Siberia, largely, if not entirely, to the eastward of the limits of *T. urogallus*. Various subspecies have been described, of which the typical race inhabits Scandinavia and Scotland (introduced). It is probable that the indigenous Scottish birds would have formed a separable geographical race, but there is no possibility now of deciding this, as, according to

Gladstone (1921), a male in the Hancock Museum, Newcastle-on-Tyne appears to be the only surviving specimen with any good claim to rank as Scottish.

The capercaillie was exterminated in Scotland by the wholesale destruction of the old pine forests without which the species could not survive, and small numbers are generally believed to have continued up to about 1760 ; the replanting of large areas of woodland was at that time only beginning—too late to save the Scottish capercaillie. On the history of the species prior to extinction much has already been written, but the following account, quoted by Angus (1886), seems to have escaped the notice of previous authors.

'From the back of a study of black-game in water colours painted at Balmoral in 1830 I copied the following in the handwriting of the artist, " Two coileach-coille, capercailzie, shot on the occasion of a marriage rejoicing in 1785, and which Sir Robert is confident are the last of the native birds heard of in Scotland. Pennant saw the bird at Inverness in 1772." This is from notes on the species on Deeside prepared by the late James Giles, R.S.A., based mainly on oral information supplied by Sir Robert Gordon of Old Balmoral ; the notes were made at the request of Dr. Macgillivray for publication in the " Natural History of Deeside," but they did not appear in that work, not having been incorporated in the manuscript before the death of the writer.'

Angus states that he found the memory of the ancient race of capercaillies lingering in Braemar in 1870. Ballochbuie forest still contains some trees which are probably a remnant of the Caledonian forest, and it is not impossible that one or two of the birds remained there as late as 1785.

## General Notes on the Capercaillie in Scotland

The first and largest introduction of capercaillies to Scotland took place at Taymouth in Perthshire in 1837 and 1838, and subsequent introductions of various size and success, which were made to many other parts of the country, greatly accelerated the attainment of the final distribution. Three methods of introducing the birds have been used : the importation of the adult birds, the placing of capercaillies' eggs in the nests of wild greyhens *Lyrurus tetrix* and the hatching

and rearing under domestic fowls. Of these the last appears to have been the least successful owing to the difficulty of feeding the caper chicks.

It is well known that in the course of colonisation of new areas the females precede the males by from one to two years, and in very few instances have the males been observed first. Before the caper cocks arrive the hens frequently mate with blackcocks *Lyrurus tetrix* and sometimes the first indication of the arrival of the capercaillie has been the shooting of a hybrid. These hybrids are much less common now than they were during the advance of the capercaillie but they are still turning up occasionally, and this year one was seen at a blackcock lek in south-west Inverness-shire (Usher 1949). It should however be emphasised that the occurrence of these hybrids is not a new event since the introductions and is not confined to Scotland, for in north Europe the caper-blackcock crosses go by the name of Rackel-fogel and were at one time thought to be a distinct species *Tetrao medius*. Lloyd (1867) devotes a chapter to the Rackel-fogel. Blackcock-capers have at various times been seen at blackcock leks in Scotland, but there is apparently no record of any having succeeded in breeding in this country. Bergman (1940) describes a cross between a male blackcock-caper and a capercaillie hen, but the present author has not had the opportunity of studying this paper.

Hybrids between the capercaillie and the pheasant *Phasianus colchicus* are of rare occurrence, but a few have been recorded in Scotland. The first was obtained in Dunbarton in 1890 and is described and figured by Lumsden and Brown (1895). Clarke (1898) discusses them, and there is a photograph of an Aberdeenshire specimen in Sim (1903).

The maximum spread of the capercaillie in Scotland was attained by about the time of the first World War, when it was a breeding species at Golspie in Sutherland, Cowal in Argyll, Buchan in Aberdeenshire and in the south-west corner of Stirling. Beyond these points there has been very little further advance into new territory, and indeed the nesting recorded in south-west Stirling in 1877 is the furthest limit of spread in this direction, as a breeding species, with the exception of possible sporadic breeding in Renfrew and the appearance

and introduction to Peebles which are described later. There is certainly no evidence to substantiate the common belief that the capercaillie is still advancing in the south of Scotland, or even attempting to colonise any county south of the Forth and Clyde.

Two major wars in the present century have been the primary cause of a serious setback which the capercaillie has sustained recently, for, besides a check imposed on any further advance, there has been, in many parts of the country in the last ten years, a substantial decrease in population and even complete extinction.

Undoubtedly the main cause of decrease has been the extensive felling of old coniferous woods during the two wars, but one can go a step further back and assign this to the decline and bankruptcy of the landed proprietor necessitating the selling of woods and whole estates to firms who thereafter transmute the wood into gold. Attendant on the felling is a general disturbance and quite often heavy shooting of anything the woods contain, with the result that there is a concentration of the evicted birds in any nearby woods which remain standing and thus at first an apparent increase in the population. In very few instances has a decrease of the capercaillie stock been recorded where the habitat remains unaltered or only slightly reduced.

There has been a definite tendency of recent years to colonise younger plantations in absence of the old woods, and it has been suggested that the undergrowth in these young plantations is too moist for the successful rearing of broods of caper, with the death of many of the chicks hatched therein. On the other hand, disappearance of the chicks has been noted in Culbin forest, which grows on sand, and the deaths were attributed to the lack of water. However, other observers have stated that breeding is less successful in wet seasons and furthermore the failure of the introductions to Denmark is attributed to the moist climate, so it is reasonable to conclude that if the undergrowth of the younger plantations is in fact more moist, this renders them more unsuitable as a breeding habitat.

The second greatest cause of decrease is undoubtedly the hostile activities of many employees of the Forestry Commission. The capercaillie is classed as vermin by most

foresters, and on many forests the adults are shot at all seasons and the nests destroyed when found. Opinion on the amount of damage done by the caper is very divided, and it is not the purpose of this paper to try to assess this ; but one point which may not be generally known is that the capercaillie in Scotland enjoys no protection whatever under the Game Laws and has no close season, presumably because there were no capercaillies in the country when the existing Game Laws were made. A further factor in the decrease, attributed to the Forestry Commission, is the increase of mechanical cultivation of moorlands, particularly those containing scattered natural pine trees.

" Vermin " have undoubtedly taken a toll of the capercaillie stock in some areas. Foxes *Vulpes vulpes* have increased during the war years and are said to be particularly fond of both the capercaillie and its eggs, and there has likewise been an increase in the notorious egg-stealers, hoodie crows *Corvus cornix* and jays *Garrulus glandarius*.

Other alleged causes of decrease reported are : " Disease," unspecified ; ticks ; disappearance of chicks due to unknown causes ; blasting operations and general disturbance by hydro-electric schemes and road reconstruction ; poaching, particularly during the war years ; overshooting of hens ; wanton destruction of eggs by hooligans.

The determination of whether there has been any recent alteration in habitat preference is not a simple matter as it has not been easy to find detailed accounts of the type and age of woods normally occupied. Lloyd (1867) gives the following : " The chosen haunts of the capercali are mountainous and hilly districts where pine woods abound, particularly such as are of mature growth and studded with lakes and morasses. Sometimes, however, it is met with in woods interspersed with deciduous trees, more especially the oak, as it feeds freely on acorns. Excepting in the autumn, and when the young are small and follow their mother, these birds are seldom seen in brushwood or even in woods of young growth, and then only when in the vicinity of great woods." Harvie-Brown (1879) states that " The beau-ideal . . . would appear to be a forest of spruce, Scots fir and larch, mixed, of say 700 to 1000 acres or more in extent . . . of which a fourth or fifth consists

of old timber and the remainder of a succession of growths in regular rotation," and "The birds often quit one part of a forest or extensive wood for another, and this migration usually takes place from an older to a younger growth—i.e. to a growth which is of that age which is suitable to their requirements of feeding and shelter combined;" but he does not give any indication at what age the younger woods become suitable to their requirements.

In the present investigation several recorders in different parts of the country stated that caper are now found in younger woods than formerly, but it was also pointed out that occupation of woods between 20 and 30 years of age is not a feature newly created by the 1939-45 war conditions, having been recorded in Inverness in 1910 among other places; but here it was noticed that there was a strong preference for those plantations containing even one or two old trees. Ritchie (1931) was of the opinion that when the stock became over numerous they began to live in the young plantings, but again gave no indication of actual ages.

There is very little to suggest that the species is now turning any more to deciduous woods than formerly. Harvie-Brown gives the favourite haunts as "spruce, Scotch fir or larch forests, and their occurrence in hardwood coverts is comparatively rare except in the breeding season;" and in a footnote, "in Norway, Sweden and Russia the capercaillie also occurs occasionally in hardwood coverts—oak, beech, birch, etc.—but is not usually stationary in such localities; but, as remarked by several Scandinavian naturalists, seems fond of patches of such growth in the midst of pine forests." Lloyd (1867) records two broods seen in autumn in small patches of willow bushes on the high fjalls at a considerable distance above the last birch tree.

Although several recorders noted breeding in birchwoods, only one specifically stated that this had occurred only since the felling of the coniferous woods. Twelve others, in various parts of the country, recorded breeding in birch or oak but in almost every instance these were either mixed with, or otherwise in close association with coniferous woods, only two listing birchwoods as distinct from conifers, and one noting a hen with chicks just able to fly in a mixed oak and birch wood.

From what information there is, it does not appear that there is any significant change towards deciduous woods as a breeding habitat.

The present writer's impression is that the preferred habitat of the capercaillie is the old open pinewoods on the hillsides with an undergrowth of heather and blaeberries, although this is not everywhere available, and it is in some areas, due to force of circumstance rather than by choice, inhabiting younger plantations.

In general, the diet, as shown by the returned cards, does not differ greatly from Lloyd's account of the food of the capercaillie in Scandinavia except for two items, grain and bracken. In the months of January, February and March the entire diet consists of Scots pine *Pinus sylvestris*, larch *Larix* spp. and, to a very much less extent, spruce *Picea* spp. Of the Scots pine, buds, shoots, needles, male flowers, seeds and cones are all eaten, and buds, shoots and needles of the larch, but of the spruce very little mention is made at all, and the capercaillie does not appear to make much use of it as food. From April onwards the diet gradually becomes more varied, at first by young shoots and leaves of the blaeberry *Vaccinium myrtillus* and young shoots of bracken *Pteridium aquilinum* of which large quantities are eaten from April to November, and crops examined have sometimes been found to be full of bracken only. Although listed in the *Handbook of British Birds* (Witherby *et al.* 1941) as normal diet, bracken is not mentioned by the older writers, but both Lloyd and Harvie-Brown mention ferns. It is quite possible that the extensive eating of bracken is of recent origin, and certainly the latter is a much more widely distributed plant in Scotland nowadays than it was seventy or eighty years ago.

During the rest of the year the diet becomes extremely varied and many different foods have been listed in reports :— birch buds *Betula alba ;* shoots of heather *Calluna vulgaris* and bell-heather *Erica cinerea ;* leaves and berries of blaeberry *Vaccinium myrtillus*, red whortleberry *Vaccinium vitis-idaea*, raspberry *Rubus idaeus*, crowberry *Empetrum nigrum ;* fruits of oak *Quercus* spp., beech *Fagus sylvatica*, rowan *Pyrus aucuparia*, bramble *Rubus fruticosus*, juniper *Juniperus communis ;* buds of cotton grass *Eriophorum* spp. ; leaves of willow *Salix* spp. ;

seed-pods of violet *Viola* spp. ; seeds and leaves of grasses and sedges, and various unidentified seeds ; club mosses *Lycopodium* spp. ; turnip tops, Brussels sprouts, poultry mash and scraps of bread. Also mentioned are insects (various unspecified), grubs, " bugs," and a black-and-red fly, half an inch long, of which several adult capers had their crops full. No further light has been thrown on the question of the length of time the young remain wholly insectivorous.

As to the visiting of cornfields, this is not mentioned by Lloyd, and Harvie-Brown ascertained that damage to crops had never been known in Norway, Sweden or Russia, but records that damage had been done to standing corn in the Crieff and Comrie district of Perthshire, and that caper were in 1877 for the first time beginning to feed on the stooks in Glen Almond. Morris (1868) lists grain, but gives no locality.

In the present investigation, visits to standing corn were mentioned by three observers only, one in Perthshire and two in Inverness-shire ; in one case a brood of caper fed daily for about ten days on some oats adjacent to a very old plantation. These oats had been heavily lodged and were lying quite flat, and had previously been severely damaged by pigeons.

The visiting of stubble fields, of oats and barley, is now a widespread and regular habit. The writer has repeatedly seen parties of caper in the stubble in Aberdeenshire and Kincardineshire, but always in fields adjacent to pine-woods. This has also been reported from Perthshire where it is said to be becoming more frequent ; from Angus and from Aberdeenshire, particularly on Deeside where caper are said to be visiting stacks much more since the woods were cut ; from Morayshire—much more this year ; from Inverness-shire, and from Ross and Cromarty.*

## The Introduction, Spread and Present Distribution in Scotland.—

### Perth and Clackmannan

The account of the introduction and spread of the capercaillie in Perth and Angus is taken from Harvie-Brown (1879)

* Millais (1909) mentions bracken, and also (1894) states that both stooks and standing corn are frequently visited.

where every step of the advance of the species throughout the two counties is recorded in great detail, and to which work reference should be made for particulars of dates and places.

Capercaillies were introduced to Lord Breadalbane's property at Taymouth Castle in 1837 and 1838 through the instrumentality of Sir Thomas Fowell Buxton and Mr. Llewellyn Lloyd, the Swedish sportsman and naturalist. The birds were turned out in the estate woods and, in addition, eggs laid in captivity were placed in the nests of greyhens, with such success that in 1839 it was estimated that there were between sixty and seventy young birds, and, in 1862, two thousand capercaillies on the estate. The whole of the Tay valley as far as Dunkeld was at this time thickly wooded, and the birds rapidly spread beyond the bounds of Lord Breadalbane's estate, following the plantations along the valley, for, as pointed out by Ritchie (1920) " the valley system ranked second only to the presence of fir woods in determining the course of the migrating capercaillies." By 1879 almost every suitable area of woodland in the county had been colonised, and considerable advance made into the adjacent counties, though mostly to the north-east through Angus into Kincardine.

### *Present Distribution*

The capercaillie is found throughout the wooded areas of the county in roughly the same distribution as in 1879, although individual localities and habitats have changed markedly in recent years. In many places there has been a considerable decrease or even complete extinction, but apparently nowhere has the capercaillie disappeared where the habitat remains unaltered, and some of the old woods are consistently producing good annual bags, as good as in former years. There are very few big old woods left now and, consequent on felling in surrounding areas, caper are concentrated in what old wood remains and are also colonising younger woods than formerly, so that there is probably little difference in the total number of birds in the whole area of Perthshire.

Atholl, Tummel and Tay Valleys to the Junction of Tay and Tummel.—Blair Atholl district : numerous, breeding regularly. The optimum period for caper in this

area is believed to have been from about 1904 to 1923 ; since then numbers have dropped, with a further considerable decrease during the recent war when mature woods were felled, and vermin, particularly foxes, were not controlled. Numbers, however, are again increasing and will probably be maintained as there is still a very large area of suitable woodland. On the adjoining property of Fincastle, on the lower Tummel valley, the position is similar, with a recent considerable drop, but now stationary with possibly a tendency to recover. Felling is the main cause of decrease, but hoodie crows, jays and foxes are all believed to have contributed.

From Tummel Bridge to Rannoch Station reports state that caper are breeding regularly but are not numerous—although no decrease is noted—except in the Black Wood of Rannoch where they are numerous and increasing, and more broods were seen in 1948 than in any previous year. The Black Wood consists of almost 700 acres of Scots pine from 80 to 200 years.

Pitlochry : generally much scarcer, but with a slight increase in places during the last two years. Engineering operations are tending to produce a local decrease owing to interference by blasting and proximity of large numbers of workmen.

Upper Tay Valley : between Ballinluig and Strathtay village there are probably about a hundred birds in the remnant of old pine wood, but between Strathtay village and Cluny Rock the wood was felled a good many years ago and only one capercaillie remains, a cock which lives on Derculich estate, while west of this again between Cluny Rock and Drummond Hill they become more plentiful. On Drummond Hill and the north side of Loch Tay there are several thousand acres of pines of varying ages in which birds were plentiful up to 1940, with a decrease since then, but are now recovering slightly. There were many troops in this area during the war, with consequent disturbance and probably poaching. On the south side of Loch Tay, from Ardtalnaig to Kenmore, felling has reduced the woods to less than 50 acres. Caper were formerly plentiful here, but were heavily shot during the felling and only a few breeding birds remain. From Kenmore to Moness there has been extensive felling and only three

cocks and five hens remain (1949). This stretch includes Taymouth Castle, site of the original re-introduction. From here, east to Ballinluig, a few only are left on Grandtully estate.

Glen Lyon still carries a very large area of woodland and a moderate stock of caper. There are no suitable woods in Glen Lochay, and no return has been received covering the stretch between Killin and Tyndrum.

Tay Valley from Ballinluig to Perth, and East Perthshire.—In the Dunkeld area there are over 2000 acres of wood on Craigvinean on the west bank of the river, where caper are breeding regularly and are very numerous in suitable parts of the forest. They are less plentiful in the woods on the opposite bank, but these are mainly 20 to 25 year larch plantations with pine and spruce clumps, and the caper are increasing as the woods grow older, though mainly seen at present among the pines.

South of Dunkeld : very numerous in Birnam Wood in places where the trees have not been felled, but probably decreasing as there are not sufficient woods of suitable age nearby into which to move as their habitat is reduced, apart from Craigvinean to the north ; about 1200 acres of 50 year conifers remain standing. In this area there are also caper on Murthly estate, but in smaller numbers. No records have been received from the corresponding area on the opposite side of the river. In Strathord and Stanley areas large scale felling has left only a few small woods, and caper are reduced to very small numbers. Between this and Perth there are 500 acres of 25 to 30 year conifers at Pitlandie and 300 acres of Scots pine, oak and birch scrub at Dry Arch and Cosnachie, in which caper are breeding regularly—a few at Pitlandie, but a moderate number in the latter woods and increasing as the woods mature. On the east side of the river, numerous and increasing at Scone, and on Deuchnie a moderate number, also increasing as habitat grows older. There are here about 1000 acres of 25 year pine and larch.

Remainder of east Perthshire : no information received from Strathardle or Glenshee, but a few breeding at Blackcraig where woods are reduced to about 100 acres, and three to four nests a year in two small pine woods at Pitcarmick.

No information from Bamff, but a few, increasing slightly, at Meigle. At Hallyburton, probably decreasing as woods are cut, but 2000 acres remain and caper are still numerous. At Tullach Ard, Balbeggie, birds were numerous up to 1920 when woods were felled, and are now returning to young plantations. These plantations are all under 15 years old, but several caper have already appeared in them and have bred on at least one occasion.

Carse of Gowrie : occasional pairs and broods in small woods on the braes between Kinnoul Hill and Rossie Priory.

Strath Earn and Glen Almond.—West from Perth there are 1500 acres of 25 year Scots pine at Lamberkins which have held caper for several years ; there is a moderate stock, increasing as the trees get older. About a mile further west they become more numerous at Dupplin where there is about two square miles of forest in which some old trees remain. They are also still breeding on the neighbouring properties of Gask and Strathallan where numbers are now stationary after a decrease following felling, and are only shot very sparingly. Similarly at Abercairney there was a decrease during the war years due to felling and attendant disturbance, but about a square mile of mixed woodland remains and the stock has now increased. Numbers are also reported to be fairly good and increasing at Drummond Castle, but scarce and decreasing at Ochtertyre and in Balloch woods, Crieff. Caper are also breeding west to St. Fillans and in Glen Artney, but precise details are not available. In the Keillour district caper are breeding regularly in mixed woods and numbers are stationary.

In Glen Almond many woods have been felled, but caper are breeding west to Logie House and to the limit of trees in Little Glenshee, also west to Trinity College, and there are one or two nests in what remains of the wood at Logiealmond Lodge. Between Trinity College and Buchanty all woods have been felled, and the same applies to the area immediately south of the College, but there are many plantations in this area which are approaching the age at which they become attractive to caper, which are being encouraged.

South-east Perthshire.—A few bred on Moncrieff Hill until 1927 when many of the trees were blown down. This

and subsequent felling have driven out the capercaillie, but there is still an occasional brood reared in Glenfarg and Abernethy. Foxes are believed to contribute largely towards the failure to increase. There are also a few caper in Turflundie wood, but this is at present being clear felled, and there are reported to be none in Glen Devon or Muckart.

South-west Perth and Clackmannan.—Round Doune, caper have never been plentiful, and in recent years have become decidedly scarce as many woods have been felled. A few remain breeding on Argaty and Kings' Lundies, but none since 1940 on Blair Drummond, and none on the Moray estate. They are also scarce and decreasing in Callander district for the same reason, but still breeding regularly. A correspondent from Cardross estate summarises the answers to the questions on his card in one word—"Plenty." Loch Ard forest, Aberfoyle, consists of 300 acres of Japanese larch and Scots pine, 20 years old, and the first capercaillie was recorded here in April 1946; they have bred annually since then. On the Braes of Balquhidder there were fair numbers up to 1939, but they have disappeared since the woods were felled.

In Clackmannan capercaillies have been of sporadic occurrence only. Harvie-Brown (1879) records two females shot in 1875, but a recent report states that several were seen near Alloa up to 1941, but only very occasionally since then as the woods have been felled. There are probably none now breeding in the county.

## Angus

In Angus the first capercaillie was recorded at Lindertis, near Kirriemuir, in 1856 when it appears there was a sudden influx of a large number of birds from Perthshire. Added impulse to the spread was given by an introduction of birds to Cortachy in 1862; in 1865 they arrived at Fearn, midway between Kirriemuir and Brechin, becoming established in 1868, and also in 1865 at Stracathro, which for long remained the limit of spread in this direction as not until 1878 was there a record from the adjacent part of Kincardine. In the southern half of the county establishment was rather more slow, but as

an indication of the numbers attained there is a record of 107 caper being shot in a single day at Fothringham,* and even in the last few years a day's bag of 52 has been obtained at Kinnaird Castle.

*Present Distribution*

The capercaillie is generally well distributed in suitable localities throughout the county ; stocks are stationary in number in most places and from very few is a decrease noted, although returns state that there has been a concentration in some areas due to timber felling.

In the Forestry Commission ground at Kirriemuir and Lintrathen there are extensive plantations of spruce, larch and pine, of varying ages, where caper have increased recently following felling in surrounding districts. On Glamis estate they are numerous, breeding regularly and not decreasing. There is altogether about 10,000 acres of woodland, and most of the birds are on the higher parts of the estate, although quite a few nest in the castle policies. In the districts of Brechin, Edzell and Stracathro they are fairly numerous and no decrease is noted. At Kinnaird Castle they were thought to be decreasing until recently when a young wood was beaten and shot, and the record bag of 52 birds was obtained. From the glens in north Angus no particulars have been received, except from Glen Ogil where numbers are stationary at about three or four pairs.

In the southern half of the county felling, particularly in the eastern Sidlaws, has reduced the old woods to a few scattered clumps from which the caper have not entirely disappeared and are still breeding in small numbers. On Fothringham estate the decrease is very marked as this area formerly produced very large bags of caper ; in those days there were about 2000 acres of mature woods, but now only a few clumps and a small area of 10 year pine remain, which hold altogether about a dozen birds. Burnside, on the north-east of Fothringham, also holds a few pairs. Returns have also been received from Montreathmont forest and Guthrie district

Gladstone (1922) states that this figure was the result of three consecutive days' shooting, and also that the figures quoted in this paper for Blackhall (Kincardine) and Monymusk (Aberdeen) are erroneous. The record is said to be a bag of 69 obtained at Dunkeld in 1910.

in the east of the county. There are practically no caper at Guthrie, but at Montreathmont, where there are 2000 acres of young Scots pine, they are numerous and breeding, with a recent influx from felled woods in surrounding districts.

## Kincardine

The first recorded evidence of the spread of the capercaillie into Kincardineshire was a cross blackcock-caper which was shot on Cheyne Hill, Fetteresso on 28th October 1872. This specimen is in the Natural History Museum, Marischal College, Aberdeen. As yet none had been recorded from the parts of the county adjacent to Angus, and of this occurrence Harvie-Brown (1879) says " It is not easy to decide the source of this hybrid, or whence came the capercaillie which produced it ; " but later (1906) he was informed that there had been an introduction at Drumtochty in 1870 by eggs from Crieff, since which time there had been a rapid increase, so it seems reasonable to suppose that the Fetteresso cross came from the Drumtochty birds, particularly as only as late as 1878 did they appear at Inglismaldie, a short distance from Stracathro. In that year a pure bred capercaillie was shot at Fetteresso and one at Fasque, but more extraordinary is the record of three birds, one old hen and two young, male and female, which were shot on Scolty Hill, Banchory, in August 1878, having evidently crossed the Cairn O'Mount and entered Deeside by way of Glendye. About the same time another was shot at Inchmarlo, three miles away on the other side of the Dee (Harvie-Brown 1879).

The next record is of one shot " within three miles of Aberdeen, on the south side of the Dee " in 1879 (Harvie-Brown 1880)—presumably this is the bird referred to by Sim (1903), shot at Kincorth, which is now part of the city of Aberdeen.

The increase throughout the county was now extremely rapid. In 1896 twenty were shot in one day at Drumtochty (Harvie-Brown 1906). The first game-book entry at Crathes Castle is 1899 but they had been present on the estate prior, to that date. A clutch of eggs in the Fenton collection Marischal College, was taken in Durris in 1900 and Simpson

(1900) records that "The capercaillie now nests in most of the higher woods." Harvie-Brown (1906) further records that in 1905 they had greatly increased at Drumtochty, and were present but not numerous at Glensaugh, Fordoun and Fettercairn, and more numerous at Dalavaird and Glenbervie; and in 1908, 150 were shot in a single day at Blackhall, the record for Scotland (Ritchie 1920).*

*Present Distribution*

The capercaillie is still generally but thinly distributed throughout the county, but there has been widespread felling during the war years and the tendency has been, as in other areas, for the birds to concentrate in the remaining woods, so that the increase which has been recorded in some localities may be apparent more than actual. Returns received are not sufficient to cover the whole county in detail, but it is possible to build up a fairly good picture of the present status and distribution.

At Inglismaldie, on the borders of Kincardine and Angus, they are stated to be numerous, breeding and increasing, but kept down by shooting. Whether they actually breed on the Forestry Commission ground there seems doubtful as the return gives breeding habitat as "Scots pine and Sitka spruce, 2 to 5 years." Wood cutting at Fasque has restricted the habitat to about 50 acres and the total stock of birds is now between forty and fifty.

Drumtochty area: breeding and tending to increase. There is here an admirable habitat for an immediate increase, 2000 acres of Scots pine and *Pinus montana* from 16 to 45 years, but numbers are being kept down in these plantations. In the area around Stonehaven caper are still present, but have decreased and distribution is now sporadic; and similarly in Durris, still breeding regularly in the remaining woods, but thinly distributed and numbers stationary.

The Deeside portion of Kincardineshire was formerly the most thickly wooded part of the county, but several thousand acres of conifers have been felled in that portion alone during the past ten years. Despite this, caper have managed to hold on in several of the remaining woods around

* See, however, footnote on p. 79.

Banchory, on both sides of the Dee. A thousand acres were felled on Blackhall, but a large amount of birch scrub and scattered Scots pine remains, in which the caper are holding their own and are stated to have increased. This apparent increase is probably due to concentration in the remaining parts of the wood. The birds are also present at Tilquhillie, Crathes Castle, and in such as remain of the woods between Banchory and the Hill of Fare.

### Aberdeen

A very full account is given by Harvie-Brown (1879) of the attempted re-introduction of the capercaillie to Braemar between 1827 and 1831. Eggs were laid by an imported hen, but all efforts to rear the young birds ended in failure. He also refers to an attempt, equally unsuccessful, at Inverernan, Strathdon in 1873. Sim (1903) gives the date of the latter as 1870. The capercaillie is not listed by Macgillivray (1855).

The Aberdeenshire capercaillies spread not only east and west along the valley of the Dee from the spearhead established in the Deeside portion of Kincardineshire in 1878, but also north across the Hill of Fare into Donside. On the lower Dee valley a hen was shot at Kincorth in 1879, a straggler possibly not from Banchory. Nests were found at Hazlehead in 1896 and 1897 (Sim 1903), and a clutch in the Fenton collection was taken in Kingshill wood, Aberdeen in 1903. The spread westwards up the Dee was reinforced by a small-scale introduction by hatching eggs at Balmoral in 1885, and fulfilled Harvie-Brown's prophecy of "rushing up the great wooded valley of the Dee as far as the pine woods reach—i.e. almost to the base of Ben Muich Dhu." Exact dates of appearance and establishment are uncertain ; the first game-book entry at Ballogie is of five shot in 1895 and they were certainly present in the Mar woods before 1900.

As regards the colonisation of Donside, Harvie-Brown was of the opinion that the spread would be "surmounting the confines of the valley, northwards into Strathdon" which is in fact what happened, but apparently there was an almost simultaneous entry lower down the Don valley where an exhausted female was found in 1889 at Monymusk, and two

years later six were shot there (Ritchie 1920). The first record of capercaillies in the game-book at Candacraig, Strathdon, is 1890, when there is the entry "Not so many capercailzie this year," apparently implying that they had been shot earlier. The early colonisation of Strathdon is further suggested by Sim (1896): "Since the arrival and settlement of the capercaillie in Strathdon, many crosses between it and the black-game have occurred." Between Monymusk and Strathdon they appeared later; a cross blackcock-caper was shot near Alford in 1895 and two hens seen the same year, and from 1897 onwards capercaillies have figured in the game-book here.

The main stock of capercaillies in Aberdeenshire has been in the two great river valleys, much of the remainder of the county being agricultural and unsuited to the requirements of the species, but they became established in several areas in the northern half of the county. In Strathbogie a young cock was shot in the Bin Wood, Huntly, on 29th September 1896 (Ross 1897), the first in the district. Later they spread north-east to Fyvie and Turriff districts and even into the flats of Buchan, far isolated from all the great pine forests. A pair nested in the Haddo House woods, near Methlick in 1911 (Ritchie 1920). A few remained until 1920 when some of the woods were felled, but there are certainly none there now. A few also lived in the woods at Pitfour House until they were felled in 1926, and the last one was seen in 1933, rather an unexpected place to find the capercaillie.

### *Present Distribution*

For the purpose of this paper, Aberdeenshire can be conveniently divided into four sections, Deeside, Donside, Strathbogie and Buchan. Deeside formerly provided a vast area of coniferous forest admirably suitable for the capercaillie, but thousands of acres have been felled during the war years, considerably restricting the available habitat. In spite of this, however, the caper is still breeding regularly throughout the greater part of the valley west of the Kincardine boundary wherever the woods remain.

From Banchory to Aboyne: numerous and breeding regularly, but decreasing, except on Ballogie where numbers

are stationary but concentrated due to felling, and on Finzean where very little wood remains and caper are now scarce but still breeding ; they are also stationary in the woods on the north slope of the Hill of Fare, where, rather surprisingly, the return states that they are protected by the Forestry Commission. In Glen Tanar forest they are breeding regularly, no decrease has been noted, but numbers are systematically kept down.

On Glenmuick and Birkhall there is still a very large area of standing timber holding an increasing stock of birds, many of which have taken refuge there from the felled areas around Ballater. This area should continue to hold a good stock as there is an increasing area of young pine woods and few caper are shot. On Balmoral a decrease is noted due to felling, and again a concentration in the remaining woods. Around Braemar there is still a fair number in the remaining woods on the Invercauld estate, but a marked decrease on the Mar estate where a small number remains, well distributed, even as far as Luibeg and Glen Derry.

On lower Deeside caper formerly nested as far east as Hazlehead, and there are still a few at Countesswells and possibly Drum.

On upper Donside the capercaillie has suffered less than on the corresponding part of Deeside, particularly between Alford and Strathdon. A smaller proportion of woodland has been felled and many plantations are now approaching the age when they become an attractive breeding habitat, resulting in a gradual increase although the birds are regularly shot. In Strathdon alone it is estimated that in twenty years there will be up to 10,000 acres of suitable woods in which the birds would soon be very numerous if not kept within reasonable bounds. They are at present breeding as far west as Tornahaish and there are also a few at Auchernach. In Glenkindie, too, they are still numerous and one correspondent states that as recently as 1940 he has seen between 30 and 40 on the wing at once. On Littlewood Park estate, near Alford, this gradual increase is also noted. A large area of timber was felled after the 1914-18 war, but comparatively little since then, and between 300 and 400 acres remain, which will be increased later with the growth of young plantations.

Monymusk district formerly held immense numbers of capercaillies ; Ritchie (1920) records bags of 84 and 73 in one day's shooting in 1910 and 1911.* Nothing approaching these numbers could be obtained now. On Tillyfoure estate they are now scarce following extensive felling, but many of these birds appear to have been driven into the Forestry Commission ground at Pitfichie where they have increased recently. Lower down the Don valley caper are scarcer. Only one has been shot on the Forestry Commission ground at Kemnay in the past 23 years, but nearer Aberdeen they are present and breeding in the woods between Tyrebagger and Elrick Hill, although scarce and decreasing in recent years.

In Strathbogie returns indicate the presence of caper in two areas only, the Bin forest, north of Huntly, and Clashindarroch on the south. There are about 1000 acres of conifers on the Bin forest where they have been present for many years, but not in great numbers. They were kept down by shooting until 1947. Clashindarroch forest consists of young fir, spruce and larch from 2 to 18 years, being rather young and with too thick undergrowth for nesting, but a few non-breeding birds have been present since 1936.

In the remainder of the county, a small number of caper have been present around Fyvie for at least thirty years, but much of the wood has been felled. Prior to 1939 there were about a dozen pairs in the Den Wood. In 1948 there were nine pairs and they also appeared for the first time in Brownhill Wood. There is in all about 500 acres of suitable habitat. Near Turriff there are capercaillies in Delgaty Castle woods where they are fairly numerous and tending to increase. There is here about a square mile of woodland, scrub and natural pine forest with clumps of birch, which forms a suitable habitat. At Balquhollie and Hatton Castle they used to be found, but have now disappeared since woods were cut.

## Banff

Less information has been forthcoming from Banffshire than any other county in the north, so the following accounts

* See, however, footnote on p. 79.

of both history and distribution are somewhat scrappy and incomplete.

In 1851 capercaillies were kept in the aviary at Duff House but the young birds all died (Harvie-Brown 1895). Nothing more is heard of the caper in Banffshire until 1886 when eggs were placed in a greyhen's nest at Altmore near Keith. The following year some boys destroyed a capercaillie's nest, but there were no further records, unless the female shot at Glenbarry on 13th October 1886 (Harvie-Brown 1896) was one of the Altmore brood.

Probably the first of the present stock entered not by way of Aberdeenshire from the south-east but from Morayshire, where a previous introduction had been successful. Steuart Menzies (1907) records that at least two cocks and three hens arrived at Arndilly, Craigellachie in 1898-99, and that in 1907 there were at least a dozen nests in the district. In 1916 capercaillies were on the increase at Cullen, and keepers were trying to shoot them down (Rintoul and Baxter 1917). Mahood (1919) states that " Several correspondents report presence or increase from about 1904—but they are nowhere common," but does not give localities, and also " Of recent years the capercaillie has found its way to the woods at Mountblairy and Forglen, where they are being spared," while another report states that the capercaillie appeared at Forglen during the 1914-18 war. This suggests a much later entry on the east of the county, although the appearance of a cock in the Bin Wood, Huntly in 1896 should be borne in mind as this is no great distance out of Banffshire.

### *Present Distribution*

Coastal area : Mountpleasant and Ardoch, south of Cullen : reported to be fairly numerous, breeding regularly and increasing due to felling in surrounding woods. Near Banff, one or two have been seen in Duff House woods in the past few years, but these woods are mainly deciduous and not a very suitable breeding habitat. Two pairs only remain in Montcoffer Wood following tree-felling. Forglen woods probably hold more caper than any other area in lower Banffshire, and there they are still increasing though controlled to a certain

extent. The habitat is very suitable—mixed conifers and scrub birch intermingled with heather, and plantations of fir, spruce and larch where they nest regularly—and packs of twenty or more can be seen in winter. At Rothiemay, breeding regularly and increasing in 600 acres of old conifers, but here the increase has been a sudden one in the past two years (as shown by game-records) and is probably due to an influx from felled woods elsewhere.

In upper Banffshire caper are present in the woods in the parish of Mortlach, but are not numerous. A few have been seen from time to time in Glenfiddich, but felling has caused a decrease. There are also some in the Buchromb area and at Loch Park in the north-east corner of the parish. In Glenlivet they are said to be increasing. In Tomintoul the woods were all cleared between 1939 and 1945, but caper were seen there until two years ago. This record of caper in Tomintoul is interesting, but subsequent enquiry failed to reveal how long they had been there. On Arndilly estate, Craigellachie, most of the woods have also been felled and the caper is fast disappearing ; about six pairs remain. The only other return from this area records a cock bird seen on the lower Cabrach, on the east of the county, early in 1949, near a small plantation of fir and larch which had survived both wars.

*To be continued.*

# BIRD PREDATION OF DEFOLIATING CATERPILLARS

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CONSIDERABLE interest has recently arisen about the extent to which birds affect the numbers of defoliating caterpillars in spring. The subject has received attention in a review by Hartley (1948). Casual observation of birds during the breeding season suggested that in our locality at any rate their effect must be appreciable. To test this and measure it, wire-netting bird-proof cages were used to exclude birds from regions of foliage—a method which does not seem to have been used previously. The results, although only trivial when the whole problem is considered, are sufficiently interesting for record, especially as the local bird population was well-known.

## LOCALITY

The work was done on the coastal plane north of the Firth of Clyde (National Grid reference : 26/323808)—a prosperous agricultural region (dairying, potatoes, oats). The tree chosen was an oak *Quercus robur*, as this species is very susceptible to defoliators : a mature specimen standing at the edge of a group of trees (3 other oaks, 1 beech, 2 rowans and a silver birch) in shallow soil near a sandstone outcrop. Other groups of trees of this character were within 200 yards, and between the coast and the chosen tree a strip, about 50 yards wide, of tall fully-grown deciduous trees (sycamore, elm, oak, ash, lime, beech) formed a very effective shelter against south and west winds. Hawthorn hedges were numerous and were not excessively trimmed. An outcrop of sandstone carried in the shallow soil around it about 400 square yards of fully-grown dense gorse *Ulex europaeus*, in which many small birds nested. The area was genuinely

rural, the only modifying factor being the presence of the authors in a caravan for two years prior to the experiment, with, no doubt, some effect on the resident fauna caused by deliberate bird feeding in winter.

## Birds

To give an idea of the character of the bird fauna, a census of pairs within 200 yards was made in the breeding season. There were :—

12 chaffinches *Fringilla coelebs*
7 song thrushes *Turdus ericetorum*
6 robins *Erithacus rubecula*
5 hedge-sparrows *Prunella modularis*
4 blue tits *Parus caeruleus*
3 great tits *Parus major*
3 willow warblers *Phylloscopus trochilus*
2 greenfinches *Chloris chloris*
2 yellowhammers *Emberiza citrinella*
2 mistle thrushes *Turdus viscivorus*
2 blackbirds *Turdus merula*
2 wrens *Troglodytes troglodytes*
1 starling *Sturnus vulgaris*
1 tree pipit *Anthus trivialis*
1 tree creeper *Certhia familiaris*
1 coal tit *Parus ater*
1 spotted flycatcher *Muscicapa striata*
1 whitethroat *Sylvia communis*

56 pairs of 18 species, and incidentally giving a good fit to the logarithmic series of Fisher, Corbet, and Williams (1943).

In the year of the experiment, 1949, chaffinches seemed to be the principal caterpillar eaters, picking from under leaves by standing on twigs below. But willow warblers, blue tits, and great tits were also seen behaving as though they might have been eating caterpillars. The previous year, when defoliators were much more numerous, a number of other species were actually seen feeding on them : rooks *Corvus frugilegus*, with young just flown, from a rookery over a mile away, robins, starlings and hedge-sparrows.

## Method

Cages were made of ½-inch mesh wire-netting rolled into cylinders 2 feet long and about 18 inches diameter. Each enclosed about 400 leaves, although this was not known when they were put on in early April well before the buds began to swell. Ten cages were used, arranged round the periphery of the tree, and accessible by step-ladder from the ground. On 21st April the oak buds began to expand, and larvæ of the oak roller moth *Tortrix viridana*, about 3 mm. long, were seen feeding on them.

Table 1.—Number of caterpillars and leaves on caged and control branches

| Cages | | Controls | |
|---|---|---|---|
| Leaves | Caterpillars | Caterpillars | Leaves |
| 262 | 5 | 1 | 261 |
| 404 | 3 | 2 | 403 |
| 398 | 3 | 2 | 394 |
| 401 | 10 | 1 | 403 |
| 230 | 3 | 0 | 229 |
| 429 | 9 | 2 | 434 |
| 331 | 8 | 4 | 332 |
| 328 | 6 | 1 | 338 |
| 530 | 11 | 3 | 525 |
| 524 | 5 | 1 | 683 |
| 3837 | 63 | 17 | 4002 |

Some difficulty arose in deciding when to examine the cages. Certain of the defoliating larvæ leave the tree to pupate, and it was therefore desirable that the experiment should be concluded before that, and yet time had to be allowed for the bird population to operate at its maximum —that is, when families are well developed. The time finally chosen was 4th June (two months after setting up). If any caterpillars had left before then, it is reasonable to suppose they had gone equally from caged and uncaged leaves.

The bird condition was then as follows :—

chaffinches with second brood,
great tits with young just leaving the nests,

blue tits with young nearly ready to leave the nests,
robins (some) still had young of late broods in the nest,
willow warblers with young in the nest.

The caged branches were cut down and carefully stripped : control branches were cut from near each cage and made up to about the same leaf number.

TABLE 2.—The kinds of caterpillars involved

| Caterpillars | No. in Cages | No. in Controls |
|---|---|---|
| *Operophtera brumata* larvae (Winter moth) | 18 | 6 |
| *Tortrix viridana* (Oak roller moth) larvae | 14 | 1 |
| *Tortrix viridana* (Oak roller moth) pupae | 9 | 2 |
| Other Lepidoptera : (1) Geometridæ, larvae | 6 | 0 |
| Other Lepidoptera : (2) Other families, larvae | 12 | 7 |
| Hymenoptera Symphyta, larvae (Sawflies) | 4 | 1 |
| | 63 | 17 |

## RESULTS

These are set out in Table 1. In Table 2 the kinds of caterpillars are analysed and enumerated ; the first two species accounted for about two-thirds of the defoliators.

## CONCLUSIONS

Analysis of variance, after appropriate transformation, reveals that such differences in numbers of caterpillars could only be expected to occur by chance less than once in a thousand times. It is quite reasonable to suppose, therefore, that the figures indicate an appreciable bird predation. They reduced the caterpillar density, if the assumption that the cages gave an estimate of the defoliator population in the absence of predation is allowed, from 16·4 per 1000 leaves to 4·2 per 1000—roughly a 75 per cent. reduction. If few

or no larvae had left the tree to pupate, this effective reduction in population has been accomplished at low densities. One further point can be noticed : a heavy bird predation pressure would be expected to bring the caterpillar population to a fairly uniform level ; the data so far as they go do not make this improbable, for it will be noticed that a reduction in variance has accompanied the reduction in mean density.

Finally, it is hardly necessary to say that different results may be expected in different bird populations and at different caterpillar densities. In the locality of the experiment it is quite likely that the abundant cover and nesting sites provided by hedges, gorse banks, undergrowth, and holes in old trees (in ash and oak especially, less so in lime and elm, and rarely in sycamore and beech) enabled a locally high bird population to exist. It is difficult to resist the conclusion that under these circumstances the " scouring " action of the bird predators had a dominating effect on the caterpillars, irrespective of whether they were parasitised or not.

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# NATURAL HISTORY NOTES FROM THE ISLE OF GIGHA

Leonora J. Rintoul and Evelyn V. Baxter
Upper Largo, Fife

Little has been written about the natural history of the Isle of Gigha and an account of what we found there between 11th and 23rd June 1949 may be of interest. It is a beautiful island, 6 miles long by 2 wide ; across the sound to the south lies the small island of Cara, to which we paid one visit. There is a considerable area of woodland on Gigha, about sixty years old, mostly deciduous but with some conifers ; there is little new planting. Round the shores and in the centre of the island there are large areas covered with scrub-sallows, whin, brambles, etc., and a good deal of bracken, but only a little heather. There is a large extent of good pasture, some hay and arable, and there are three lochs and three hills over 200 feet high. The shores are rocky, broken and mostly not precipitous ; here and there in the bays there are cockle strands with lovely white sand. On the west side there are caves and geos where rock doves have long been known to breed. The 30-foot beach is well defined in some parts of the island ; the level stretch between it and the sea is studded with hummocky rocks, rising from sward studded with daisies, buttercups, orchids, etc. The wild flowers are lovely—honeysuckle, burnet roses, great beds of yellow flag iris, campions and many more. Cara is covered with rough grass and much bracken, its rocky shores rising at the south end to precipices where many shags breed. We are much indebted to Colonel Horlick, the owner of Gigha, for permission to go anywhere on the island, for information as to its birds, and for many kindnesses.

We shall give a list of the birds and then notes on other aspects of its natural history.

Raven. Breeds on the north-west side of Gigha and one pair on Cara.

Hooded Crow. Very common on both islands.

Carrion Crow. One paired with a hooded crow and three young ; one of these looked almost pure hoodie, the other two approximated more closely to the carrion.

Rook. There used to be a rookery on Gigha but it has ceased to exist. We only saw three rooks during our visit.

Jackdaw. Very common on both islands.

Chough. Used to breed on Gigha but we saw none nor could we hear of any recent occurrence.

Starling. Local and not numerous.

Greenfinch. Pretty common, nesting even in the scrub.

Linnet. Well distributed.

Bullfinch. One pair in the woods.

Chaffinch. Very common.

Yellowhammer. One pair on Gigha.

Reed Bunting. Four pairs on Gigha.

House Sparrow. Not common.

Skylark. Common on both islands.

Meadow Pipit. Thinly distributed on both islands.

Rock Pipit. Very common round the shores on both islands.

Pied Wagtail. Three or four pairs on Gigha.

Blue Tit. A fair population in the woods on Gigha.

Coal Tit. Fairly common in the woods on Gigha.

Goldcrest. Fairly common in the woods.

Willow Warbler. Common.

Sedge Warbler. Two singing males on Gigha.

Whitethroat. Common.

Song Thrush. Fairly common.

Blackbird. Common.

Wheatear. Sparsely distributed.

Stonechat. A female for one day on Gigha.

Redbreast. Common.

Hedge-sparrow. Thinly distributed, but nesting in the scrub right out to the edge of the sea.

Wren. Very common everywhere.

Swallow. Three or four pairs on Gigha.

Cuckoo. Thinly distributed.

Peregrine. A pair breed on Cara.

Kestrel. Two in different places.

Buzzard. Colonel Horlick told us that buzzards often come over from the mainland, especially in autumn.

Heron. We saw one or two occasionally and were told that a pair bred on the island.

Mute Swan. Three nesting pairs. One pair had their nest on a small rocky island in the sound between Gigha and Gigulum and we were told that they bred there regularly. We often saw the male on the sea, sometimes swimming far out towards the mainland. The other two pairs bred on the inland lochs.

Sheld-duck. Many pairs, both islands.

Mallard. Not uncommon, breeding both islands.

Teal. We saw four.

Wigeon. One in the sound.

Eider. Common, with ducklings, both islands.

Common Scoter. One flew past, far out.

Red-breasted Merganser. Very common, both islands.

Cormorant. A few about but we could not establish breeding.

Shag. A large breeding colony on the south end of Cara.

Gannet. One or two passing.

Little Grebe. Two pairs on the Mill Loch.

Wood Pigeon. Not uncommon in the woods and in the scrub, right out to the extreme north end.

Rock Dove. Nesting in the caves.

Curlew. A few ; breeding not proved.

Whimbrel. One.

Woodcock. Breeding not uncommonly.

Snipe. Some in the bogs.

Common Sandpiper. Common, breeding along the shore.

Redshank. Two pairs.

Ringed Plover. Two pairs breeding on Gigha.

Lapwing. Two pairs on Gigha and one on Cara.

Oyster-catcher. Very common everywhere, both islands.

Common Tern. Nesting Gigulum and the islets off shore.

Black-headed Gull. One or two, could not ascertain if nesting.

Common Gull. Common everywhere, breeding.

Herring Gull. Some breeding Gigulum and Cara.

Lesser Black-backed Gull. Not very common, breeding.

Great Black-backed Gull. Some breeding Cara.

Great Skua. One seen off the island by Colonel Horlick in September 1949.

Guillemot. Two flying near Cara.

Black Guillemot. One flew off Cara.

Corncrake. Three pairs on Gigha.

Moorhen. A pair on the Upper Loch.

Red Grouse. A few pairs in the heathery bit near Ardminish.

Pheasant. A few, introduced.

Partridge. There used to be partridges on Gigha but they died out.

Of mammals, we saw a pipistrelle bat and found shrews to be not uncommon. Grey seals were numerous in the

sound, and very fearless as they are not persecuted. Wood mice and house mice were not uncommon and we saw a brown rat. Rabbits abounded and we saw several porpoises in the sound. We were told that there are otters but no moles, foxes, stoats, weasels or hares.

When we first arrived there were very few butterflies to be seen but there was a big hatch during the last three days of our stay and we saw nine species. Meadow browns were quite common at the end of our visit, as were small heaths. There were two painted ladies in beautiful condition, two small tortoiseshells, one worn the other in good condition, and at least six peacocks, all rather worn. We only saw one common blue but there were many large and small whites and a few green-veined whites. We also saw a cinnabar moth, a lot of the small blue dragonfly *Enallagma cyathigerum*, and all too many horse-flies and midges.

# ISLE OF MAY BIRD OBSERVATORY AND FIELD STATION

## BIRD REPORT, 1948 AND 1949

HUGH F. D. ELDER
Recorder for Birds

1948 as a whole was a disappointing year for migration at the Isle of May, while 1949 was the most successful since the Observatory started in 1934. Lacking a resident warden, the station is entirely dependent on the services of voluntary observers, and although it is never easy to arrange for a succession of competent observers to aid the less experienced, the Observatory was in 1949 somewhat more fortunate in this respect. Another Heligoland trap was completed in March 1949, and has proved itself to be a most valuable addition to the station's equipment. There are now three of these traps on the island. The construction of this new trap was the unaided work of John Bain, to whom the Observatory owes a large debt of gratitude, not only for this and for redecorating the house, but for many less spectacular jobs. Favourable weather in the autumn of 1949 was a third factor to which the success of this year was due.

The committee would again like to thank the Commissioners of Northern Lighthouses for their continued permission to run the station on the Isle of May. To them and to the keepers and their families on the island we are deeply indebted for helping us in many ways.

### 1948

The station was manned continuously from 6th April to 7th June, and from 1st September to 5th November, as well as for shorter periods in February, March, June, July and August.

The more interesting records included :

Siskin *Carduelis spinus :* 2 on 22nd and 1 on 24th April.

Lapland Bunting *Calcarius lapponicus :* 1 from 10th to 12th October.

Tree Sparrow *Passer montanus :* 1 on 22nd April.

Shore Lark *Eremophila alpestris :* 1 on 30th October.

Tree Creeper *Certhia familiaris :* 1 on 24th July, and 1 on 1st and 2nd October. The only previous records of this bird on the island are in 1920.

Long-tailed Tit *Aegithalos caudatus :* 4 on 3rd, 2 on 4th and 1 on 5th November. The only previous record of this bird on the island is in 1913.

Great Grey Shrike *Lanius excubitor :* 1 on 9th October.

Red-backed Shrike *Lanius collurio :* 1 on 20th May, 1 on 4th and 5th June, 1 from 5th to 10th and 1 on 12th September.

Pied Flycatcher *Muscicapa hypoleuca :* 1 on 26th May, and up to 3 between 4th and 10th September.

Chiffchaff *Phylloscopus collybita :* 1 on 19th April, and 2 on 31st October.

Wood Warbler *Phylloscopus sibilatrix :* 1 on 3rd June.

Grasshopper Warbler *Locustella naevia :* 1 on 23rd April.

Barred Warbler *Sylvia nisoria :* 1 on 10th October.

Garden Warbler *Sylvia borin :* 2 on 29th May, 1 on 3rd June, and 3 on 10th September.

Blackcap *Sylvia atricapilla :* 1 to 2 from 22nd April to 7th May, 2 on 10th September, 2 on 9th and 4 on 10th October, and 1 on 2nd November.

Lesser Whitethroat *Sylvia curruca :* 1 to 3 from 4th to 8th May, 1 on 19th May, and 1 on 4th September.

Ring Ouzel *Turdus torquatus :* 1 on 29th March, 1 on 11th and 12th April, up to 3 between 18th and 21st April, 1 on 3rd and 6th May, and 1 on 9th October.

Blackbird *Turdus merula :* About 500 on 30th October.

Black Redstart *Phoenicurus ochrurus :* 4 on 25th, 2 on 26th and 27th and 3 on 28th March, 1 on 18th and 19th April, and 1 on 6th May.

Turtle Dove *Streptopelia turtur :* 1 on 13th and 28th May, 1 on 6th, 2 on 7th and 1 from 25th to 27th June, 1 on 4th and 1 from 7th to 10th July.

Curlew Sandpiper *Calidris testacea :* 2 on 8th September.

Ruff *Philomachus pugnax :* 1 from 4th to 9th, 2 on 10th and 1 on 11th September.

Little Auk *Plautus alle :* 1 on 15th March and 18th April.

Water Rail *Rallus aquaticus :* 1 on 1st May, and 1 on 9th October.

## 1949

In the spring the station was manned from 25th February to 29th May with three short breaks totalling 14 days. The station was open in the autumn without a break from 20th August to 5th November.

The more interesting records included :

Siskin *Carduelis spinus :* Recorded between 23rd September and 12th October.

Redpoll *Carduelis flammea :* 1 to 2 between 4th and 8th October.

Scarlet Grosbeak *Carpodacus erythrinus :* 1 on 22nd September, identified in the hand.

Black-headed Bunting *Emberiza melanocephala :* 1 on 22nd September, identified in the hand. It was an adult female answering in plumage to every detail given in the *Handbook* except the wing length, which, at 94 mm., is a little longer than the maximum given for females, but shorter than the maximum for males. Only the top of the upper mandible was lead-blue : the lower part was the same as the lower mandible. Distinguished from female red-headed bunting *E. bruniceps* by (*a*) 5th primary being very slightly emarginated, indeed scarcely at all ; (*b*) presence of chestnut on upper parts, noticeable on back and rump ; (*c*) long length of wing.

The following field notes are by M. F. M. Meiklejohn ; only rather poor views were obtained, e.g.

the yellow on the underparts was not observed in the field :

Appeared a large bunting, larger than rock pipit *Anthus spinoletta*, with bill much longer and more pointed than in native British buntings. General pale appearance, with which dark eye was in striking contrast ; upper parts darker and streaked. No white on tail. The bird suggested a large pale female house sparrow *Passer domesticus*, a resemblance which Meiklejohn noticed the first time he saw a female of this species in Palestine. Uttered a shrill faint squeak in the hand and a sparrow-like chirp on being released. Twice seen consorting and feeding with meadow pipits *Anthus pratensis* and rock pipits—one of the latter, however, chivvied it. Although when captured it was in cover, it seemed to prefer open places. When disturbed flew up on to rocks and walls, as it does in Persian mountains above tree level. It perched both erect and flattened horizontally. The flight was undulating.

The species has been recorded on four previous occasions in Scotland.

Rustic Bunting *Emberiza rustica :* 1 female 29th September to 13th October. With inconspicuous plumage, lacking black and white head markings, its identity was not recognised until it was trapped on 3rd October. In the hand Dr. K. B. Rooke, H. F. I. Elliott and others noted, *inter alia*, the following characters clearly distinguishing it from the little bunting *E. pusilla* and the reed bunting *E. schoeniclus*, with which it might be confused :—wing, 73 mm. ; bright pink legs ; chestnut lesser wing-coverts, hind neck, rump and upper tail-coverts ; absence of chestnut on sides of head ; whitish underparts, with chestnut markings and some dark streaks forming an indistinct breast-band which extended a little way downwards on the centre of the breast and on either side towards the flank-streaks of similar colours. It was usually seen feeding on the ground, and beside a rock pipit it looked

distinctly small and rather short-tailed, giving the impression of being the size of a linnet *Carduelis cannabina* or a trifle smaller. The flight-call was rendered " tzip," the alarm-note on the ground as " tick " or " twick " uttered singly.

Wood Lark *Lullula arborea :* 1 on 13th April, and 1 to 2 on 6th to 8th October.

Blue Tit *Parus caeruleus :* 1 from 30th October to 2nd November. The only previous records from the Isle of May are of a single bird in 1884 and another in 1908.

Great Grey Shrike *Lanius excubitor :* 1 on 9th and 10th October.

Red-backed Shrike *Lanius collurio :* 1 on 26th August and 15th September.

Pied Flycatcher *Muscicapa hypoleuca :* 1 to 2 between 13th and 19th May. Larger numbers from 25th August to 6th October. 25 on 5th September.

Red-breasted Flycatcher *Muscicapa parva :* Between 1 and 3 daily from 13th to 23rd September, 2 on 6th October and 1 on 7th. At least 12 individuals passed through—8 ringed and at least 4 unringed.

Chiffchaff *Phylloscopus collybita :* 1 on 16th April, and up to 6 between 7th September and 13th October.

Wood Warbler *Phylloscopus sibilatrix :* 1 on 23rd July.

Yellow-browed Warbler *Phylloscopus inornatus :* 3 on 21st and 22nd September, 1 on 6th and 7th October and 1 on 24th October. At least 6 individuals passed through—5 ringed and 1 unringed.

Reed Warbler *Acrocephalus scirpaceus :* 1 on 23rd and 24th September.

Aquatic Warbler *Acrocephalus paludicola :* 1 on 26th September. Found dead and skin preserved. Readily identified and agreed well with the *Handbook* description except for the bill. The upper part of the upper mandible was very dark (almost black) ; the lower part and the lower mandible were yellowish-

flesh. The inside of the mouth was yellowish-orange. The species has been recorded on two previous occasions in Scotland.

Icterine Warbler *Hippolais icterina :* 4 on 5th September, 6 on 6th, 1 from 7th to 10th, 2 on 12th and 1 on 13th. At least 9 individuals passed through—9 having been ringed. All were identified by G. W. Rayner.

Barred Warbler *Sylvia nisoria :* 1 on 6th October.

Garden Warbler *Sylvia borin :* 4 on 15th May, and larger numbers between 27th August and 10th October. 10 on 14th and 23rd September.

Blackcap *Sylvia atricapilla :* 1 on 16th April, and larger numbers between 14th September and 14th October. 8 on 24th September and 10th October.

Lesser Whitethroat *Sylvia curruca :* 1 on 28th May, and 1 or 2 between 14th and 29th September. An example of the Siberian race *S. c. blythi* was present from 6th to 10th October and was identified in the hand by Dr. K. B. Rooke.

Redwing *Turdus musicus :* 1, which was first trapped on 6th April and remained till the 12th, with a wing length of 124 mm., was noticeably dark on the mantle, and had very heavy and dark breast markings and deep red axillaries compared with other birds of this species examined at the same time. The observers had no doubt that it was of the Icelandic race *T. m. coburni.* This subspecies does not appear to have been recorded before from the Forth area, having doubtless been overlooked.

Ring Ouzel *Turdus torquatus :* 1 to 2 on 2nd to 4th April, 23rd September, and 6th to 11th October.

Black-eared Wheatear *Oenanthe hispanica :* An example of the western race *Oe. h. hispanica* was present from 30th September to 8th October. Dr. Rooke identified the species and the race in the field, later confirmed by careful detailed examination in the hand. It was of the black-throated phase, the feathers of the chin and upper

throat being brown-black, broadly tipped with pale creamy buff largely obscuring the black, which appeared as faint streaks and mottling. The extent of the black feathering was, if anything, less than in the *Handbook* illustration. The lores and ear-coverts were blackish and there was no black in the forehead feathers.

The intense black of the tail, the prominence of the blackish ear-coverts and wing-feathers, the warmth of the upper parts and upper breast, the pale tips to the chin and throat feathers, and the abrasion of the retrices and second primary, showed that it was a first winter male. Its wing measured 94 mm. and its tarsus 24 mm. The iris was dark brown.

In the field in a dull light the bird looked strikingly pale, with sandy buff upper-parts and pale creamy buff under-parts contrasting with blackish lores and ear-coverts and black on wing. In a bright light there was a noticeable warm orange tinge on upper breast, sides of neck and upper-parts. Though broadly margined and tipped buff, blackish markings showed clearly on the secondaries, wing-coverts and scapulars, in contrast with the uniform mantle. The trace of black on chin and throat, visible only in good conditions, was typical of the western race in extent. On the ground, viewed from above, the white on the slightly expanded tail projected well beyond the closed wing-tips, which it does not appear to do in the common wheatear *Oe. oenanthe*. Usually only fleeting glimpses of the tail pattern were obtained, in flight, but sufficient to see that the extent of black (on 2nd to 4th from outer feathers) was much less than in the common wheatear, an important field character, though Rooke noticed that there was rather more black on these feathers than in some breeding adults he had seen in Algeria and Tunisia.

It was a very active bird, fly-catching in the air and on the ground. Often hovering, its movements were very quick with a fast flight. When suspicious, as often, it was adept at "vanishing," to reappear hours later in one of a few favourite haunts : usually

rocky or grassy hollows or gullies; less on exposed slopes and rocks than the common wheatear.

The call was softer and less harsh than that of the common wheatear and was noted by Rooke as "djag" or "dzag" and by H. F. I. Elliott as "prat" (rather than "chak").

Two previous occurrences of this species in Scotland have been recorded.

Bluethroat *Luscinia svecica:* 1 on 14th and 23rd September.

Great Spotted Woodpecker *Dendrocopus major:* 1 from 12th to 19th September, at least 7 on 22nd, 1 on 23rd, 2 from 24th to 26th, 1 from 27th to 30th, 2 on 6th October, 3 on 7th and 8th, and 2 on 9th. No adult birds were recorded, all of those seen clearly being juveniles. The five trapped were all of the northern race *D. m. major*, the subspecific determination being based on measurements aided by the illustration of the bill in the *Handbook*. Some individuals stayed on the island for several days and the first was retrapped a week later. Two are known to have died on the island—possibly of starvation. The island has no suitable habitat for woodpeckers, which were to be seen in flight over the sea below the cliffs, clambering on rocks, chipping at rusty iron posts or clinging to the tower of the lighthouse.

Golden Plover *Charadrius apricaria:* 3 on 18th May were recognised in the field as being of the northern form *P. a. altifrons*. This form probably occurs frequently but the only previous record on the island was on 7th May 1909.

Little Auk *Plautus alle:* 1 on 24th February and 4th March, and 2 on 23rd March.

Corncrake *Crex crex:* 1 on 5th May and 1 on 12th September.

Water Rail *Rallus aquaticus:* 1 on 14th September and 11th October.

## Ringing

The following table shows the species ringed in 1948 and

| Species | Numbers Ringed | | | Numbers Recovered |
|---|---|---|---|---|
| | 1948 | 1949 | 1934-49 | |
| Starling | 2 | 32 | 49 | 1 |
| Greenfinch | 2 | 3 | 45 | — |
| Siskin | — | 3 | 12 | — |
| Redpoll | — | 1 | 12 | — |
| Linnet | 2 | — | 9 | — |
| Scarlet Grosbeak | — | 1 | 2 | — |
| Chaffinch | 13 | 84 | 256 | 1 |
| Brambling | 12 | 133 | 191 | — |
| Corn Bunting | — | — | 1 | — |
| Yellow Bunting | — | — | 8 | — |
| Black-headed Bunting | — | 1 | 1 | — |
| Yellow-breasted Bunting | — | — | 1 | — |
| Cirl Bunting | — | — | 2 | — |
| Ortolan Bunting | — | — | 3 | — |
| Rustic Bunting | — | 1 | 1 | — |
| Little Bunting | — | — | 1 | — |
| Reed Bunting | 4 | 7 | 36 | — |
| Lapland Bunting | — | — | 1 | — |
| Snow Bunting | 1 | — | 1 | — |
| House Sparrow | — | — | 110 | — |
| Tree Sparrow | — | — | 2 | — |
| Skylark | — | 4 | 8 | — |
| Tree Pipit | 1 | 3 | 22 | — |
| Meadow Pipit | 20 | 42 | 121 | 1 |
| Rock Pipit | 16 | 18 | 193 | 3 |
| Wagtail (*M. alba*) | 1 | 12 | 48 | 1 |
| Tree Creeper | 1 | — | 1 | — |
| Blue Tit | — | 1 | 1 | — |
| Coal Tit | — | — | 1 | — |
| Long-tailed Tit | 4 | — | 4 | — |
| Great Grey Shrike | 1 | 1 | 2 | — |
| Red-backed Shrike | 1 | 1 | 10 | — |
| Spotted Flycatcher | 8 | 7 | 39 | 1 |
| Pied Flycatcher | 4 | 34 | 88 | — |
| Red-breasted Flycatcher | — | 8 | 11 | — |
| Goldcrest | 27 | 136 | 294 | — |
| Chiffchaff | 2 | 19 | 37 | — |
| Willow Warbler | 249 | 331 | 1172 | 3 |
| Wood Warbler | — | 1 | 6 | — |
| Yellow-browed Warbler | — | 5 | 9 | — |
| Grasshopper Warbler | 1 | — | 3 | — |
| Reed Warbler | — | 1 | 4 | — |
| Sedge Warbler | 12 | 31 | 146 | — |
| Icterine Warbler | — | 9 | 9 | — |
| Barred Warbler | 1 | 1 | 16 | — |
| Garden Warbler | 5 | 32 | 104 | — |
| Blackcap | 6 | 25 | 58 | — |
| Whitethroat | 80 | 84 | 367 | — |
| Lesser Whitethroat | 2 | 5 | 36 | — |
| Fieldfare | — | 7 | 7 | — |
| *Carry Forward* | 478 | 1084 | 3561 | 11 |

| *Species* | *Numbers Ringed* | | | *Numbers Recovered* |
|---|---|---|---|---|
| | *1948* | *1949* | *1934-49* | |
| *Brought Forward* | 478 | 1084 | 3561 | 11 |
| Song Thrush | 11 | 50 | 178 | 1 |
| Redwing | — | 10 | 21 | 1 |
| Ring Ouzel | — | 1 | 7 | 1 |
| Blackbird | 120 | 411 | 910 | 11 |
| Wheatear | 20 | 4 | 49 | — |
| Black-eared Wheatear | — | 1 | 1 | — |
| Whinchat | 6 | 13 | 39 | — |
| Stonechat | — | 3 | 11 | — |
| Redstart | 21 | 35 | 137 | — |
| Black Redstart | 1 | 4 | 11 | — |
| Bluethroat | — | 2 | 8 | — |
| Robin | 34 | 105 | 519 | 3 |
| Hedge-sparrow | 5 | 5 | 52 | — |
| Wren | 6 | 15 | 65 | — |
| Swallow | — | 1 | 2 | — |
| Swift | — | — | 1 | — |
| Great Spotted Woodpecker | — | 5 | 6 | — |
| Wryneck | — | — | 2 | — |
| Cuckoo | — | — | 1 | — |
| Long-eared Owl | — | — | 1 | — |
| Short-eared Owl | 1 | — | 1 | — |
| Peregrine | — | — | 1 | — |
| Sheld-Duck | — | — | 1 | — |
| Eider | — | — | 2 | — |
| Shag | — | 1 | 2 | 1 |
| Gannet | — | — | 3 | 1 |
| Fulmar | 2 | 6 | 20 | — |
| Turtle Dove | — | — | 1 | — |
| Woodcock | — | 2 | 2 | — |
| Turnstone | — | — | 1 | — |
| Ruff | 1 | — | 1 | — |
| Oyster-catcher | 1 | 1 | 2 | — |
| Sandwich Tern | 434 | 192 | 881 | 5 |
| Common Tern | — | — | 165 | — |
| Arctic Tern | — | — | 11 | — |
| Herring Gull | — | 35 | 285 | 5 |
| Lesser Blackback | 10 | 13 | 46 | 2 |
| Kittiwake | 12 | 12 | 172 | — |
| Razorbill | 1 | 4 | 20 | — |
| Guillemot | 22 | 2 | 158 | 11 |
| Corncrake | — | — | 3 | — |
| Water Rail | 1 | 2 | 3 | — |
| Moorhen | 1 | 1 | 2 | — |
| Totals | 1188 | 2020 | 7365 | 53 |

in 1949. It also gives the totals ringed since the Observatory started, and the numbers recovered away from the island up to 31st December 1949. Details of these recoveries have been or will be published in *British Birds*.

With the aid of the new trap in 1949 the Observatory's ringing record of 86 birds in one day (30th October 1948) was quickly broken, 96 being ringed on 15th May and 119 on 28th August 1949.

# A NOTE ON THE DISTRIBUTION OF THE PEACOCK BUTTERFLY *NYMPHALIS IO* IN SCOTLAND

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On 31st January 1950, a female peacock butterfly was brought to the Zoology Department, University College, Dundee. It had been found hibernating in a dark corner of an outhouse in Dundee, was in very good condition, and presumably could have paired in the spring. According to South (1933, *The Butterflies of the British Isles*, 73) it is not unknown for the peacock to be seen flying in February while snow is on the ground : he gives two records, 1778 and 1900. For 1948, there were two early records for it in flight, 7th and 23rd February (*Scot. Nat.*, 60 : 211). Mr. Alexander Cross (Dundee Naturalists' Society) informs me that it can always be seen, sometimes in quite large numbers, near Muthill and Kinfauns, Perthshire, especially on *Buddleia*, and he has records from June to August during 1948 and 1949. There are also several localities in Angus, such as Wellbank and Letham, where it is always seen.

Opportunity is here taken to bring together recent records for Scotland. The peacock used to be restricted in Britain to the centre and south of England, but by 1945 it had spread once more to north England and Scotland, which it had inhabited long ago (cf. Ford 1945, *Butterflies*, 132). The period 1937-45 saw its spread into Scotland : by 1945 it was common in the Border Country and was working steadily northwards, there even being an isolated record from Caithness. In the west it was seen at Crinan, Argyllshire, in 1935, on Barra, Inverness-shire, in 1937, and was very common at Crinan and Cairnbaan by 1948. During the spring of 1948 it was reported as being the commonest species of butterfly near Oban, Argyllshire. In Inverness-shire it became common on Canna and Eigg, and at Arisaig and Knoydart, and was

a well-established resident in the Hebrides by 1948 (*Scot. Nat.*, 60 : 47, 126, 211, 212). It can be said, therefore, that it is now quite common in the West Highlands and Islands. The general spread of the peacock into central Scotland is indicated by the records from several localities in Lanarkshire and Renfrewshire, and a record from Stirlingshire in 1948 (*Scot. Nat.*, 60 : 212 ; 61 : 115). Regarding eastern Scotland, during the past two years the peacock has become so common in Perthshire and Angus that its presence is regarded as requiring no comment.

Migrating swarms, as known in France and England (one record for Surrey : Ford's *Butterflies*, 153), have not been observed in Scotland.

Thus from 1945 to 1950 there has been a general north-easterly trend in the distribution of the peacock in Scotland, so that it now appears to be established well up the west coast and in central and eastern Scotland.

# NON-BREEDING IN THE FULMAR *FULMARUS GLACIALIS*

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## Introduction

It is an established fact that each summer a certain proportion of fulmars do not breed, but very little is known of the identity of these birds. Wynne-Edwards (1935) first pointed out that a large fulmar population was to be found in the North Atlantic in the breeding season, and later (1939) he suggested from a study of the moult, wear of claws and follicular condition of the ovaries that probably only one bird in three breeds in any one year. Richter (1937) remarked that non-breeding fulmars at the colonies moult first and migrate to the sea at the end of July and beginning of August, and estimated that at a Scottish colony only one-third to two-fifths of the birds present were breeding. A number of other observers have also recorded non-breeding birds leaving the breeding colonies in July. Fisher and Waterston (1941) produce figures to show that in a number of small colonies about 23 per cent. bred successfully while in the larger colonies the corresponding figure was in the region of 75 per cent.

The first point to consider is the possibility that non-breeding fulmars at the colonies are in fact unsuccessful breeders, their eggs or young having been taken. Such birds, according to Fisher and Waterston (1941, p. 255), leave the colony in July but Richter, though supposing the same, mentions a pair losing their egg and sitting the whole summer through. On Fair Isle in 1949 a pair under observation lost their egg on the 19th July. Next day both were present at the ledge but thereafter, until observation ended on 26th July, one bird was seen at infrequent intervals at the nest-site.*

* Mr. James Fisher has kindly informed me that he has evidence that some, if not all, failed breeders do abandon the colony within about two weeks.

My own experience over a number of years suggests that the proportion of birds losing eggs or young must be very small. Apart from accidents of various sorts causing such loss, we know that in this country at least there is no evidence that the species is heavily preyed upon by any bird or mammal. In addition, the proportion of addled eggs also appears to be small. On Bear Island in 1948, during the examination of a very large number of breeding pairs, only three eggs were seen that failed to hatch. Such a small proportion of unsuccessful adults could never account for the decrease in numbers noted at the colonies in July or for the large proportion of fulmars in moult at this time which are presumed not to be breeding birds. On the above evidence we are left with the alternative that the non-breeding fulmar population is made up of juvenile birds and/or intermittent-breeding adults. Using a somewhat different approach to that of Wynne-Edwards (1939) I want to show that both these age-groups of fulmars do exist and that this author's estimate of one bird in three breeding in any one year is supported by further evidence.

## Moult

Richter (1937) and Wynne-Edwards (1939) make the point that non-breeding birds moult first and that at this time of the year it is a means of separating breeding from non-breeding birds. Observation on Fair Isle in 1949 fully substantiates this view. From 14th-26th July, when visits were made to several fulmar colonies and numbers of breeding birds disturbed from their chick, not one showed primary moult. This was also confirmed by later observation in Shetland and Ireland. On the other hand, the majority of fulmars presumed by their behaviour to be non-breeders showed missing primary feathers. This distinction can only be made for a short period. On 22nd July on Fair Isle I first saw a fully-feathered fulmar which I took to be a non-breeding bird having completed its moult. Its behaviour was the same as that of moulting non-breeders (described later) and the 3rd primary in each wing was the longest, indicating incomplete growth of the 1st and 2nd and giving

each wing-tip a more rounded outline. In full plumage the 1st primary is the longest and the wing-tip sharper. From this date the numbers of fully-feathered non-breeders increased.

Further evidence of the presence of apparent non-breeding birds at the colonies was obtained from the state of the brood patch. On the 19th, 25th and 26th July three breeding fulmars were collected and a fourth examined alive. All had a naked brood patch though one (26th) showed evidence of new down beginning to grow over the skin. On 14th and 25th July two non-breeding birds were collected and found to have their brood patch completely covered with down. Similarly on Bear Island in 1948 eight non-breeding fulmars collected in late July to early August showed missing or incompletely developed primaries and down-covered brood patches, whereas four breeding birds were fully-feathered and the brood patch of each was naked or showed traces of new down. It appears, however, that earlier in the season even the non-breeding birds have naked brood patches. Darling and Morley (1947) examined a fulmar from a non-breeding colony on 26th June and found that its gonads were undeveloped and its brood patch naked.

It is interesting to note that the three breeding birds examined on Fair Isle showed a general body moult and in one case the median and lesser coverts but no primary moult.

## Behaviour of Non-breeding Birds

Two weeks' intensive observation on Fair Isle in July 1949 strongly suggested that it was only the non-breeding bird that played the role of "visitor." * During the period when these birds were moulting nothing was seen to contradict this view, but at the termination of moult, when non-breeders are almost indistinguishable from breeding birds, it is much more difficult to be sure. Later in the season when parent birds leave their chicks unattended for long periods it is possible that they too "visit" other fulmars.

* The term "visiting" is used to describe a form of behaviour whereby one or more fulmars sitting on a ledge with or without young are "visited" by another fulmar or fulmars, the "visitors" not being mated to the former, and display between the two groups takes place.

On 27th July in Shetland a fulmar was seen to leave its chick and settle on the sea, where it washed and preened for a while. Returning to the colony it made a pass at its own ledge, then attempted to land at a nearby ledge where several fulmars sat with their chicks. It was vigorously repelled and eventually returned to its chick. On 24th July one of my marked birds was seen perched on the cliff-top about 25 yards from its chick, cackling with a fulmar of unknown identity. The marked bird had fed its chick just previously. Breeding birds will also join parties on the water, the members of which often indulge in display.

At one of the colonies watched on Fair Isle, an apparently non-breeding darker-phase fulmar was a regular visitor. It was of an intermediate grade of coloration between the two extremes ; the blue-grey of the back extended forward to the nape, though getting paler, and the rest of the head and neck together with breast and belly were a pale powdery grey. It was very easily picked out when with other fulmars and an account of its movements will serve to illustrate the behaviour of the non-breeder in July. It was first seen on 16th July sitting on a ledge near a marked pair that I was watching, and it remained there for a short period until I left. On 20th July it was seen circling off the cliff face of the same colony, clearly showing advanced primary moult. Eventually it landed near its previous ledge and joined another apparent non-breeder which was cackling to a pair with a chick. Two more non-breeders settled nearby and cackling took place amongst them and between the non-breeders and parent birds. The latter occasionally showed hostility by bursts of frantic cackling at the nearest " visitor." None of the non-breeding birds showed animosity to each other or such a high pitch of emotion as the breeding birds. After about five minutes the non-breeders began to leave one by one and the dark bird was not seen again that day.

On 22nd July it appeared for the third time settling near the ledge it had occupied on the two previous occasions. It wandered about the ledge for a short time, waving and bowing its head as non-breeding and breeding birds do, but this was not directed to any other fulmar. Eventually it formed an association with another non-breeder nearby.

They sat together on the ledge occasionally cackling and head-waving. After ten to fifteen minutes the dark bird flew. Next day it was seen again at this colony but at a different ledge. By it, almost touching, sat another non-breeder and for about twenty minutes they sat peacefully together before flying. In the afternoon of the same day the dark bird was seen circling off other cliff-faces in the vicinity, but eventually it arrived at the colony under observation and landed on a previously unvisited ledge. A non-breeder already in possession showed no hostility. Soon after, two more non-breeders landed on the ledge ; the first formed an association with the original owner and the second with the dark bird. Cackling took place for a while and later, during a quiet period, the dark bird was seen to pick up a piece of vegetation and place it posteriorly on its left side.

The dark bird was seen for the last time on 24th July when it appeared in the late afternoon. It landed at again a different ledge and was soon joined by a second non-breeder. They cackled actively together for about twenty minutes, after which the dark bird flew. No more extensive observation was possible at this colony during the remaining two days of my stay. It can be seen from this account that the non-breeder is a bird of no fixed abode, visiting different ledges and forming associations with any fulmar willing to display with it. It does not adequately show the relationship between the non-breeding and breeding bird, but it is sufficient at the moment to say that the general behaviour of the former is marked by a lower emotional pitch than that shown by parent fulmars. The latter show dominance in all matters concerned with ledge possession and defend a definite territory around themselves and chick. They will cackle with a non-breeder which is outside their territory but violently repel any " visitor " that approaches too near.

As recorded for the dark bird, other non-breeding fulmars were seen to pick up vegetation whilst occupying a ledge. On 20th July a presumed non-breeder was seen to pick up bits of turf and flowers in front of it and throw them to one side. It did this on two separate sites almost like a fulmar excavating a nest-site. On 13th August in Donegal, a presumed non-breeder, which had previously attempted to

perch by a near-fledged chick, landed on a grassy ledge and spent some time vigorously pulling up pieces of turf. It made no attempt to arrange the pieces but moved them around with its beak. It seemed restless and continually moved about the ledge. After a while it sat down peacefully for a short period before flying.

This pseudo-scrape-making (if this term is permissible), together with " visiting " and communal display, may all be part of the normal fulmar sexual cycle, breeding perhaps not taking place the *same* year, but in the following season. Marshall (1949) examined exhaustively the testes of twelve out of fifteen Bear Island fulmars forwarded to him, and he is of the opinion that all had arrived at breeding condition and regressed.* Seven of these fifteen birds were in active wing moult, three to seven primaries having been lost, and the brood patch of each was well covered with down suggesting that the birds were probably non-breeders. From this evidence it would appear that the sexual development of both breeding and apparent non-breeding fulmars at the colonies in any one summer follows the same pattern but the latter never reach the stage of successfully mating and defending a nest-site. The gonads begin to regress just before this stage is reached.

Another point which may substantiate the above conclusion is the evidence that a proportion of non-breeding fulmars do not leave the colonies in July, but remain throughout the breeding season. Reference has already been made to non-breeding birds at the colonies in mid-August, and several observers have referred to display at the ledges as late as September, when parent birds have ceased to visit the ledges or do so only infrequently. By this month fulmars which have bred are moulting, but on 5th September 1945, in Northern Ireland, eight fulmars were seen displaying communally on the ledges, only one being in moult. Observation at a Donegal colony during the second week of August 1949, some chicks being fully fledged, showed that in

* Dr. A. J. Marshall reported that all the testes examined showed an unmistakable fatty metamorphosis of the spermatogenetic tubules indicating a former spermatogenesis. The interstitium was in a state of regeneration and new spermatogonia were present in the tubules. The remaining three testes were not examined in great detail but all contained metamorphosed lipoid material.

the case of four pairs the parent birds visited the colony only long enough to feed the chicks before returning to sea, but there was always a number of fulmars about the ledges, often displaying together on empty ledges, and several had short 1st primaries, indicating that they had probably already moulted. In 1944 a fledged chick was visited by a very ragged parent on 3rd September. The adult was light-brown on the back and upper wing surface instead of clear grey and had very worn feathers. Primaries 7-10 were missing and the remaining ones so worn that the shafts were bare of webs at the tips. The tail was in the same condition.

Summarising from the above evidence one might tentatively suggest that :—

(1) there is a movement of non-breeding birds away from the colonies, beginning in July (perhaps earlier), and a proportion of presumed non-breeders remain until the end of the season ;
(2) the normal fulmar breeding cycle may include a year of " visiting " and display before actual breeding.

If we apply the above data to the *minimum* requirements of the fulmar breeding cycle we find that it will fit only two reasonable alternatives. In each case the fulmar population is analysed into age groups and the activity of each is traced for any one summer.

A. *Breeding in 3rd year and then every 2 years.*

| *Non-breeeding birds* | | *Breeding birds* |
|---|---|---|
| 1st year birds . . . | at sea | 3rd year birds |
| 2nd year birds . . . | " visiting " | Breeding adults |
| Adults in non-breeding year . | " visiting " | |

In this case the first year birds would be at sea during the summer, while the second year birds and non-breeding birds would be at the colonies indulging in display and " visiting " prior to breeding. It is difficult to say which age-group forms the section leaving the colonies in July, but it would seem more likely to be the second year birds whose sexual development might not reach such an advanced

stage as birds which have bred in previous years. The chief objection to this alternative is that for a part of the early summer the oceanic population would consist largely of first year birds. If this really were the case the drain of fulmars from the pelagic areas in spring would certainly be noticeable, but as far as we know the fulmar population at sea does not undergo *large* seasonal variations in numbers. The landward movement is however considerably prolonged probably from November to April and consequently the disappearance of fulmars from the ocean may not be so noticeable.

B. *Breeding in 3rd year and then every 3 years.*

| *Non-breeding birds* | | *Breeding birds* |
|---|---|---|
| 1st year birds . . | . at sea | 3rd year birds |
| 2nd year birds . . | . " visiting " | Breeding adults |
| Non-breeding adults . | . at sea | |
| Non-breeding adults . | . " visiting " | |

This analysis fits the evidence far more readily, providing a way out of the main objection mentioned in A. The oceanic population in early summer now includes first year birds and adults which bred the previous year, in each case a year being spent at sea before a summer of " visiting." It is also supported by the evidence obtained by Wynne-Edwards' (1939) examination of sixteen fulmars collected on the Labrador coast in July. It was shown that these fulmars consisted both of birds which had not bred previously and birds which had laid eggs in previous years. Neither were breeding that particular summer and they would correspond to my first year birds and non-breeding adults.

A factor so far omitted is the extent to which breeding fulmars on foraging excursions contribute to the summer oceanic population. It must be admitted that very little is known about the distances covered by such birds and it is possible that they may be considerable. As each parent incubates in approximately four-day periods they would have the opportunity to travel long distances in search of food, but when the chick hatches it is visited much more frequently, and it is during this period that food-collecting is most important. Two field observations may give slight support to

the view that the breeding fulmar does not fly great distances from the colony.

On 6th and 7th July 1948 fulmars in primary moult were counted between the Faeroes and the Lofoten Islands. On the first day 5 per cent. were in moult, but on the 7th July the figure was 75 per cent. This seems to suggest that the sea area nearest the Faeroes had a much greater proportion of breeding birds which at that time are not moulting. At 24·00 hours on 6th July we were about 270 miles from the Faeroes and the Shetlands. Similarly on the same days dark-phase fulmars were counted. On 6th July none was definitely identified, but on 7th July the dark forms were estimated to total about 3 per cent.* On Bear Island about 450 miles to the north, 90 per cent. of the fulmars are some stage of "blue," and if large numbers of them wandered far south one would expect to see some definite evidence of their presence.

As pointed out to me by Dr. Lack, if intermittent breeding is a fact there must be some strong counter-selection against breeding each year as annual breeders would naturally leave more offspring. It is difficult to see any adequate reason in the case of the fulmar, but there are perhaps similar cases in animals with which intermittent breeding is established. For instance, the majority of salmon *S. salar* in some rivers breed only once, but a small proportion return to breed a second, third or fourth time, intermittently or in successive years (Jenkins 1936). Why is it then that such fish do not replace those that breed only once in a life time? One can only suggest that breeding only once confers, in some way, greater viability on the offspring.

## Establishment of New Colonies

It seems reasonable to assume that the first birds to arrive at a breeding colony are those intending to breed the following summer and that their time of arrival will depend on their physiological condition. In this way the effect of the greater social stimulation at the larger colonies will be reflected in

* This figure may be low owing to the difficulty of picking out the lightest dark-phase birds when at sea.

the earlier arrival of fulmars than at smaller breeding colonies. Other fulmars whose breeding cycle is not so advanced (e.g. non-breeders) will arrive comparatively late and it is probable that a proportion may be displaced when they find other birds already in possession of the ledges. The displaced birds would consist largely of second year and/or non-breeding adults and would be made to join smaller colonies where the proportion of non-breeding birds has been shown to be greater (Fisher and Waterston 1941) and also form the new non-breeding colonies. It is well known that fulmars at these colonies arrive considerably later than fulmars at the larger colonies.

If this explanation is correct then the low breeding success of small colonies and the existence of non-breeding colonies may be largely due to the presence of a proportion of sexually immature birds (i.e. second year birds) as well as to the Darling effect (Darling 1938). These immature non-breeders would of course contribute to the social stimulation effect in the colony but be themselves incapable of breeding.

It has been suggested earlier that the non-breeding fulmars leaving the colonies in July are probably second year birds. This is also the month when the majority of fulmars leave the non-breeding colonies in which case it seems likely that this age-group may be responsible for the establishment of new colonies. A study of the number and movements of second year fulmars might well reveal important clues on the causes responsible for the increase in range of this species.

## Acknowledgements

I would like to express my thanks to Prof. V. C. Wynne-Edwards, Mr. James Fisher, Dr. David Lack and Dr. A. J. Marshall for making valuable comments and criticisms on the material of this paper. Also to the University College, Leicester from which a grant was received to make the trip to Fair Isle.

## Summary

(1) A review is made of past work on non-breeding in the fulmar.

(2) By a study of primary moult, state of brood patch and behaviour, it is deduced that a non-breeding population exists at the fulmar colonies consisting of birds which begin to leave in July or earlier and others which remain throughout the summer.

(3) Reasons are stated for suggesting that the normal breeding cycle of the fulmar includes a non-breeding year of " visiting " and display.

(4) Examination of existing data suggests only two reasonable alternative breeding cycles, for the second of which there is more evidence :

A. The fulmar breeds in its third year and then every 2 years.
B. The fulmar breeds in its third year and then every 3 years.

(5) A theory is put forward to explain the establishment of new colonies and the age-group of the fulmars responsible.

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## ZOOLOGICAL NOTES

**Lepidoptera taken at Heisker Lighthouse in 1949 :—**

Angle shades *Phlogophora meticulosa.*
Dark arches *Xylophasia monoglypha.*
Rosy rustic *Hydræcia micacea.*
Silver Y *Plusia gamma.*
Feathered thorn *Colotois pennaria.*
Small tortoiseshell *Vanessa urticae.*

*Pennaria* is new to the Canna list. I am indebted to the Head Lighthousekeeper for sending me these specimens and to Mr. D. S. Fletcher of the British Museum for identifying *monoglypha* and *micacea* which were very worn.—J. L. CAMPBELL, Isle of Canna.

**Orangetip Butterfly in Morayshire.**—During the last four years I have found *Euchloe cardamines* common all along the River Spey from Aberlour to the mouth of the river, and also in the boggy area between Culbin and Nairn. I have seen isolated specimens at Gordonstoun, Forres, Elgin, Kellas, and in the Glen of Rothes, indicating a general distribution over the county.—R. RICHTER, Gordonstoun.

**Notes on the Mosquitoes of Moray.**—Since records of mosquitoes for this county appear to be far from complete, the following notes may be of interest. They are based on observations made during the years 1948 and 1949. The species were identified from *The British Mosquitoes* by J. F. Marshall, 1938, and doubtful cases confirmed at the Royal Scottish Museum.

*Anopheles plumbeus* Stephens. Marshall gives no record for this county. I discovered larvae in a hole between the roots of an old beech tree at Gordonstoun, and I have been bitten by females in the same wood.

*Anopheles claviger* (Meig.). Common throughout the area.

*Anopheles maculipennis* Meig. Widespread throughout the county, but local. Examination of larvae suggests that var. *messeae* alone occurs in the district.

*Theobaldia* (*Theobaldia*) *annulata* (Schrank). This extremely common species bred in the open during the mild winter 1948-49. Eggs, larvae of all stages and pupae were found throughout the winter.

*Theobaldia* (*Theobaldia*) *alaskaensis* Ludlow. This is a boreal species said to be extremely rare in Britain. I found it not uncommonly in three localities, in pinewoods, viz. Lossiemouth, Gordonstoun and Darnaway.

The larva has apparently never been found in Britain. I also failed to discover its normal breeding places, although a careful search was made of all accumulations of water in those areas. In July 1949, however, I discovered five larvae, in company with *Th. annulata* in a shaded pond at Gordonstoun. This was no doubt an 'emergency' breeding place due to the drought, since never before or after did either species breed there. The identity of the larvae was confirmed by rearing the adults.

*Theobaldia* (*Culicella*) *fumipennis* (Stephens). Larvae were found in a clear temporary pool near Elgin, October to December 1948. Attempts to rear adults were unsuccessful, the larvae dying apparently from water pollution, though other species in the same tanks were not affected.

*Theobaldia* (*Culicella*) *morsitans* (Theobald). As Marshall gives no Scottish records, and Miss M. Platt informs me that she has seen only one specimen from Scotland (Longniddry), I was surprised to find this one of the commonest and most widespread mosquitoes in the area. Larvae are to be found in almost every ditch in any type of habitat. I cannot but think that the species has also been overlooked in other Scottish counties.

*Aedes cantans* (Meig.). Marshall gives no Scottish records but Miss M. Platt, at the Royal Scottish Museum, informs me that a record exists for Dingwall, East Ross. Larvae were found in March and April 1949 in temporary woodland pools at Gordonstoun. During April and May adults were found throughout the woods, and 'swarming' of males observed. The adults died off in July, but in the middle of August larvae appeared again in a pool that had been re-flooded; a new crop of adults developed there in the first days of September.

*Aedes detritus* Haliday. This species swarms on the coastal marshes, especially between Culbin and Nairn.

*Aedes punctor* Kirby. Extremely common in woods and moors, missing only from purely agricultural land and the sea-shore.

*Culex pipiens* Linn. With *Th. annulata* the commonest species. All specimens examined answer to *pipiens* Linn. and not *molestus* Forskål, by their appearance, breeding behaviour, and the fact that they do not bite man.—R. Richter, Gordonstoun.

**Rare Spiders from Moray.**—Collecting in Moray in the years 1947-49, I came across the following three species, for which I find no satisfactory Scottish record in Bristowe's county list (*Comity of Spiders*, 1939). No more recent records are available to me.

*Singa pygmaea* Sund. There are two flourishing colonies of this pretty species along the coast of the Moray Firth, near Burghead and Culbin. The spiders are found in long grass where they spin their diminutive orb nets, and the egg cocoons are placed among the flowers in May and June.

*Episinus angulatus* Bl. I discovered this species in 1947 and 1948 among broken stones in a disused quarry on a hill near Elgin. Only three specimens were found. W. S. Bristowe cites a record for Perth, but states that the specific identity of the Perth specimen is open to doubt.

*Theridion simile* C. L. Koch. Two specimens of this spider were found in 1947 among bog myrtle near Culbin (Bristowe gives : Scotland : ? Locality unknown).

I have to thank Mr. G. H. Locket for identifying my spiders. —R. Richter, Gordonstoun.

**Hawfinch in East Lothian.**—With reference to the previous notes on the occurrence of the hawfinch *Coccothraustes coccothraustes* in East Lothian (*Scot. Nat.*, 60 : 215), it may be of interest to record that my wife picked up a dead male hawfinch on 17th April 1950, in Keith Woods, East Lothian. The bird, which was still warm, was in perfect condition and in good plumage. It was sent to the Royal Scottish Museum, Edinburgh.—R. C. Blackwood, Midlothian.

**Pied Flycatchers in Leet Valley, Coldstream.**—Early in 1948, 65 nesting boxes were put up along the banks of the Leet, a mile north of Coldstream. Results for 1948 : —4 pied flycatchers *Muscicapa hypoleuca* (a fifth pair nested in a natural hole), 3 great tits *Parus major*, 3 blue tits *P. caeruleus*, 3 wasps' nests ! Results for 1949 :—9 pied flycatchers (3 other pairs nested in natural sites), 35 great tits, 4 blue tits.

Heights of pied flycatchers' nests varied from 3 feet on an overhanging bank to 20 feet on the bare trunk of a beech tree ; every nest except one was within 50 yards of the river. Nine broods had no nestling mortality, and there were very few infertile eggs— 2 in one nest and 1 each in two nests.

In three cases great tits ousted pied flycatchers and built over

their nests. This amazing increase in great tits from 3 to 35 pairs in one year may prove a threat to the flycatchers.—Henry Douglas-Home, Edinburgh.

**Chiffchaff in East Inverness.**—On 1st May 1950, I listened to a chiffchaff *Phylloscopus collybita* which was singing repeatedly from tall trees in a shrubbery beside the main road along the south shore of the Beauly Firth, about one mile west of Clachnaharry. I visited the place on several occasions afterwards, but did not hear the bird again, and it seems probable that it was a wandering male. This occurrence, however, is worth recording, not only because the *Geographical Distribution and Status of Birds in Scotland* (Baxter and Rintoul, 1928) has no note of its occurrence in East Inverness, but also as there is some evidence suggesting a tendency towards extension of range in the Highlands, so that further information on the present distribution of the chiffchaff in these areas is desirable.—James W. Campbell, Strathtay, Perthshire.

**Blackcap in East Ross.**—With reference to the note by Editors (*Scot. Nat.*, 60 : 219) mentioning the presence of two singing male blackcaps *Sylvia atricapilla* at Scatwell, Strathconon, in June 1948, it will be of interest to record that there are now, June 1950, six males singing in the grounds at Scatwell. The first male was observed on 10th May, when it had not yet started its full song. —James W. Campbell, Strathtay, Perthshire.

**Stonechats in Midlothian.**—In the report " On the present status of the stonechat in Scotland " by Misses Rintoul and Baxter (*Scot. Nat.*, 60 : 164-170), the authors mention only one record for Midlothian during the period of the inquiry, namely in summer 1947. It may therefore be of interest that on 29th January 1950 I saw three stonechats *Saxicola torquata*—two males and one female —in the Howden Glen, Pentland Hills, Midlothian. The behaviour of the birds was very suggestive of that of recently arrived migrants, that is to say, they permitted of very close approach, and when they did fly only flitted for short distances before alighting. The weather, however, may have accounted for this, since there was a bitterly cold south-east wind.

These are the first stonechats that I have personally seen in Midlothian, or indeed in any south-eastern county, for very many years.—R. G. Thin, Edinburgh.

**Little Owls in Berwickshire.**—At Charterhall, near Duns, in August 1949, a gamekeeper surprised three little owls *Athene*

*noctua*. He shot two, one adult and one young bird. The third retreated down a rabbit hole. In January 1950 a little owl was trapped by the foot a few miles from Charterhall. It is at present in the Royal Zoological Gardens, Edinburgh. The fact that three of these birds were hunting together in August lends weight to the assumption that they had bred in that locality, for the little owl usually travels singly or at most in pairs ; further, one of these shot was an immature specimen.—HENRY DOUGLAS-HOME, Edinburgh.

There are very few records for Scotland, and none suggesting breeding. In *Country Life*, 9th June 1950, p. 1723, there is a photograph of a recently fledged little owl, which is stated in the title to have fallen down a chimney in Perthshire. On inquiry, Mr. W. A. Ramsey informs us that the photograph was taken in Sussex ; the error arose through his letter describing the incident having been sent from a Perthshire address.—EDITORS.

**Hen Harriers *Circus cyaneus* in Moray.**—A pair of hen-harriers was seen several times during May 1949 on a moorland tract in this county. No nest was found, but the female was seen again in the same spot on 26th August, a male on 12th February 1950, and a female again on 26th March 1950.—R. RICHTER, Gordonstoun.

**Barnacle Geese in Berwickshire.**—The appearance of the barnacle goose *Branta leucopsis* on the east coast, and inland at that, is of sufficient rarity to merit some account of the circumstances.

On 20th November 1949 I went to Greenlaw moor to count wildfowl for the International Inquiry. When I arrived at the smaller loch there were five pink-footed geese *Anser arvensis brachyrhynchus* on the ground. While I was watching these with glasses, at a range of about 400 yards, I saw a line of geese approaching from the north-east. These circled once and then settled round the five on the ground. There were about 150 pink-foots and I then saw that there were twelve barnacles among them. The latter broke up and walked about among the pink-foots. When I finally showed myself the whole party rose, the barnacles forming a compact separate little flock but keeping with the others. They settled about 1000 yards away and were still there when I left at 4 p.m.

It is possible that these twelve barnacles were the survivors of the twenty-one which escaped from Dr. Berry's enclosure at Tayfield, Fife, in March 1948, as he tells me twelve are in fact unaccounted for. On the other hand, all his birds were ringed,

and I could see no rings on the birds at Greenlaw moor. The conditions were perfect, bright sunshine with no wind.—W. M. Logan Home, Edrom, Berwickshire.

**A Further Note on the Display of Velvet Scoter.**—In the *Scottish Naturalist*, volume 61, page 12, the writer gave a short account of some display of the velvet scoter *Melanitta fusca*. A further opportunity of watching the display behaviour arose at Lunan Bay on 17th September 1949, when some additional details were obtained. On this occasion velvet scoters were present in fair numbers, and under the conditions of tide and wind had moved inshore to a reasonable range.

The males used an intent attitude similar to that of common scoter—neck extended, vertical, with bill level—but differing by an obvious raising of the plumage of head and neck, particularly of the crown, giving a high, pigeon-like contour, and of the lower part of the neck, giving a very heavy appearance to the bird.

From this intent position a salute was given at least three times, the bill being raised to a vertical position rather deliberately, with a momentary upward jerk of the head as with an additional stretch of the neck, but without the rise on the water noted for common scoter. This action had been noted for two brownish birds (perhaps immature males) on a previous occasion, but these could not be identified as velvet scoters with certainty owing to the range.

The display, apart from the intent and salute, was a chase of considerable activity. The more ardent males used an attitude recalling the "coot-scud" behaviour of common scoter. The back seemed arched, giving a humped appearance, the head held low with the neck moderately extended and a little arched, the bill moderately dipped, with some lift of breast from the water, ready, it appeared, to grasp the nape feathers of the female in the actual treading.

The most active display was seen in a group of seven males and one female. Only one, possibly two, of the males were pressing hard to reach the female, using the crouching attitude just described, the other males contenting themselves with the intent attitude on occasions and close attendance on the active birds. The ardent males scudded after the female as she turned this way and that, retreating when she turned and snapped, the other males—probably one or two intent—crowding around. When the action got very fast the female would dive, followed by all the males, and it seemed that the female emerged with the ardent males in close attendance. The action continued for several minutes, with

repeated dives of fifteen to twenty seconds. The activity ended with a series of short dives of three to five seconds on the part of the more active birds only—just up for a breath and down again—at least three times. When the birds emerged finally it was obvious that the action was over as these surfaced not as a group, but scattered, and not simultaneously. There had been a final phase underwater which broke the spell—just what is speculation.—HENRY BOASE, Invergowrie, by Dundee.

**Turtle Dove and Little Auk in North Perth.**—Through the courtesy of W. J. Plowden-Wardlaw, Kinloch Rannoch, I have received details of the following interesting records from that district of Perthshire.

On 29th May 1947 a turtle dove *Streptopelia turtur* was found at Kinloch Rannoch, and came into the possession of Mr. Plowden-Wardlaw. The bird, an adult female, was not in breeding condition.

Two examples of the little auk *Plautus alle* were found dead in the same village in 1949, a male on 5th February and a female on 7th December. Both birds were in an extremely emaciated condition and are now in Mr. Plowden-Wardlaw's possession.—P. A. CLANCEY, Glasgow.

The turtle dove and little auk are occasional visitors to this area.—EDITORS.

**Black Guillemot at Gullane, East Lothian.**—At Gullane on 6th October 1949 I saw a black guillemot *Uria grylle* in full summer plumage, swimming just off shore. On the mornings of 7th and 9th October the bird was seen standing on the shore among some gulls at the Aberlady end of Gullane sands. On our approach it waddled off into the water, and leisurely swam away.

This record would appear to be of interest as the black guillemot has not been proved to breed in this area for a long time (L. J. RINTOUL and E. V. BAXTER, 1935, *A Vertebrate Fauna of Forth*, Edinburgh), and, according to *The Handbook of British Birds*, does not as a rule move to any great distance beyond the normal breeding range of the species.—R. S. WEIR, Dunfermline.

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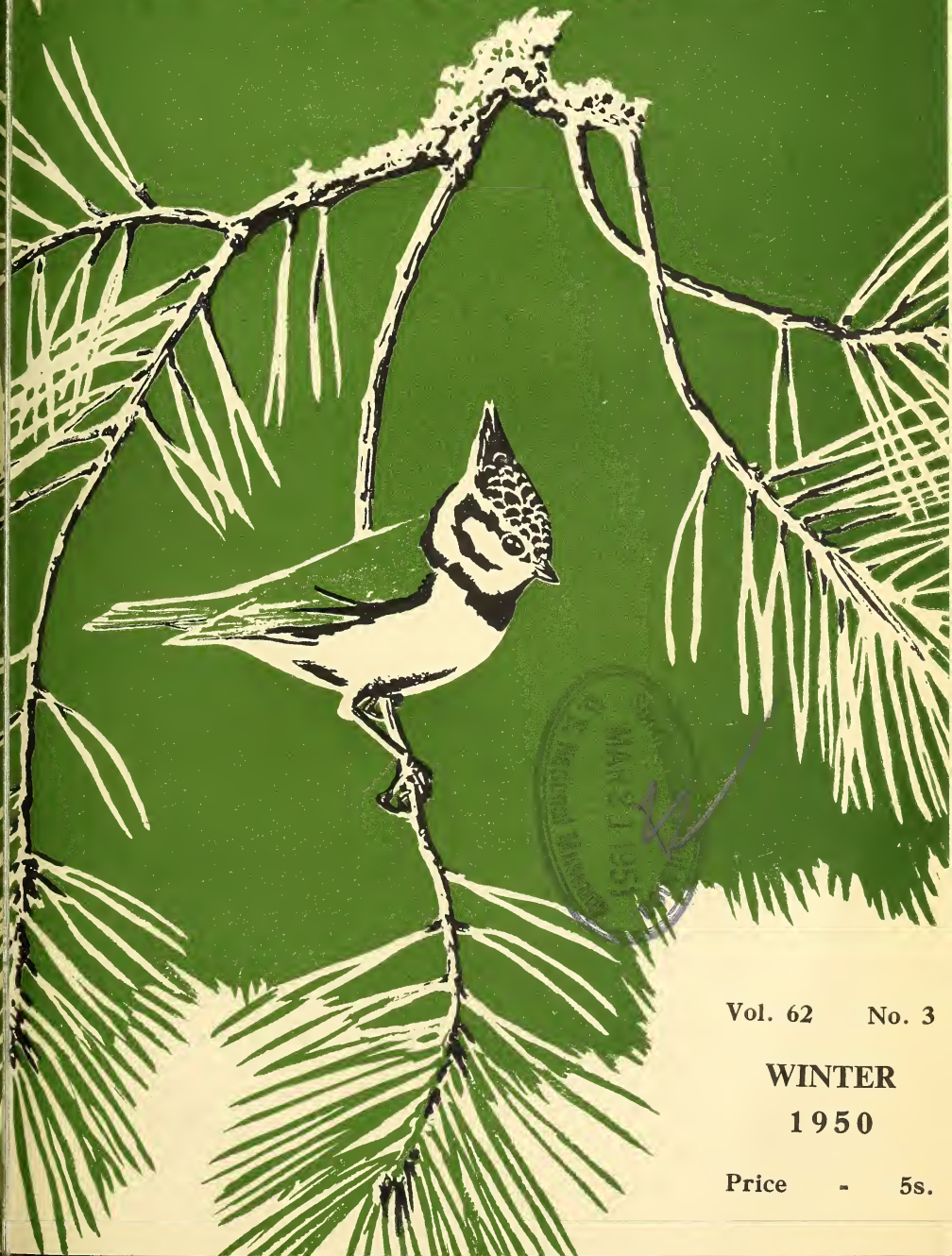

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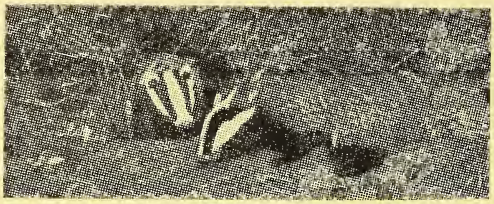

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# The Scottish Naturalist

Volume 62, No. 3 Winter 1950

## A HISTORY OF THE OPAH *LAMPRIS GUTTATUS* (BRÜNNICH)

Philip A. Orkin

Aberdeen

Over two and a half centuries ago Robert Sibbald figured in his *Scotia Illustrata* a " piscis maculis aureis " (fish with golden spots) which was cast up " near the North Ferry at Leith " in 1664. This fish, which we now call the opah, is one of the most beautiful and mysterious of the occasional visitors to our shores. Beautiful it certainly is, with its great elliptical form, bright, metallic, greenish-blue colour dappled with pale yellow spots, scarlet fins and large golden eyes—" like some prince of Neptune's court in gala attire ", says Lacepède. Mysterious it is as well, for even to-day we have very little knowledge, other than anatomical, about the opah, its habitat, migrations, breeding and development ; we are not even sure about how it swims. But many scattered observations lie buried in the literature, and it is one of the objects of this article to compile them into a sort of preliminary Natural History of this interesting fish. The best previous accounts are those of Cuvier & Valenciennes (1835), over a century old, Smitt (1893) and Gudger (1930, 1931) ; the last deals mainly with American and Hawaiian records ; the monographs of Bakker (1822) and Ekhoff (1875) are devoted almost entirely to the skeleton.

So striking a creature has everywhere attracted attention, and it is known by many names. It is mentioned in the Edda



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where the Icelanders call it Gudlax, God's salmon ; the Germans still call it Gotteslachs, the Danes, Glansfisk, glittering fish, and so on. English-speaking peoples call it Opah, Kingfish, Moonfish, Sunfish, Jerusalem Haddock, Mariposa, etc. The name opah has the merits of brevity, wide usage and definiteness ; other names are either very local or are also applied to other species. It arose in the following way : in 1750 one of these fishes, stranded, like Sibbald's specimen, in the Firth of Forth, was brought to London and exhibited before the Royal Society. There (Mortimer, 1750) " The black Prince and his Cousin from *Anamaboe* [a Fante village in what is now the Gold Coast] on the coast of *Guinea* and Mr. *Creighton* formerly Governor of *Capo Corso Castle*, upon seeing this Fish, immediately knew it, and said it was common on that Coast and very good to eat. The Natives call it *Opah*, and the *English* there call it the *King-fish*."

Opahs are known from the Canaries and the Cape of Good Hope, but neither Fowler (1935) nor Irvine (1947) give any records from the West African mainland, so it is certainly not " common on that Coast ". More likely Mr. Creighton and the " black Prince " were referring to one of the large, deep-bodied Carangoids (e.g. *Scyris* or *Chloroscombrus*), well known food-fishes of those parts, which superficially resemble the opah. For that matter, the horse-mackerel *Caranx hippos* is called " Opaa " in the Fante language at the present day (Irvine, p. 140).

The opah has also been reported from Western Europe, the Mediterranean, New Zealand, Tasmania, Japan, Hawaii, California, British Columbia, Alaska, Florida and New England. Almost all the records, however, come from Western Europe and Madeira in the Atlantic, and Western America and Hawaii in the Pacific.

Wherever taken to-day the opahs are referable to a single species whose scientific name is still a little uncertain. All accept the generic name *Lampris* Retzius, 1799 (from the Greek *lampros*—beautiful, radiant), but there are at least four specific names in current use : *pelagicus* (= *Scomber pelagicus* Gunner, 1770), *luna* (= *Zeus luna* Gmelin, 1789), *guttatus* (= *Zeus guttatus* Brünnich, 1788), and *regius* (= *Zeus regius* Bonnaterre, 1788). Other names, *imperialis*, *stroemii*,

*opah*, etc., which are much later and completely disused, need not be considered.

Gunner's name is a misidentification of *Scomber pelagicus* Linnaeus, 1758 (a juvenile *Coryphaena hippurus*) ; but the combination *Lampris pelagicus* has appeared in several recent standard works (Smitt, 1893 ; d'Ancona, 1933), as well as two Scottish faunal lists (Elliott, 1901 ; Elmhirst, 1926).

The name *luna*, found in most British references, is anticipated by both *guttatus* and *regius*, but which of these takes priority is not known. If common usage is any guide, *guttatus* is to be preferred as it was used by Retzius (1799), Cuvier & Valenciennes (1835), and many other authors up to the present day, e.g. Collett (1874 *et seq.*), Murray & Hjort (1912), and Ehrenbaum (1928, 1935). On the other hand *regius* was rarely, if ever, mentioned, except as a synonym, before Goode & Bean (1895). It seems ill-advised to revive a moribund name unless it is certainly a prior one.

As to the gender of *Lampris*, classical names ending in *-is* are usually feminine, but not invariably (e.g. *Agis*) ; there is no inescapable reason therefore for changing the specific termination from *-us* to *-a* as some authors have done. Thus the name of our fish, after a hundred and fifty years, is still *Lampris guttatus* (Brünnich).

Though most of the other names are strict synonyms, several may be considered further. Gilchrist (1903) has described *L. immaculata* from South Africa, an opah identical with ours except that it has no spots. The only other South African record known to him was also of a (probably) spotless fish, and Smith (1949) knows of no later records. But Collett (1879) describes an opah taken off Norway whose spots were not visible until the scales were removed, so Gilchrist's specimen is probably not peculiar to South Africa. Incidentally, the spotting is very variable, and opahs are known from the western Atlantic and Hawaii which are spotted on the fins as well as on the body (Gudger, 1926).

Relegation to synonymy has also overtaken *L. lauta* Lowe, 1837, from Madeira. Lowe gives four points of difference for this species—six branchiostegal rays instead of the seven in Cuvier & Valenciennes' description, the tongue devoid of recurved prickles, the tail without lateral keels, and a different

vertebral count. As to the first point, competent zoologists have found both six (Retzius) and seven (Gunner, Cuvier, Bakker) branchiostegals in European specimens ; all those which I have examined had six. As to the second point, no opah which I have examined had any prickles on the tongue. These are mentioned in most British descriptions between 1765 and 1835, which are all derived from Mortimer (1750).

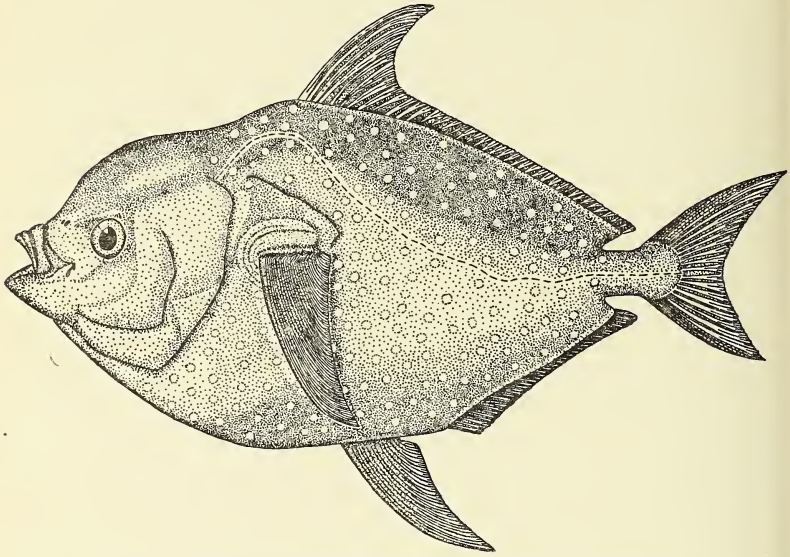

Fig. 1.—The opah *Lampris guttatus*, (redrawn after Smitt).

One wonders if the latter was perhaps referring to the pharyngeal teeth, with which the opah is certainly well provided. As to the third point, the opah has no lateral keels, Richardson (1836) notwithstanding. The last point is admittedly an error (Lowe, 1839).

A good species, however, is *Lampris zatima* (Jordan & Gilbert, 1919), found in the Miocene of Southern California, to which further reference will be made.

Of the early descriptions, Cuvier's excepted, none is free from error ; many of them appear to have been made from damaged specimens. The same may be said of illustrations, the most accurate being that of a juvenile in Cuvier & Valenciennes, which shows well the great relative length of the fins at this age. More recently Smitt has given us an even

better picture of an adult. Most illustrators err in depicting the pectoral fins. They fail to notice that the line of their insertion into the body is horizontal, that they are turned down, and that a prominent dermal fold lies above and behind each of them.

Concerning the angle of the pectoral, Boulenger (1902) shows that it is anatomically impossible for this fin to be elevated very far above the horizontal, though it can be depressed right against the body, and he remarks that this point is correctly shown by authors like Gunner and Smitt [and Sibbald] who had seen fresh specimens. A photograph of a freshly-caught opah, taken from a rather unusual angle (Clarke, 1905) shows the pectoral fin in what is probably a natural position, a little below the horizontal.

As to the fold above this fin, Retzius calls it a deep cleft, wonders at its significance, and makes it part of the definition of the genus *Lampris*. But, as Cuvier rightly remarks, it is only a shallow fold which is also found in other fishes. A partly decomposed opah, which I saw, exhibited the condition as Retzius described it. From the context of his account, his specimen was far from fresh ; this must have misled him.

In the scheme of classification *Lampris* is often excluded from the highest grade, the Acanthopterygii, although it only just falls outside it (just inside it according to some), for the following reasons : it has no spiny fin-rays ; it has an orbito-sphenoid bone in the skull, a feature which is found in no spiny-rayed fishes except the very primitive Berycidae ; and it has 13 to 17 soft rays in each ventral fin. Among the Acanthopterygii only some of the Berycidae have as many as 13. The Miocene opah *Lampris zatima* has fewer dorsal fin rays but the ventral count is 14, so this condition may be primitive.

But *Lampris* resembles the Spiny-rays in many respects, for example : the air-bladder is closed ; the supraoccipital has grown forward and separates the parietals ; the pelvis is joined to the shoulder-girdle ; the branchiostegals number six or seven.

*Lampris* has a protractile mouth of a rather unusual kind, the praemaxillary and maxillary bones sliding forward when it is opened. (In most fishes with a protractile mouth, only one end of the maxillary moves forward, the other end

pivots about its point of attachment to the vomer.) Several other fish possess this peculiarity in a greater or less degree, and Regan (1907, 1929) has united all of them into an order under the name Allotriognathi (*allotrios gnathos*—outlandish jaw). They seem a strange, heterogeneous assemblage—the long ribbon-like oar-fish *Regalecus*, the ribbon-like, but otherwise quite dissimilar *Lophotes* and *Eumecichthys*, the wry-tailed deal-fish *Trachypterus*, the almost discoidal *Velifer*, and the remarkable *Stylephorus* whose complex jaw-mechanism resembles some Heath Robinson contraption.

In a classification based on evolutionary principles one expects, and finds, groups which have diverged so little as to be doubtfully separable ; others may have diverged so widely as to make it a matter of opinion whether they are related at all. The latter fate seems to have overtaken the members of the sub-order Allotriognathi. Other than the peculiar mouth (which is not expressed to the same degree in all species), they have almost no distinctive features in common : *Lampris* has 13-17 ventral rays, *Velifer* 8-9, *Trachypterus* 0-7, *Regalecus* 1, *Stylephorus* 0 ; the caudal fin is large and lunate in *Lampris*, small and rounded in *Lophotes*, asymmetrical in *Trachypterus* and *Stylephorus*, vestigial in *Regalecus ; Velifer* has spiny rays ; the mouth of *Eumecichthys* is not protractile ; *Trachypterus* has no air-bladder, etc. But whoever ventures to break up this order will have to put the components elsewhere or make a number of orders out of them.

Surprisingly enough, the gorgeously coloured opah is said to be a fish of the deep sea, rarely seen at the surface or in shallow water except as a straggler, ill, chilled or otherwise incapacitated. Farran (1923) describes its confused and aimless behaviour when near the shore ; it is quite evidently out of its element. It can hardly be its shape that makes it inefficient in this situation ; many large, discoidal fishes live close inshore, especially in the tropics.

The late Prof. D'Arcy Thompson (1920) has assembled a good many records of their occurrence off our coasts. They are often taken by long-liners in 100 fathoms near the edge of the continental shelf. Records of their capture, mostly along the edge of the shelf, extend from Varangerfjord at the north-east corner of Norway, in 70 deg. north latitude (Collett,

1902), to Madeira where, says Lowe (1843), they are highly prized, and taken only at considerable depths. They are not taken by long-liners in winter and spring in the northern areas ; in Madeira they are fished from May onwards, according to Lowe. In Britain they may be cast ashore in any month of the year, although less often in winter.

They are rarely taken by trawlers. Either they do not frequent the bottom (but Gudger (1926) gives an account of one taken off western Florida with its stomach full of clams), or else, which is more likely, they are not common where trawlers usually go. Clarke (1905) records one taken in a trawl 20 miles off Hartlepool, and a specimen in my possession was trawled 80 miles north-east of Aberdeen in the spring of 1949.

Why do they sometimes drift helplessly ashore ? Smitt remarks that once opahs come to the surface they seem incapable of getting down again. He suggests that the cause may be injury to the air-bladder due to a too rapid ascent, but the more usual explanation is that they are numbed by the cold. A deep-sea fish should be accustomed to low temperatures, but other factors may be involved. It is known that active fishes can maintain a temperature much above that of their surroundings. In this way the opah in pursuit of prey may penetrate far into cold, deep water, rising to the surface for rest and warmth. Wandering too far north, it finds no relief at the surface when chilled, and is soon rendered helpless. It is then, presumably, unwilling rather than unable to descend. This is largely surmise, but it is not easy to explain otherwise how the opah, which is known to feed actively in 100 fathoms off the Hebrides, is found at the surface in the North Sea paralysed by a temperature little if at all lower than that of its more usual surroundings.

On the California coast the opah suffers much the same fate. Gudger (1931) says, "None on the Southern California coast has ever been taken on the hook as far as records go [but see below]. The universal explanation of their capture at the surface at Santa Catalina is that they get into cold water and become more or less disabled, come to the surface and float about helplessly, or feebly swim into bays where the water is warmer—in any case are taken at the surface either in nets or with the gaff." In fact the cold inshore waters of Southern

California come as a disagreeable surprise to many a visitor to that otherwise balmy climate—and to the opah as well.

At Lompoc in Southern California are vast beds of diatomaceous earth which are of Miocene age. Here are found the remains of an opah *Lampris zatima* which, except for its smaller size (up to 25 inches) and fewer dorsal fin-rays, can hardly be told from its modern representative (David, 1943). A few miles to the west of Lompoc similar deposits of diatoms are still accumulating in the shallow sea in the area where opahs are reported as drifting about disabled by the cold. One is tempted to imagine some of these sinking to the bottom and being covered up as were their predecessors twenty million years before.

Of the breeding and development of the opah almost nothing is known. No free eggs, larvae or very young forms have ever been described (d'Ancona, 1933). Females containing unripe eggs are recorded from time to time, e.g. Fulton (1901) records one of 3½ feet length and 85 pounds weight taken off Scalloway in the Shetlands on 18th October 1900. The ovaries weighed 276 and 255 grammes and contained " an enormous number of eggs ", the largest being 0·82 mm. in diameter. In eggs of 0·7 mm. the germinal vesicle measured 0·115 mm. They were yolked but not densely opaque. He concludes that the eggs are pelagic.

On 27th July 1923 a spent female 38 inches long came ashore at Rosslare near Wexford. It still contained a few crushed eggs about 2·5 mm. in diameter (Farran, 1923). Early in the nineteenth century a juvenile 25 inches long was taken off Bordeaux ; it is illustrated in Cuvier & Valenciennes, and is the smallest opah recorded, says Gudger (1930), although several slightly smaller ones have been recorded since. Between these two stages, the mature but unextruded egg and the juvenile of 2 feet or so, lies an unfilled gap in our knowledge, a gap whose width is quite unusual except in the case of those excessively rare fishes of which only a few specimens of any kind have been taken. But although less than half a dozen opahs below 30 inches are known from the Atlantic, above 30 inches the records run into the hundreds.

Herald (1939) has made an interesting compilation of the 29 records of the opah known from the west coast of North

America. One of them, taken in 1938 and weighing 13 pounds, was 23 inches in length—smaller than Cuvier's specimen. Another, weighing 10 pounds, must have been smaller still. The 13-pounder was taken on a hook with a brass spoon and "fought like a large salmon until brought to gaff". Five out of the 29 specimens were under 18 pounds weight, and presumably well under 30 inches in length. An examination of all the records does not suggest that the opahs of the Pacific are smaller than those of the Atlantic, but for some reason, very young examples seem relatively more common in the north-eastern Pacific.

D'Arcy Thompson (1920) has suggested that the relative abundance of the opah about the 100 fathom line in middle and late summer is connected with a breeding migration, and Farran's discovery of a spent female on the Irish coast in June lends some colour to this. But if so, it is remarkable that no early stages have been taken, considering the truly vast amount of trawling and plankton research in the North Atlantic during the past century.

In contrast it may be noticed that the oar-fish *Regalecus* is very much rarer, yet d'Ancona (*loc. cit.*) records a good series of larval and young stages. It looks as though the early life of the opah is passed in unexplored or inaccessible waters. Only when they approach a length of 30 inches or so do they venture over the continental shelf.

The opah feeds for the most part on pelagic cuttlefish such as *Ommastrephes* and *Onychoteuthis*, as many as 50 beaks having been taken from a single stomach. Other animals reported from the stomach contents are *Thysanoessa inermis* and other crustaceans (Collett, 1902), the littoral clam *Donax variabilis* (Gudger, 1926), isopods and fish (Lowe, 1843), rhizostomes and other scyphomedusae (Cuvier & Valenciennes, 1835). In a specimen taken about 50 miles west of Achill Head at the beginning of June 1950, the stomach contained half-a dozen squid, the beaks of several dozen more, a number of fish bones, a freshly taken *Gadiculus argenteus* and the otolith of a *Gadus poutassou* (D. W. Tucker, private communication). These two fish are known to occur at considerable depths.

Whoever examines the structure of an opah will be struck by two unusual features, the large horizontal, sickle-shaped

pectoral fins, and the immense and solid muscles which move them. These great muscles require large and firm origins, and the shoulder bones of the opah form broad, blade-like expansions, whose unusual size has always attracted the attention of anatomists.

What is the function of this powerful apparatus? Here we stand on less firm ground, for nobody has ever seen an opah living in its normal surroundings. Until this happens any suggestions must be very tentative indeed.

The paired fins of bony fishes function chiefly as brakes. That is why, in the most advanced types, the pelvic fins are shifted forwards, and the pectorals upwards; the nearer the paired fins are to the centre of gyration of the fish, the less will be its tendency to turn somersaults when the brakes are applied. The horizontal pectorals of the opah can hardly exert much braking effort unless they can be made to tilt upwards. This they must do if only to counteract the forward pitching moment of the pelvics, which would otherwise stand the opah on its head whenever it tried to stop itself. The dermal fold, previously mentioned, must play some part in this tilting, for the skin of the opah is as thick and tough as sole-leather, and without this fold it would not be easy to change the angle of attack of the pectoral fin.

Besides using them as brakes, bony fish often use their pectoral fins as oars for making small, accurate movements as in feeding, holding still against slight currents, backing slowly, etc., never for rapid or prolonged swimming. But whether for braking or slow movement, the pectoral muscles need not be very large. It seems as though the great muscles of the opah can only be meant for rapid propulsion. In conjunction with the stiff, wing-like pectoral fins they must enable the opah to fly through the water rather like a penguin, and to twist and turn with the greatest ease.

But it must be admitted that swimming by undulations of the tail and body seems to be the most efficient method. The swiftest fishes depend very little on their paired fins, and whales and dolphins, returning to the water, have largely given up their limbs, and gone back to wriggling. Among the truly marine vertebrates only penguins and sea-turtles swim by means of flippers—their bodies are too stiff to bend. Most

likely then the opah swims with its large, lunate tail, and uses its pectorals for sudden turns and rapid acceleration.

At first glance the opah does not appear very speedy or manoeuvrable, yet the pelagic cuttlefish which form its usual food are among the swiftest and most agile of all sea-creatures. Swimming as they do by pulsations of the mantle, their motion is rapid, jerky and unpredictable. The opah must be regarded as a type highly modified for dealing with these "artful dodgers". And the scores of beaks which may be found in a single stomach, the millions of years during which the opah has existed in the sea almost unchanged, bear witness to the success of this type.

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# THE WHOOPER SWANS OF LOCH SPIGGIE, SHETLAND

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Scousburgh, Shetland

## Introduction and Habitat

Owing, perhaps, to the high acidity and lack of bottom vegetation in most Shetland lochs, with consequent scarcity of food, there are not many places where whooper swans *Cygnus cygnus* winter in any abundance. There are a few places where small numbers are regularly to be seen (e.g. the brackish end of Strom Loch, Whiteness and some where they are to be seen on occasions (e.g. Loch of Clumlie, Dunrossness), but the two main wintering places seem to be the loch at Uyeasound, Unst (54 during winter 1948-49 : 31 during winter 1949-50) and the Loch of Spiggie near Scousburgh. These are fresh water lochs and Spiggie, with an average winter pH of 8·5 in the shallows, is considerably less acid than the peaty lochs in the district.

Apparently the Scousburgh locality has been an important winter headquarters for some time, for the Rev. John Mill, in the *Old Statistical Account of Scotland*, 1793, says : " Swans in great numbers resort to this parish in October and November, and remain about the lochs of Skelberry and Scousburgh during the winter. In the end of April, or beginning of May, they migrate to Norway, where their young are hatched." Mill was a great character in his day and a very observant man, an amusing and indefatigable diary writer from 1740 to 1803. His " this parish " is Dunrossness and his " lochs of Skelberry and Scousburgh " are Brow * and Spiggie.

Mr. T. Henderson of Scousburgh, the proprietor of Loch Spiggie, tells us that in times past, when swans were shot for

* Spiggie and Brow are separated only by a narrow marshy belt, and for the purposes of this paper Brow is treated as part of Spiggie. Brow is not much frequented by the swans.

food and feathers, the disturbance was such that few remained throughout the winter. This is substantiated by Edmonston (1809). He describes how a horse was used as a moveable "screen" for shooting from loch shores and adds: "A few swans have been known to spend the winter in the loch of Scousburgh in the parish of Dunrossness." Dunn (1837) says that: "Large flocks of this bird annually visit Shetland and Orkney in the spring and autumn . . . at which time they are frequently shot by the fowler, who secretes himself by the side of the water. . . . Five have been killed at one discharge in this manner." Evans and Buckley (1899) consider December records for Spiggie so unusual as to be worth recording individually. Fortunately, swan shooting has practically died out in Shetland and nowadays some, or all, of this spectacular herd can be seen on the loch from autumn to spring. How variable the numbers can be, comparing one winter with another, will be seen in the following communication.

Whoopers do not normally breed on Shetland, but a wounded pair did so successfully on Spiggie for a number of years. This appears to be the origin of the statement in the *Handbook* (3 : 171) that: "Pinioned birds bred Shetlands 1910 and one or two subsequent years," but the present Mr. T. Henderson has given us further details (see also Henderson 1910). In 1905, when swans were still being shot, a bird with a permanently maimed wing was left on Spiggie at the end of the winter. A second wounded bird was left on Loch Clumlie in 1907, and this was caught and brought over to Spiggie where it joined the other bird. They proved to be a pair and first nested in 1910 when they reared three young. They continued nesting, but irregularly and not always successfully, into the war years of 1914-18. At the end of the war these birds, together with a pair of introduced mute swan *Cygnus olor* and their progeny, were all shot. We quote a note from Mr. Henderson (personal communication) on this: "Actually they weren't shot by poachers for food. I could have forgiven that. What happened was this. In 1919 all the youths of the district who had been at the war were returning home, and practically 90 per cent. of them brought home guns. They shot every darned thing that flew

during the winter of 1919-20, including our swans (both *C. cygnus* and *C. olor*) and, so far from these being used as food, the wing pinions were stripped and the carcasses left in most cases to rot where they fell."

Prior to this the mute swans and their various families were comfortably established, but neither the adult whoopers nor their young ever settled down to regard Spiggie as their home. The cygnets always left with the northward migrants at the end of their first winter and they never returned to breed. When the passage migration was on in the autumn the pair of wounded birds would become very excited, call a great deal, and sometimes set off southward on foot while, in spring, as the last of the active birds were leaving, this pair would start walking northwards at least once a season and have to be turned back with the aid of a sheep dog.

The *Handbook* (3 : 168) suggests that salt water, rather than fresh water, is the normal winter habitat. This is far from the case in Shetland. We have only seen whoopers on salt water on the Loch of Strom (and here they are almost always at the brackish north end), and occasional passage migrants in sheltered bays. Saxby (1874) states that Bewick's swan *C. bewickii* was a regular spring and autumn passage migrant in his day, and gives the curious piece of information that : ". . . its flesh is acknowledged to be far superior in flavour to that of the Hooper." He noted that it was usually seen on salt water. We have failed to see this species on Shetland, and of recent years it has become far less common in Scotland, the Outer Hebrides and Ireland (George Waterston, Dr. J. W. Campbell and Robert Ruttledge : personal communications). Mr. T. Henderson tells us that he has not seen a Bewick's at Spiggie since about 1926, but there is one recentrecord for Unst (Moore, 1948).

Normally the Spiggie whooper swan population is practically confined to the north end of the loch where the water is only 18 inches to 2 feet deep. On 27th October 1948, when 79 swans were present, the writers dredged twice across this area and specimens of all the plants collected were kindly identified by Dr. J. W. G. Lund at Wray Castle, Ambleside. The floor of the loch here was completely carpeted by a small form of the stonewort *Chara aspera* with occasional patches of

amphibious persicaria *Polygonum amphibium*, creeping scirpus *Eleocharis palustris*, floating manna-grass *Glyceria fluitans* and bogbean *Menyanthes trifoliata*. The following algae were abundant, attached to and entangled among the roots of *C. aspera* : *Rivularia*, *Cocconeis*, *Rhopalodia*, *Cymbella*, *Epithemia*, *Navicula*, *Cosmarium*, *Aphanochaete* and *Coleochaete*. Druce (1922 and 1925) records two more species of stonewort from Spiggie : *C. delicatula* and *C. contraria*.

Here, in this extensive shallow area, the swans " up-end " and graze on the plentiful vegetation, sometimes first scratching backwards with their toes if the water is shallow enough. A large flock of duck (mostly goldeneye *Bucephala clangula* and not infrequently tufted duck *Aythya fuligula*) usually feeds just downwind of the herd, reaping the benefit of the disturbed bottom. Miss Rintoul, Miss Baxter and Dr. J. W. Campbell tell us that they have seen similar associations between mute swans and wigeon *Anas penelope*, and whoopers and wigeon.

## Winter Population : Size and Mobility

From 1947 to 1950 we were living close to Loch Spiggie and counted the swans several times each week throughout the winters. These counts are summarised in Table 1, and more detailed observations are given below together with brief notes on the two previous winters.

*1945-6.*—50-60 swans wintered on Spiggie.

*1946-7.*—The herd peaked at some 60-70 birds before mid-winter and these remained, mostly feeding at the north end of Spiggie, until the abnormally long and severe frost of February and March (see Venables & Venables, 1948) completely froze all the lochs on Shetland. On no occasion during this period was any swan seen on salt water or attempting to feed there and, as the land was snow-covered, it is difficult to imagine what they could have eaten. After about one week of these hard conditions, all except 15 birds left Spiggie and were not seen again. Five of the remaining 15 died but 10 managed to survive. These stayed in the moving water of the outlet stream which they kept open by constant activity. The surviving whoopers on the Loch of Strom merely stood on the ice in a comatose way until the thaw. On a visit to

Scousburgh from 7th to 12th April we noted 13 swans, and the last bird, a passage migrant, was seen on 5th May.

*1947-8.*—The counts for this and subsequent winters are shown in Table 1 : each month is divided into four parts—

TABLE 1.—Average number of whooper swans per quarter month and percentage of cygnets per month

| | Winter 1947-8 | | Winter 1948-9 | | Winter 1949-50 | |
|---|---|---|---|---|---|---|
| | Total No. | % of Cygnets | Total No. | % of Cygnets | Total No. | % of Cygnets |
| Sept. D | — | — | < 1 | 0 | 1 | 0 |
| Oct. A | < 1 | 0 | 1 | 17·7 | 5 | 3·1 |
| B | — | | 10 | | 3 | |
| C | 22 | | 28 | | 2 | |
| D | — | | 74 | | 39 | |
| Nov. A | — | 11·5 | 86 | 22·5 | 60 | 5·4 |
| B | 10 | | 88 | | 58 | |
| C | 23 | | 61 | | 62 | |
| D | 28 | | 58 | | 69 | |
| Dec. A | 34 | 11·7 | 68 | 26·6 | 62 | 1·4 |
| B | 34 | | 50 | | 57 | |
| C | 34 | | 37 | | 36 | |
| D | 35 | | 29 | | 18 | |
| Jan. A | 62 | 9·8 | 35 | 33·3 | 20 | 0 |
| B | 74 | | 23 | | 21 | |
| C | 86 | | 23 | | 21 | |
| D | 83 | | 18 | | 18 | |
| Feb. A | 81 | 13·1 | 21 | 39·1 | 18 | 0 |
| B | 83 | | 23 | | 26 | |
| C | 84 | | 20 | | 22 | |
| D | 81 | | 28 | | 28 | |
| Mar. A | 81 | 16.7 | 26 | 43·0 | 24 | 0 |
| B | 32 | | 18 | | 11 | |
| C | 5 | | 13 | | 14 | |
| D | < 1 | | 8 | | 5 | |
| Apr. A | — | — | 8 | 67·8 | 2 | 0 |
| B | — | | 7 | | 3 | |
| C | — | | 7 | | — | |
| D | — | | 6 | | — | |
| May A | — | — | 1* | 100* | — | — |

* One, later two, first-year birds summered.

the first three parts are normal seven-day weeks and the last covers the balance of the month. The figures give the size of the total Spiggie herd and were obtained by averaging the individual counts made during each period. The right-hand columns show the percentage of cygnets each month.

For the winter under discussion the October figures represent migrant flocks which settled on Spiggie for a few hours, or sometimes days, before moving on, but from 19th November onwards swans were always on the loch right throughout the winter, reaching their highest numbers by the third week of January. It will be noted that during this winter "plateau" the figures were seldom the same from week to week. This was due to occasional movement between Spiggie and irregularly frequented lochs. These wanderers were few in number and were all white birds without young. This point is emphasised by the fact that from 16th January to 5th March, though the number of white birds varied between 70 and 75, the number of cygnets remained constant at 11.

At the end of the first week of March there was a sudden spurt of activity and excitement—parties getting up and circling with their beautiful musical calls while others, on the loch below, were sitting upright with stretched necks and waving wings giving an answering clamour. The local saying about this spectacular behaviour is that the swans are clearing their anchor chains and singing their capstan shanty. This proved to be the case and the numbers rapidly fell off from that date, though there would be a temporary increase as northward-bound passage migrants passed through. The last birds, two adults with three cygnets, were seen on 25th March.

*1948-9.*—After the autumn passage, the highest numbers (88 in the second week of November) were reached considerably earlier than in the previous winter. During that month, however, we had an abnormal series of severe gales which created such a surf at the shallow end of the loch that practically all the vegetation was torn up and washed ashore. The carpet of *Chara* disappeared, the loch floor being left bare and as "rippled" as the sea sand at a low ebb. Almost immediately the swans started to leave, and Table 1 shows how the numbers fluctuated at first and then fell off to the twenties

by January. It was established by means of enquiry, personal search and correspondence in the two local papers that these missing swans did not winter in other parts of Shetland.

The remains of the herd almost deserted their usual quarters at the shallow end of Spiggie, and frequented the west side, the marshy area between Spiggie and Brow, and also the small loch of Hillwell, one mile to the south. In normal years this is only an " occasionally-visited " loch, but it has had to be included in the counts for this winter. Most of the remaining birds left in March, but a pair of adults with four young stayed until 29th April. These were frequently in the company of an apparently wounded cygnet that had been on Hillwell for most of the winter but, being almost incapable of flight, it was forced to remain behind when the family party migrated.

By mid-June this bird was capable of flying to Loch Brow (one mile away) though it never stayed there for more than a few hours before returning to Hillwell, where it spent more of its time grazing on the shore than feeding in the water. By that time a really good view in bright light was necessary to see that it was not in fully white adult plumage. It had a little ash-brown flecking on the upper neck, head, face and back but this was far from distinct. The yellow of the bill was apparently as bright as in the adult. By mid-August it was indistinguishable from an adult bird. On the night of 7th-8th July another first-year whooper appeared out of the blue and joined the Hillwell bird. This newcomer was rather more heavily flecked on the upper neck, head, face and back and also had some flecking on the wings and rump. The yellow bill was equally bright. This bird, too, was indistinguishable from an adult by mid-August. These two birds kept together until the autumn migrants started passing through. One left with passage birds on 13th September and the other with more passage birds on 10th October.

*1949-50.*—During this winter we took regular counts until 6th January. We were then away from Shetland until April, but Mr. T. Henderson, Mr. W. Leslie and Mr. R. Bairnson kindly counted the swans for us.

The herd peaked at over 60 birds by mid-November, but once again, and in spite of a very open winter, many of the

birds left by mid-winter. It is by no means certain, however, that they left the islands. On our return to Shetland in April we heard frequent stories of small parties of swans paying short visits to many of the lochs of Mainland (i.e. the main island of Shetland) throughout the second half of the winter. A letter from Mr. Charles Inkster of Mid-Yell gives a similar report for the island of Yell where, normally, it is very rare to see a swan once the migratory movement is over.

The remainder of the Spiggie herd was more mobile and scattered than usual so that we have had to include the whole group of lochs—Spiggie, Brow, Hillwell and Clumlie—in the counts given in Table I. Two possible theories to account for the failure of the main herd to winter on Spiggie suggest themselves. One is the great increase of duck shooting that year, including the introduction of a boat on Hillwell, leading to excessive disturbance. The other is greater mobility owing to the complete absence of cygnets (see below). Normally the "wandering" birds are white birds with no young, and during this winter the whole herd came into this category. This suggests that the presence of family parties helps to anchor the herd to one spot and provide a nucleus to which the wanderers return.

## Winter Population: Family Size and Percentage of Cygnets

It is well towards the end of the autumn passage before any cygnets appear on Spiggie (see Table 1). It is not known however, whether the earlier "white" arrivals are second winter birds or fully adult swans that have failed to rear young.

During the period of peak numbers in early November 1948, the individual family parties on Spiggie were counted separately. This was not particularly difficult as each adult pair and its young usually kept well together. On 2nd November and from 7th to 15th November there were 88 swans on the loch: 65 white birds and 23 cygnets. The cygnets were divided into eight families (5, 4, 4, 3, 2, 2, 2, 1. Average = 2·9). The *Handbook* (3 : 170) gives five to six as the usual clutch of eggs, with four and eight as the extremes.

Judging by the size of the families at the time of their arrival in Shetland there must be a considerable egg or chick mortality. This is borne out by counts in Shetland of 34 further families (10 ones, 5 twos, 9 threes, 8 fours and 2 fives. Average = 2·6.)

Of the 65 white birds, 16 (= 8 pairs : 24·6 per cent.) had cygnets while 49 (75·4 per cent.) had none. No doubt this high percentage without young is largely due to the presence of second winter birds in the herd. Dr. Finn Salomonsen (personal communication) informs us that whoopers do not nest until they are two, or possibly three, years old and, as we have shown above, birds slightly over one year old are indistinguishable from adults.

TABLE 2.—Percentage of Cygnets on Spiggie

| Winter | Nov. % | Dec. % | Jan. % | Feb. % |
|---|---|---|---|---|
| 1947-8 | 11·5 | 11·7 | 9·8 | 13·1 |
| 1948-9 | 22·5 | 26·6 | 33·3 | 39·1 |
| 1949-50 | 5·4 | 1·4 | 0 | 0 |

Table 2 shows the startling drop in the proportion of cygnets for the winter of 1949-50. We saw only three broods (3, 2, 1) and the last of these, the single, left in the third week of December. After this only white birds remained. This links up with information concerning the previous breeding season in Iceland. The summer of 1949 in Iceland was the worst and latest since about 1885. Mr. G. K. Yeates (personal communication) tells us that it was mid-June before the lakes in south Iceland even began to thaw (presumably they would be still later in the north) and, from his own observations, he doubts whether any swans managed to nest "save an odd pair or so."

Other than a few pairs in Scotland, whoopers breed in Iceland and in north Scandinavia up to 70° Lat. (and also further east). The director of the Meteorological Office, Harrow, has kindly supplied data concerning the weather in north Scandinavia in June 1949. These show an average season with only slight deviations (— 2·2° F. to + 2·0° F.)

from the normal. The whooper nesting season is from mid-May to mid-June (Slater, 1901, and the *Handbook*). The fact that Iceland was icebound until mid-June while northern Scandinavia had a normal season, coupled with the surprising drop in cygnet numbers on Spiggie the following winter, strongly suggests that our Spiggie herd is of Iceland stock. On the day the proofs of this paper were corrected (5th November 1950) the Spiggie herd had built up to 47 birds, 31·9 per cent. being cygnets. This high percentage of young may possibly be explained by the fact that as the 1949 breeding season had been such a failure, there would be a corresponding drop in the numbers of white birds during the winter of 1950-51.

## Summary

Loch Spiggie, Dunrossness, has long been the main winter quarters of whooper swans *Cygnus cygnus* on Shetland. A pinioned pair bred there for a number of years. The feeding area has an average winter pH of 8·5 and a depth of 18-24 inches. A list of the bottom flora is given.

Observations on the size and movements of the herd throughout the winter seasons of 1947-50, with brief notes on the two previous winters, show :—

(*a*) Whooper swans in Shetland rarely make use of salt water even when long periods of severe frost restrict their fresh-water habitats.

(*b*) The winter herd may be scattered by a prolonged frost, or by severe gales which tear up the bottom vegetation on which the swans graze. Excessive duck shooting may cause the herd to scatter locally.

(*c*) The " white " birds without cygnets are most prone to wander, and family parties tend to anchor the herd to one locality.

Notes are given on the plumage changes of two cygnets which remained throughout one summer.

The average number of cygnets per successful pair in November 1948 was 2·9 though the average clutch size is 5·5.

There was a sudden drop in the percentage of cygnets in the winter of 1949-50 (Table 2). 1949 was an extremely late and severe spring in Iceland but was normal in northern

Scandinavia. These facts suggest that the Spiggie herd is of Iceland stock.

## Acknowledgements

The writers wish to acknowledge the very considerable help they received from Mr. T. Henderson, the proprietor of Loch Spiggie, who gave them much information, read the manuscript of this paper and took counts when the authors were away from the district. It is due to Mr. Henderson that this beautiful herd of whooper swans is now protected.

The writers wish also to acknowledge their indebtedness to Mr. W. Leslie and Mr. R. Bairnson for observations at Lochs Hillwell and Clumlie respectively.

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Fig. 1. General view of school looking south.

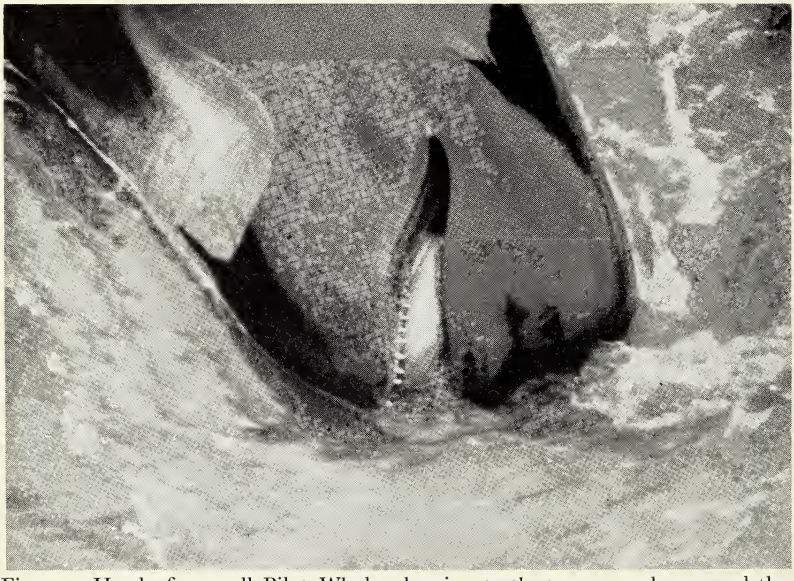

Fig. 2. Head of a small Pilot Whale, showing teeth, tongue and eye, and the characteristic colour marking under the throat.

PLATE II

*Face p. 153*

# NOTES ON A SCHOOL OF PILOT WHALES STRANDED IN EAST LOTHIAN

David Steven
Edinburgh

The stranding of a considerable school of pilot whales *Globicephala melaena* on the coast of East Lothian, at Thorntonloch on Saturday 13th May 1950, attracted nation-wide interest, and was extensively reported at the time in the press and on the radio. The purpose of this article is simply to put on record certain observations made during two visits to the scene on the 14th and 15th May respectively. According to eye-witnesses the whales came ashore on a rising tide about 9.0 a.m. The exact number originally stranded is not known, since a small group, estimated at about fifteen individuals, managed to free themselves and were not seen again. One or two dead whales also floated off, and may not be included in the total number of corpses eventually disposed of, which was one hundred and forty-seven. It appears that efforts were made on the first day to tow some of the smaller whales into deep water, but that all of them returned immediately to the beach.

My first visit to the scene was at midday on Sunday 14th May, accompanied by Dr. A. P. Meiklejohn of the Department of Medicine of the University of Edinburgh. The site of the stranding was a gently shelving sandy beach about 400 yards south of the cottages at Thorntonloch. The 5-fathom depth contour at this point is some 600 yards from the shore. The whole school lay along about 100 yards of the beach near high water mark, the whales being so close together that in many places they were three or four deep and had damaged one another considerably in their struggles. Plate II, fig. 1 shows the general scene at this time. The tide was almost full, and most of the whales were lying in 1 or 2 feet of water. Rather more than half of them still showed signs of life, though obviously they were very weak.

Some were blowing fairly regularly, others only occasionally, while many were seen making spasmodic attempts to swim. An official of the R.S.P.C.A., who had spent some hours on the spot, told me that many of the whales, which had appeared to be dead when the tide was out, had revived as soon as the water reached them.

The conditions at high tide, with the whales just awash, were particularly favourable for observing their swimming movements, though this was made difficult by the close tangle of bodies and the breaking surf. Figure 2 shows a close view of the anterior end of a small whale, on which the principal features are clearly visible. The tongue, which is flesh coloured, can be seen between the slightly parted jaws, and the teeth, of which there are ten pairs, on the right side of the lower jaw. The eye is situated a short distance posterior and dorsal to the angle of the lower jaw. Also prominent are the "beak" and the characteristic heart-shaped area of light grey skin on the ventral side, as described by Williamson (1949). Although not visible in the photograph, the region around the mouth of this and other specimens examined was marked with the circular scars made by the suckers of cuttlefish. Since most of the whales were lying on their sides and had sunk into the sand to a depth of several inches, their muscular efforts, which often reared their tails and heads well clear of the water, were quite ineffective to shift them. We noticed only one small individual still able to make rhythmical swimming movements which might have been sufficiently powerful to propel it, had it been able to free itself from the sand and from the others around it. From observing the amplitude of the stroke of the body and tail in the dorso-ventral plane, I estimated that even the smallest whales would require at least five feet of water in order to swim effectively.

We were not able to determine the sex and age composition of the school, since so many of the animals were still alive and in the water. There were three full-grown dead bulls, each over 20 feet in length, with the penis extruded. Each of these bulls was closely attended by two or three full-grown cows and a number of smaller whales, which gave the impression that the school had consisted of three distinct family

groups, each following its own bull. This seems to agree with the statements of eye-witnesses that they came ashore in three or possibly more groups, separated by short intervals of time. It seems likely also that the small group which managed to free iself represented another family. In this connection, Williamson (1948) has recently recorded a fact well known in the Faroe Islands, where this species is still extensively hunted by the population, that a single whale will nearly always rejoin the herd, but if a party breaks clear from the ring of boats driving them it will not return. The behaviour of the small whales which were towed off shore on the first day supports this observation. It seems clear that the majority of the whales comprising a school of this gregarious species have no individual freedom of action in this respect, and that judgements and decisions as to the course of behaviour must rest with one or a relatively small number of individuals, possibly the adult bulls.

On my second visit the following afternoon the tide was out, and the remaining whales had been killed. On this occasion I counted fifteen bulls of various sizes with the penis extruded. Some of them were quite small, only about 10 feet in length. By this time the local authorities had already removed some of the corpses from the beach, so that the total number of bulls was probably greater.

Most of the whales still alive at midday on Sunday were small or of medium size. All the largest specimens of both sexes were already dead. I was informed that the largest bull, which was just under 24 feet in length, died about 4.0 p.m. on Saturday, about seven hours after the stranding. It seems likely that the relatively rapid death of the larger whales was due to collapse of the thorax, since the ribs do not connect with the sternum, and, being therefore unsupported at their ventral ends, cannot sustain the weight of the body wall when the animal is out of water. This is clearly not true in the case of the smaller ones, since many of them had already survived two periods of low tide before our visit, and were still breathing regularly. More than sixty were eventually despatched by an official of the R.S.P.C.A. late on Sunday afternoon, some thirty hours after the stranding. The smaller whales probably died from exhaustion and buffeting, possibly

hastened by dehydration and sunburn. Saturday 13th May was an exceptionally fine day, hot and cloudless, and most of the whales had sustained extensive sunburn blisters, which had broken down in many places, particularly where they had been rubbed by the bodies of other whales, exposing the underlying layer of blubber. There seemed, however, to be very little haemorrhage from these wounds.

At my second visit on the Monday one of the smallest whales was taken back to Edinburgh, and was later dissected at the Royal Dick Veterinary College. It was hoped that an examination of the stomach contents would yield information on the food taken shortly before the stranding, which might throw some light on the cause of the event. Unfortunately the stomach was empty, and the intestine contained only a yellow bile-stained fluid with no recognisable animal remains. We had noticed on our first visit that many whales had vomited a yellow fluid, so that any undigested solid matter previously vomited was probably washed away by the tide. The specimen we dissected was an immature female, 6 feet 9 inches in length. It had been killed by gunshot, and appeared to be healthy and in good condition. The lungs were not collapsed, and there was no extensive internal haemorrhage. The blubber layer was about 1 inch thick over most of the body. The skull, flippers, a scapula, the cervical and some other vertebrae, a portion of the skin and blubber, the heart, part of the lungs and trachea and the kidneys were kept, and are preserved at the Department of Zoology of the University of Edinburgh.

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# THE HISTORY AND DISTRIBUTION OF THE CAPERCAILLIE IN SCOTLAND

Ian D. Pennie
Tongue

Part 2

## Moray and Nairn

From the various scattered and sometimes rather incoherent notes available on the early history of the capercaillie in Morayshire it is somewhat difficult to piece together the true sequence of events.

The earliest record is of an attempted introduction by the Earl of Fife, who obtained a few birds from Norway about 1852 and liberated them at Loch-na-bo, near Elgin, but they were never seen again. About 1860, eggs were placed under greyhens in the Castle Grant woods, but an unusually severe frost killed all the young birds in a single night (Harvie-Brown and Buckley 1895). A further attempt at Loch-na-bo took place in 1878 (Harvie-Brown 1879), but presumably this too was unsuccessful as there is no further reference to it in any of the papers.

About 1883, the Earl of Moray obtained eggs which were hatched out under hens, but again the young birds all died, although it is noted that a cock bird was seen in the spring of 1883 (Harvie-Brown and Buckley 1895). In 1884, however, the keeper found a nest containing ten eggs at Darnaway and saw three coveys of young birds. On 15th February 1886 a hybrid blackcock-caper was found dead in the Darnaway woods, where there were "a few more of such exactly the same", and in 1888 another was trapped about six miles from Forres (i.e. almost certainly in the Darnaway woods). A third was shot at Loch Loy in 1889.

By 1890 they had increased to such an extent that fifteen pure-bred capercaillies were seen at Darnaway in a single day, and in 1892 there were nine nests with an average of eight eggs each, but a letter received by Harvie-Brown in November

1894 stated that they had all disappeared, and that none had been seen for the past nine months.

A successful introduction to the Clunas woods, Ferness, is described by Thompson (1900), who states that in 1884 a hatching in Clunas woods was very successful and by 1892 there were several to be seen. However, in a letter to Harvie-Brown dated 21st May 1892, Thomson says that the introduction took place "about eight years ago", and as Clunas woods are only about seven miles from the centre of Darnaway forest, it seems safe to assume, in absense of other evidence, that this was the origin of the Darnaway stock.

Attempts at the hatching of eggs were made in several places about this time, but, as occurred so often, the eggs hatched safely but the chicks died within three weeks. In 1888 eggs were placed under a greyhen at Gordon Castle, and although at least one bird was seen in the grounds for eighteen months after this, they finally disappeared. An introduction of birds at Gordon Castle in 1897 was attended by greater success (Steuart Menzies 1907). Two males and several females were turned out by the Duke of Richmond in that year ; they became successfully established, and the population was estimated ten years later at about thirty birds (Davidson 1907).

The Spey valley provided an admirable route south from this last centre, and in the season 1898-99 two males and three females were seen at Craigellachie, and a male hybrid blackcock-caper was shot at Carron in 1900 (Buckley 1900). The first pure-bred capercaillie in this area was shot in the Drum wood at Carron in 1903 ; this was a male, which was preserved and is still in Carron House. The story is told of this unfortunate pioneer that the beaters at a shoot arrived in great excitement about an enormous pigeon (or was it a muckle doo ?) sitting in a tree in the Drum wood. One of the keepers returned and shot the bird which proved to be a cock capercaillie.

In 1907 twelve broods were known to have hatched out at Craigellachie, and in the same year the first capercaillie, a female, was seen on the Binn Hill, Elgin, and later, two males and a female. A cock was killed at Pluscarden, and two more seen, a male and a female, all in 1907.

There were no further records from Darnaway forest until 8th January 1908, when a cock capercaillie was observed at

close quarters during a roe shoot. This occurrence was notified to the Earl of Moray in a letter dated 18th January 1908 in which the writer states : " I understand this bird is very rarely seen in your woods ". The first entry of capercaillies in the Darnaway Castle game book is in 1912, when nine were killed in the season.

The possibility of spread to Moray from the successful introductions in the neighbouring part of Inverness must of course be borne in mind.

By this time the capercaillie was becoming plentiful inland, and a few years later began to make its appearance in the coastal woods. Caper hens were seen at Lochloy about 1918, where there was at first some interesting interbreeding with blackgame which were plentiful in the district, and by 1922 they had spread into the Culbin forest.

A more recent advance is recorded from a young plantation of Scots pine at Roseisle, near Burghead, where a hen was shot in 1945 and another in 1947. A third was seen on 9th March 1948, but so far none has bred in this forest.

There has been a similar appearance during the past two years in the Lossie forest, due probably to the felling of timber in the surrounding districts. In this forest there are a few 70 year old Scots pines, a large area of 15 to 20 year old Scots pine and three acres of scrub larch. So far no nests or broods have been seen, but the number of adult birds is said to be increasing.

### *Present Distribution*

The capercaillie is generally well distributed throughout all the larger coniferous woods in the two counties, in varying density, being most plentiful in the coastal forests, the upper Spey valley and Darnaway forest, restriction of habitat being responsible for a diminution in numbers elsewhere.

From the area east of the Spey, around Fochabers, two returns have been received. Caper have decreased throughout the area but are now stationary. In the eastern section of the Speymouth forest, restriction of habitat by timber-felling and, it is thought, a succession of wet breeding seasons, have prevented any increase, but they are breeding regularly in the 900 acres of Scots pine, larch and old birch. On the

Seafield estates over three-quarters of the old Scots pines have been felled during the last thirty years, leaving about 500 acres of mature Scots pine and larch in which caper are now scarce, but breeding regularly.

In the western section of the Speymouth forest there are 400 acres of Scots pine varying in age from 50 to 100 years, and mature birch ; the capercaillie population is similar to that of the eastern section. From the area between this and Rothes only one return has come in, from Teindland forest, where there has been a marked decrease during the past thirteen years due to felling of many of the old woods in the locality, and the capercaillie is now scarce, but still breeding where the older trees remain. From the remainder of the Morayshire portion of the Spey valley reports state that the capercaillie is still numerous and on the increase.

Between Elgin and Forres, returns have been received from Pitgaveny, Monaughty forest, and Dallas and Rafford districts. On the Pitgaveny ground, caper have gradually disappeared over the past twenty years and are now seen only occasionally. On Monaughty, there are about 2000 acres of suitable woods, but numbers were kept down by the Forestry Commission until two years ago, and, although a few breeding pairs are present, there has so far been no increase, the birds for the most part keeping to the higher ground as they have been continually disturbed by road reconstruction work in the vicinity.

In Dallas district, again scarce, estimated at about five breeding pairs in 200 acres of old pine owned by the Forestry Commission, and correspondingly scarce on Dallas estate ground with a similar area of suitable wood. Broods of young birds have hatched in those woods but have subsequently disappeared after about a fortnight.

To the west of the localities just mentioned, birds are generally more plentiful on the lower ground but scarcer on the higher parts, as in Glen Ferness where there has been extensive felling and consequent decrease, and also at Regulas and Dunphail. The woods at Newtyle, Altyre and Darnaway hold considerably greater stocks, stationary in numbers although there has been a decrease in the felled areas. At Cawdor they are stated to be on the increase.

In the coastal forests between Nairn and the mouth of the Findhorn the capercaillie is particularly common. There is said to be a "fair number" at Loch Loy, and they are plentiful in the Culbin forest (5000 acres of Scots pine and Corsican pine, ages from 10 to 70 years) although the head forester at Culbin reports that in 1948 the number of young birds seen was very small in proportion to the number of eggs hatched, many clutches of seven and eight having dwindled, later in the season, to one or two young birds.

## Inverness

The earliest reference to attempted reintroduction of the capercaillie to Inverness-shire is of eggs being sent on several occasions prior to 1843 from Perthshire to Beaufort Castle, but the hatching was unsuccessful (Harvie-Brown 1879). The next attempt was about 1860 when Lord Seafield made an introduction from the Duke of Athole's estate, but the birds died out, the last one, a young male, being found dead at Balmacaan in 1866 (Harvie-Brown and Buckley 1895).

An introduction to Guisachan in 1868 was no more successful. Thirty-nine birds were brought there and were confined in pens, prior to being released, where they were unfortunately attacked by polecats and all were killed except two males. Following this disaster, eggs were hatched out and the young birds reared, but apparently they did not flourish, as, in a letter dated 27th December 1879 (Harvie-Brown 1880) it is stated that they "have now nearly died out at Guisachan."

In 1873 birds were introduced at Invereshie, but again never became fairly established. A cock was shot there in 1875 and in 1878 one hen only remained. Harvie-Brown (1879) states that the keeper had instructions to introduce them again, by birds, in 1879, but there is no record of whether this was done.

On 24th July 1881, while passing through Dalwhinnie in the train, Harvie-Brown saw what he was almost certain was a female capercaillie on the fence of a young plantation, and subsequently discovered that this bird had been there for about three weeks. On 27th November of the same year

a male was shot at Dalwhinnie (Harvie-Brown and Buckley 1895). These are the first records of capercaillies having arrived of their own accord in Inverness-shire, but it is doubtful whether there was any further spread from this direction as circulars sent out by Harvie-Brown in 1890 brought negative returns from all estates in Badenoch, from the parish of Laggan and Kingussie and from all other parts of the county.

The next account of the species was in 1885 when it was reported that " capercaillies had at last reached into Speyside," but this remained unconfirmed and was discredited by Harvie-Brown. However, in a note by Dr. W. Eagle Clarke (1898), there is a record of a pair of hybrids obtained from Aviemore on 10th November 1890 and of a brood of these hybrids at Rothiemurchus about this time. In the autumn of 1890 four capercaillies were seen in Rothiemurchus, and in the same year a hybrid capercaillie-pheasant was shot in that district. In 1891 five were shot " much lower down the valley than Lynwilg " (Harvie-Brown and Buckley 1895). These birds were probably vagrants from Morayshire, and one of them was a male, the first cock caper to be seen on Speyside, but no eggs or young birds were found. Another female was shot in 1893.

It is highly probable that the capercaillies would ultimately have colonised Inverness-shire of their own accord, as they were already established, though in a small way, in Morayshire, and on the east were by this time on a firm footing and rapidly advancing north in Aberdeenshire ; but a series of introductions from 1895 onwards altered the natural course of events.

These introductions were begun in Strathnairn about 1892 by Mr. W. Dalziel Mackenzie of Farr. Early attempts were unsuccessful, and again in 1894, when a dozen birds from Norway died before being released. In the winter of 1895, however, thirty-one imported birds were turned out on the estate, and some every year for the next five years. The following circular letter issued by Mr. Mackenzie gives the main facts of the introductions. For many years it was Mr. Mackenzie's custom to fine any gun (himself included) who shot a caper on Farr a sum of five pounds, which was sent to the Royal Northern Infirmary, and it was not until

after the South African war that any caper were allowed to be shot on the estate.

*Important.*

FARR,
INVERNESS.

## CAPERCAILZIE (*Tetrao urogallus*) in STRATHNAIRN

DEAR SIR,

May I ask your kind assistance in my endeavour to acclimatise Capercailzie in this district. If the Proprietors, Shooting Tenants and Keepers will refrain from shooting them for some years to come, there is no reason why this grand bird should not become as common on the North side of the Grampians &c, as on the South.

I may shortly state that I introduced about 10 or 12, from Norway, in the winter of 1894, but, owing to insufficient pen room and the severe weather, they all got cramp, and eventually died.

Last winter, however, during the months of November and December, I imported 31. Most of them were turned out at once, a few were put into a large pen, from which, with the exception of 2 or 3 pinioned, they gradually made their way out.

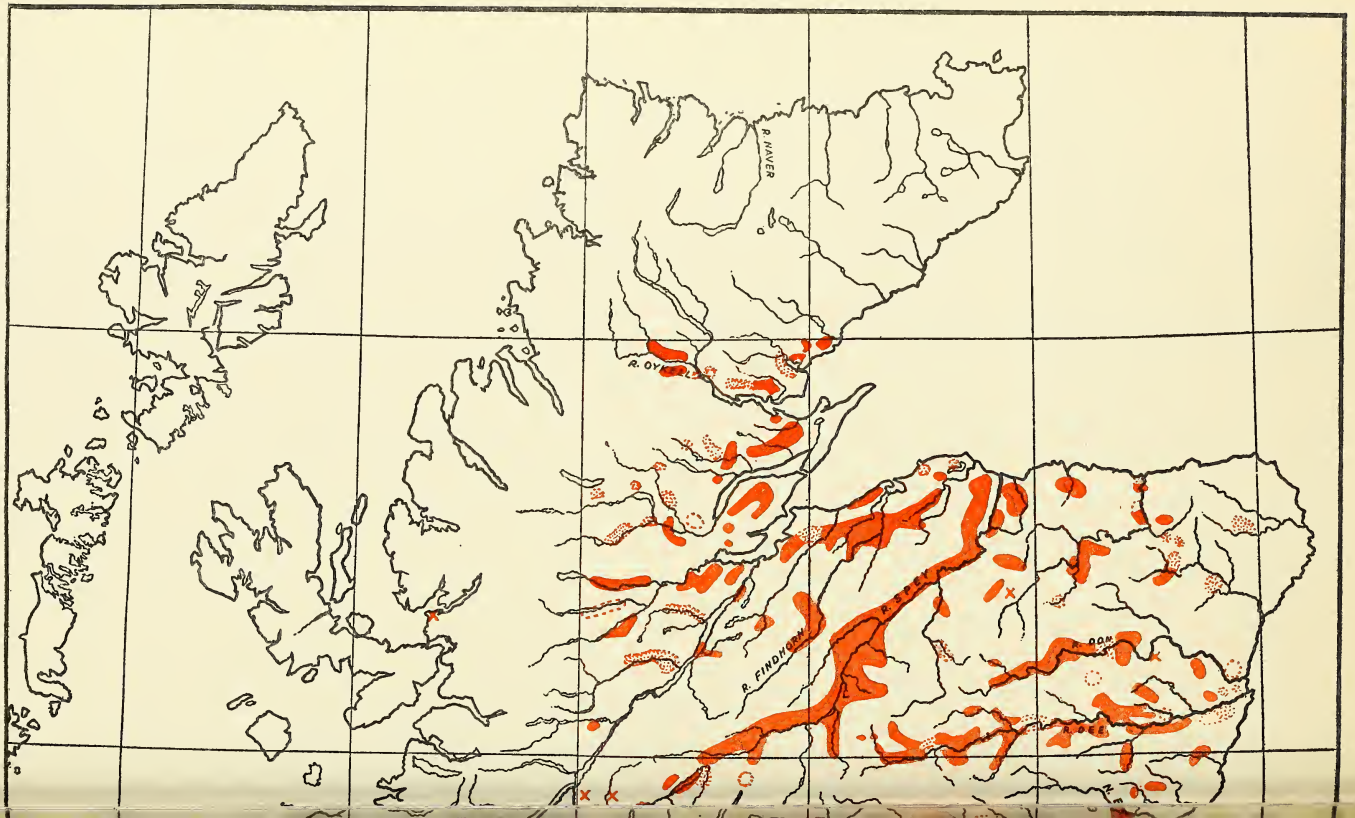
Birds were constantly seen through the spring and early summer of this year in the neighbourhood of the pen, others about a mile off. Latterly they have not appeared. It is to be hoped that some may have nested, and brought off the chicks. Two hens in the pen have not laid at all, although a cock constantly flew in to them. They may, presumably, be birds of one season only and probably like black game, may not breed till their second year.

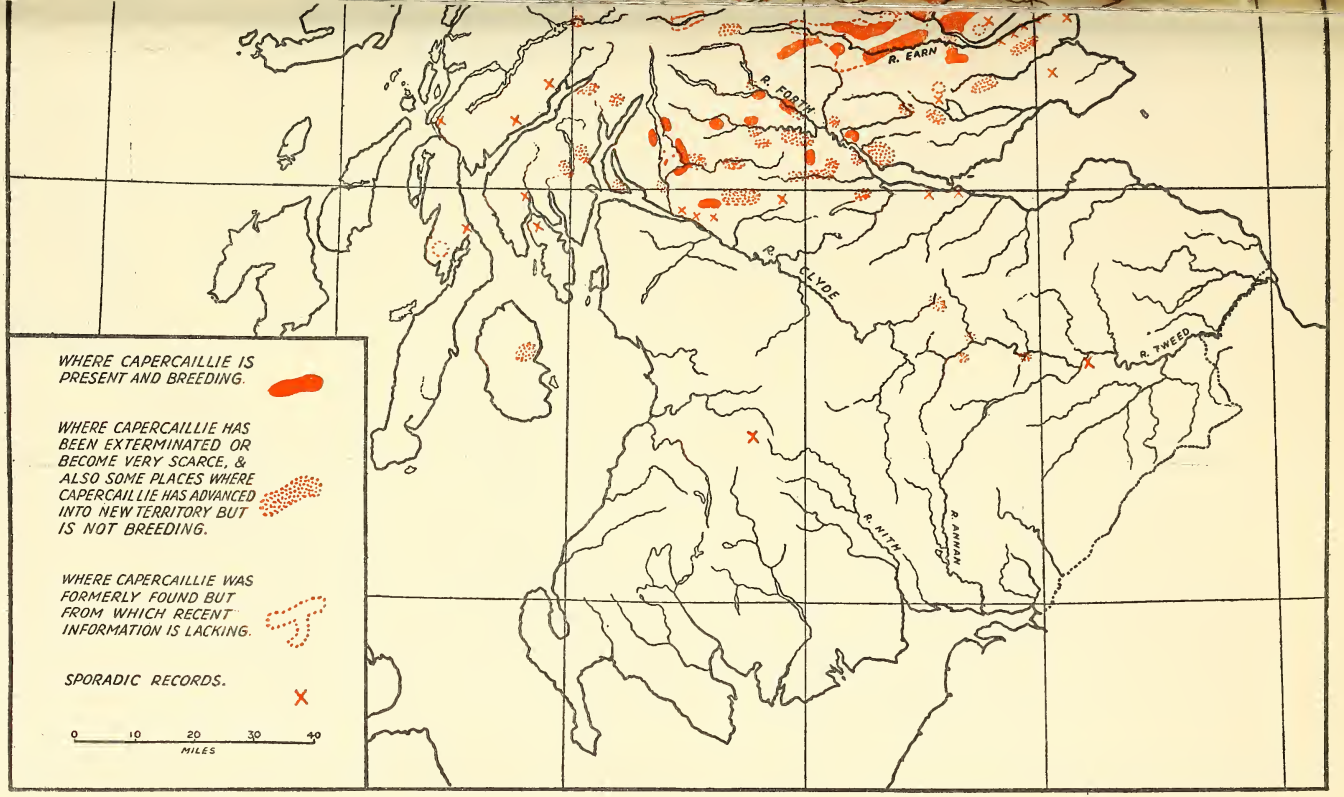
A few, we know, have died, but we have reason to believe that the majority are still in the Strath. Any information as to their appearance will be much appreciated by me.

It is on record that the last native bird was killed near Inverness at the end of the last century, and as Inverness-shire, thanks to the large tracts that have been planted with pine during the last 50 or 60 years, is eminently suited to Capercailzie, it is to be hoped that attempts to reintroduce them may eventually be successful.

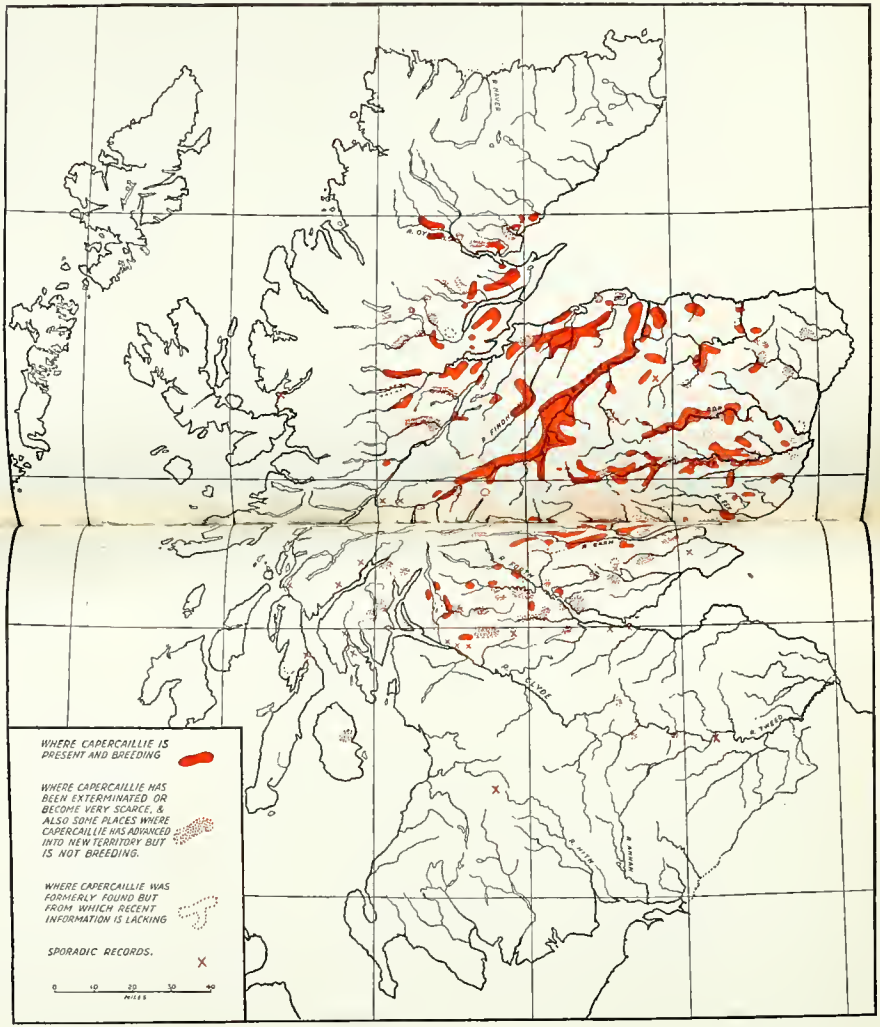
I am,
Yours faithfully,
W. DALZIEL MACKENZIE.

*25th July, 1896.*


R. HAVER
R. OYKEL
R. SHIN
R. FINDHORN
R. DEE

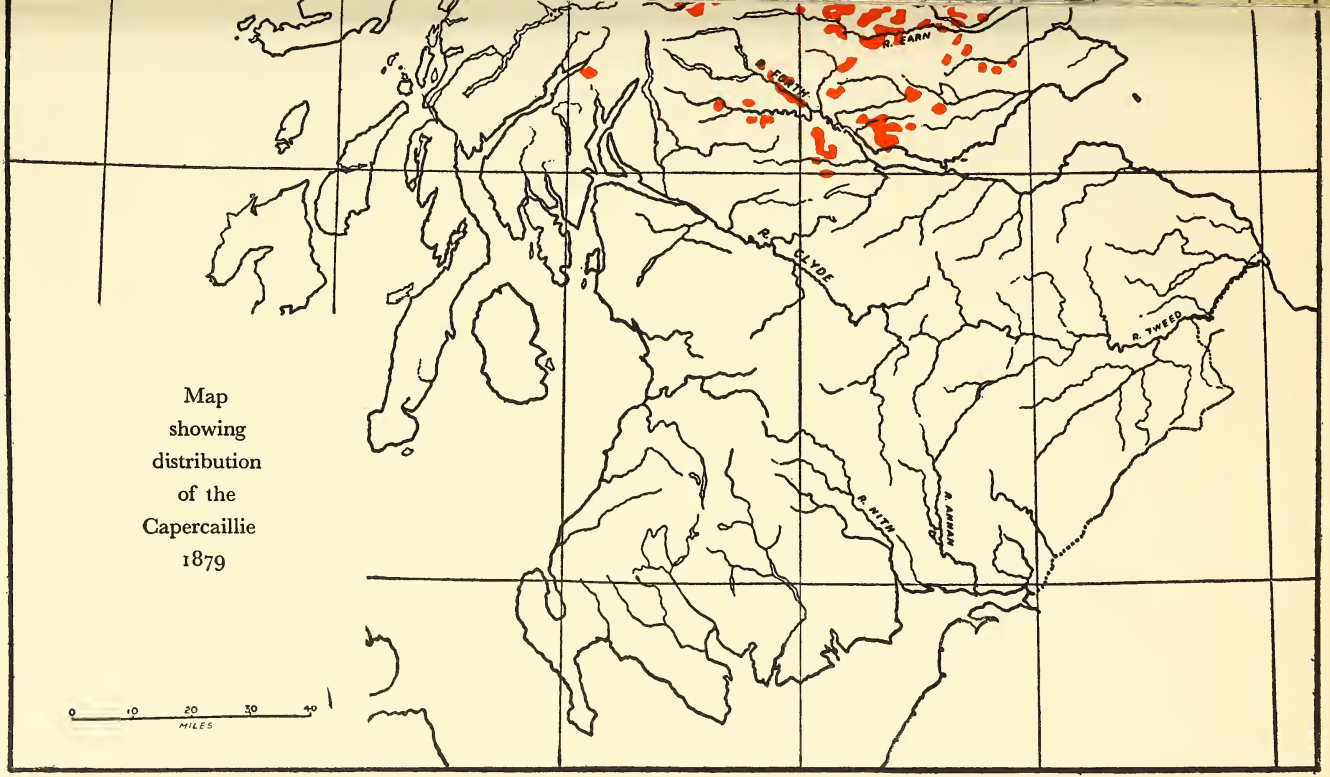



Map showing distribution of the Capercaillie—1949




Map showing distribution of the Capercaillie—1949

R. HAVER
R. OYKELL
R. SPEY
R. FINDHORN
R. DON
R. DEE




Map
showing
distribution
of the
Capercaillie
1879

Map showing distribution of the Capercaillie 1879

A second letter giving further details was issued three years later and was reproduced in *Annals of Scottish Natural History* (1900).

These birds were turned down into an area of mixed Scots pine and larch, the whole plantation being approximately 35 acres, and containing some open spaces with birches, bracken and some berries. This area was never disturbed in any way, and all the conifers were mature trees except for one small stand which had been planted about 1890; but at the same time as the caper were introduced, a considerable planting programme was being carried out on the estate, almost entirely Scots pine and larch.

In addition to the area in which the birds were put down, there were a few stands of old Scots pine, each of which, once the capercaillies were established, held a nest or two, according to its size, but there was at first no attempt to make use of the young plantations, and the spread was mostly in a north-easterly direction. However, once established on the estate, the capers did not increase in numbers to any appreciable extent. By about 1910 they began to make use of some of the plantations, which were by then about 20 years old, both at Farr and in Strath Dearn in the Upper Findhorn valley, but it was noticeable that they showed great preference for plantations in which there even one or two very old coniferous trees. Consequent on the heavy felling of timber during the war years in Strathnairn, there has been more than one attempt at nesting in mature birchwoods.

Meanwhile, similar efforts at reintroducing the capercaillie were taking place in other parts of the county. In the spring of 1895 eggs were obtained from Kinfauns, Perthshire, by the late W. MacNicol, Dorback Lodge, which were placed in the nests of greyhens by his neighbour, the late D. Collie, in the Abernethy forest, as there were very few blackgame on MacNicol's ground.

Establishment was slow, and in the first few years several hybrid blackcock-capercaillies were seen, two being observed at blackcock leks in 1902, and two shot in 1904 or 1905. By 1900 there were a few pure-bred capers in the district, and in 1912 they were still scarce, but they increased considerably during the 1914-18 war.

In view of the slowness of establishment, and of the occurrence of the parties of caper hens in 1890 and 1891, it is probable that the success of this introduction was influenced by further influx of birds from Morayshire and, later, from Strathnairn, where establishment and spread were more rapid.

A third introduction to Inverness-shire took place about the same time at Guisachan, where there had been an unsuccessful attempt in 1868. About 1895 or possibly earlier, eggs were brought to Guisachan from Taymouth by the late Mr. MacGillivray, keeper to Lord Tweedsmouth, which were placed in greyhens' nests on the estate. Some immature birds were also turned down at the same time, but details of the numbers are not known.

From the introduction at Farr the spread was rapid, at first mainly to the north-east following the river valley and sending an off-shoot south-east into Strath Dearn. On the west side of the Canal the first record was of one shot on Dunain Hill in 1897, but the next was not killed there until 1905, although they had been observed between these dates.

The first arrivals were seen near Beaufort about 1902 and the birds were well established there by 1907. There was considerable and rapid increase for the next three or four years, by which time they had reached their maximum numbers in the district. With regard to the arrival at Beaufort, this was almost certainly from Guisachan, as there was a healthy spread from there, having reached well up Glen Strath Farrar by 1907. A note in the *Field* (R . . . 1912) states that " The caper is greatly on the increase in the Beauly district and the neighbouring part of Ross-shire. The birds were introduced at Guisachan, and are now plentiful over a large area." Glenurquhart was probably colonised too from Guisachan, but no dates of arrival or establishment are available. In Glenmoriston they have been present for about forty years but have never been numerous.

Down the east side of Loch Ness the spread seems to have been much slower, and even in 1923 a report of one seen between Foyers and Inverfarigaig was doubted locally, although they became more plentiful in the following few years.

In the Spey valley, caper were scarce in the Abernethy forest in 1912, and in Rothiemurchus rare before 1914. The

first available record from Kincraig was in 1912, but there was a general increase in all these districts during the 1914-18 war.

From the Laggan area no positive records are available of when capercaillies first made their appearance, but they were certainly well established prior to 1920. Here the possibility of colonisation from Perthshire must of course be borne in mind.

In Glen Spean caper have appeared only since the felling of timber was carried out along Loch Laggan. A single cock bird was observed at Ferindrish, where it remained throughout the whole winter of 1947-48, feeding regularly with poultry, and there have been other reports of caper seen in the Roy Bridge area during the past year or two. Usher (1949) records a hybrid blackcock-caper observed in Glen Spean in 1948 at a blackcock lek. This occurrence also suggests an extension of range in this direction.

An interesting report has come from the west side of the Great Glen at Invergarry where two nests were found on Craig Liath in 1935, the first known in the district. There was a slight increase for four years, but since then the total population has remained stationary at six to twelve birds, inhabiting scattered groups of old pine trees.

### *Present Distribution*

In the Aird district capercaillies have been generally much reduced by timber-felling during the war. On Beaufort the area of suitable woodland has been reduced from 4,000 to 400 acres, and, where previously there were very large numbers of caper on the ground, probably about a thousand, there are now few left. On the neighbouring estate of Moniack, where there are 150 acres of pine, the numbers have remained stationary at between fifty and one hundred. On Newtonhill caper were very plentiful from 1936 to 1939, but in 1940 all the old trees were felled and the birds consequently became extremely scarce. None was seen in 1946 or 1947, but one brood of young was seen in August 1948. It is suggested that poaching may also have contributed to the decrease.

In the Dochfour-Dunain Hill area caper were formerly plentiful, but very heavy felling during the war years again altered circumstances. The birds, however, appeared to be loath to desert the district and moved into any patches of old trees which remained, and some are known to have migrated over the Beauly Firth to the Black Isle. Game-book entries show the highest numbers between 1930 and 1937, the peak season being 1932-33 when 54 were killed. From 1937 onwards there has been a marked decrease in the number shot, but it is pointed out that this is as much due to a drop in the quality of the shooting and scarcity of beaters as to scarcity of birds.

At Guisachan, although some woods were cut the suitable habitat was not seriously affected, as many of the old woods of Scots pine and birch, with open spaces of heather and blaeberry, still remain. In spite of this, however, there has been a marked decrease in the capercaillie population and they are now scarce. The same situation pertains in Glen Strath Farrar where the old woods remain but capercaillies have become very scarce for no obvious reason.

In Glenurquhart the habitat has been restricted by timber-felling, but, in addition, caper are shot at every opportunity on the Forestry Commission ground, and on the 2,500 acres under their control the capercaillie has been virtually exterminated. In Glen Moriston it appears that the species has never been plentiful, and none has been seen in Portclair forest since 1937 when the old Scots pines were felled. A few were seen on Craig nan Eun in 1947, but none in 1948.

East of Inverness, although still breeding in restricted numbers in the Culloden area, felling of the older trees has reduced the suitable habitat, while near Croy none has been seen since 1944 for the same reason.

On Loch Ness-side, while still plentiful near Loch Dochfour, they become scarcer further south where most of the woods have been cut during both wars. A few remain near Errogie, but there are none on the Forestry Commission land at Inverfarigaig.

In Farr and Glen Kyllachy caper are still regular breeders, but in an area reduced from 350 acres to 60 acres of suitable

woods. In Strath Dearn they are not plentiful but breeding regularly, and here the numbers have been stationary for the past twenty years.

In the Spey valley, although considerable areas have been felled, there are still many thousand acres of standing timber and young plantations. From Abernethy and Rothiemurchus there are reports of a fair stock of birds, well distributed throughout the forest, and slowly increasing. Here there is regular shooting, but also adequate control of foxes and hoodie crows. They are numerous and increasing in the Queen's forest, Glenmore, and moderate but increasing on Inchriach. In Newtonmore district the area of forest is much smaller, but a small regular stock is maintained in Glentruim and also at Cluny. A hen was seen in April 1948 on the moor at Ralia, two thousand feet above sea-level and two miles from the nearest wood.

In the Laggan district capercaillies are found in woods which stretch between Drumgask and Moy at the west end of Loch Laggan. The area from Drumgask to the east end of Loch Laggan has been felled during the war, leaving only fringes of stunted fir scrub along what were the Strathmashie woods. The birds all left this area when the woods were felled, but have now returned in fair numbers to the scrub. The Black wood, on the north side of the glen, consists of about one and a half square miles of 50 to 60 year old Scots pine. Here only small blocks of larch have been felled and there is still a fair stock of caper.

The area between the River Pattock and the east end of Loch Laggan has been cleared of trees and also of capercaillies, but the Ardvereikie wood, stretching unbroken along the whole of the south side of the loch, remains standing.* This wood consists of Scots pine with numerous ornamental pines along the 2½-mile avenue to the lodge, and here the birds remain practically undisturbed.

On the north-west side of the loch is the Moy wood, which, although little over 100 acres in extent, holds a few residents, while in Glen Pattock are eight or nine plantations, of about this size, of 30 to 40 year old Scots pine, which have not attracted any capercaillies. It has been suggested that

* Now being felled.

this may be due to the fact that any possible nesting cover has been trampled down by deer.

## Ross and Cromarty

On the history of the capercaillie in Ross-shire very little has been written, and previous authors on the subject (Ritchie 1920, Darling 1947) have assumed that the introductions to Strathnairn were responsible for the appearance and spread of the species in Ross and Sutherland. Harvie-Brown (1911) gives *circa* 1907 as the date of establishment at Fairburn, and "A.R." (1912) states that "The caper is greatly on the increase in the Beauly district and the neighbouring part of Ross-shire;" but, beyond these, there are no early records for the county.

During the course of the present investigation it became apparent that the capercaillie has been present in Ross-shire much longer than is generally supposed. A record was received of a first appearance at Fairburn in 1898, and a game-book entry of caper shot in 1896 at Foulis, six miles north of Dingwall, suggesting that there must have been an introduction to Ross-shire hitherto unrecorded. After considerable correspondence to all parts of the county the following letter was received :—

Diebidale,
Glencalvie,
Ardgay.
*20th Jan. 1949.*

Dr. I. D. Pennie.

Dear Sir,

I have received a letter from Novar to-day and my friend says that the Capercaillie were introduced to Brahan Estate some 60 years ago, from there they multiplied and spread to the adjoining estates.

I think this information should be quite reliable as the man who gave it has been a forestry worker in that area all his life. He is now over 70.

Hoping this may help.

Sincerely yours,
HUGH FRASER.

This would make the date of the first introduction to the county at about 1890, and fixes the starting point for an interesting series of records. The first caper was shot at Foulis, eight miles north of Brahan, in 1896, and the date of appearance at Novar, a further three miles, is given as "about 1900." In Ardross the first was shot in October 1911, but it is interesting to note that a year previously they had already crossed the Dornoch Firth, having been seen at Skibo in 1910. No dates are available for the Easter Ross woods between the Cromarty Firth and Tain, but presumably these were colonised between 1900 and 1910.

On the west of Brahan, the earliest record is 1898 from Fairburn, where the capercaillie was established as a breeding species by 1907 (*vide supra*) and one was seen at Scatwell about 1911 (Harvie-Brown 1911). The woods west of these localities are less extensive and it was not until much later that colonisation was effected, and on a smaller scale.

In the Black Isle an unsuccessful attempt was made in 1888 at Rosehaugh to rear caper from eggs hatched under domestic hens. Several other attempts were made in following years with the same result, but in 1910 or 1911 a successful introduction was made by bringing several pairs of adult birds from Foulis Castle.

Outwith the areas listed above, colonisation was later and slow. Birds were present in the Kildermorie wood, above Ardross, until recent felling, and the first record is stated to be April 1932. On the borders of Ross and Sutherland caper have been present in the Strathkyle woods, which lie on the south side of the Oykell valley, since the 1920's, having presumably spread west along the valley from south-east Sutherland. None have reached the Amat wood which is reputed to be a remnant of the Caledonian forest.

In the remainder of the county capercaillies have at no time been plentiful. Not until 1932 were they recorded in Strathconon, where they had a brief existence, having been since exterminated by timber felling. Similarly in the district of Garve a few pairs were seen from 1933 onwards, and a pair in 1942 in the Inchbae wood, but all have disappeared since felling of the woods during the war years. A single pair appeared at Lochluichart in 1934, where there are 100

acres of 70-year fir, and remained there until 1941. No young birds were ever seen, none was shot, and no trees felled.

Apart from a single record of a female at Plockton in October 1929 (Reid 1930), the furthest point reached in this direction was the Strathbran wood, Achanalt, where a few capercaillies took up their abode about 1920. These plantations, between 500 and 600 acres of fir and larch, were then about 30 years old, but were not a very suitable habitat, being composed of trees not properly thinned and so thick that it was not easy to make one's way through them. Caper were observed on a few occasions during the next twenty years, but 500 acres were felled during the war and the remainder thinned out, and it is certain that the birds are no longer there.

An introduction was attempted at Coulin, near Kinlochewe, about twenty years ago, by hatching out eggs. Four or five birds were reared to maturity and these made their way to a young plantation at Achnashellach where they finally disappeared. It may have been one of these birds which was seen at Plockton in 1929.

### *Present Distribution*

In Mid Ross the capercaillie has been generally scarce in recent years though still breeding regularly in some localities. No information has been received from the area between Brahan and Strathpeffer, but many of the woods there have been felled. In Fairburn district, now scarce and decreasing, but still breeding regularly in 400 acres of old pine and larch which remain standing. Disease of young birds is stated to be a contributory factor to the decrease. Between this and Strathconon, where caper were formerly plentiful, most of the woods have been felled and they are now scarce and probably non-breeding.

Black Isle : generally scarce, but does not appear ever to have been really plentiful. A decrease is noted from the north and east of the peninsula, from Findon, Mulbuie, Newhall and Poyntzfield, but still breeding in reduced numbers. Tree felling has played a large part in the decrease but various

causes have probably contributed, viz., increase in mechanical cultivation of moorlands, especially moorlands with scattered clumps of natural fir ; poaching during the war years ; and control by the Forestry Commission workers. Elsewhere in the Black Isle, although not numerous, the same decrease is not noted, and there has been a slight increase in numbers in the Redcastle area where a few clumps of young pines have attracted birds crossing the Beauly Firth from the felled areas on the Inverness side.

North and East : a few remain in 20 acres of conifers at Foulis, where most of the woods were felled during the 1914-18 war, and there has been a decrease in the last ten years on Novar estate—1,500 acres of Scots pine—but caper are now protected and numbers again stationary. In the Ardross woods a campaign of shooting at all seasons, together with destruction of eggs, has been in force for ten years, but in spite of this, extermination is not yet complete. Precise details have not been forthcoming from the area between Ardross and Tain, which contains considerable stretches of coniferous woodland and where capercaillies were formerly abundant ; but in general there has been a marked decrease, large areas having been felled during the recent war, and, where some years ago there used to be hundreds of caper, there are now very few. On the other hand an increase is recorded from Morangie on the north-west of Tain where there is a small area of 50-year pine, due, presumably, to an influx of birds from the felled areas, but here numbers are being kept down. In Strathkyle there has been a gradual increase during the past eighteen years, and where two or three would formerly have been seen in a day's walking there would now be thirty or forty, and this in spite of a considerable amount of felling which has left about 100 acres of standing timber.

### Sutherland

An attempted introduction by hatching out eggs at Skibo in 1870 is described by Harvie-Brown (1879) Ritchie (1929) records one capercaillie seen at Skibo in 1927, otherwise there are no published references to the species in Sutherland.

The first capercaillies to cross the Dornoch Firth arrived

at Skibo in south-east Sutherland in 1910 and rapidly became established, but at a later date a war was declared on them and every nest found was destroyed. These measures however were too late to prevent further spread, and caper were seen in Balblair wood, on the north side of the Little Ferry, in 1912. Four were seen in this wood in 1915 and there was a pair at Dunrobin in 1922, which may have been there before that date. Caper have since bred regularly in small numbers in this area and have been present in Ben Bhraggie wood since 1928, and came to Uppat wood, Brora, "about fourteen years ago, perhaps more." Uppat shares with Rosehall the distinction of being the northern limit of distribution of the capercaillie in Scotland. To the latter they spread west along the Kyle of Sutherland and have been there for "at least thirty years."

They have also recently taken to some of the younger plantations in south-east Sutherland: since 1932 in 670 acres of young Sitka spruce and Scots fir near Dornoch, and since 1935 at Carbisdale and Balblair, Invershin—862 acres of young fir and spruce. Breeding has not yet been recorded in any of these, and numbers are small and not tending to increase at present.

### *Present Distribution*

From west to east: in Rosehall wood, still breeding but becoming scarcer and more scattered throughout the younger plantations since most of the old fir trees were felled. The distribution in Inveroykell is similar to that in Strathkyle, Ross-shire. In Balblair wood, Invershin, and Carbisdale wood—both young plantations—they are scarce and non-breeding, but numbers are being kept down.

Between Bonar Bridge and Spinningdale most of the wood was lost by fire a few years ago and felling has completed the elimination of practically all suitable habitat. A few pairs bred annually at Spinningdale until three or four years ago, and there are still approximately three cocks and eight hens at Ospisdale.

Skibo probably holds more caper than any ground in the south-east corner. At least three broods were reared in 1948

and packs of as many as fifteen birds have been seen within the past two years. Between Skibo and The Mound a few pairs bred annually until 1942, but all have been driven out as no woods remain standing. To the Forestry Commission woods near Dornoch caper come to feed only and breeding has not been recorded, but their presence is not encouraged.

The population of Balblair wood, Golspie, has remained constant at about two pairs since the birds became established there, and there is a similar number in Ben Bhraggie, Dunrobin and Uppat Woods, north of which none has ever been recorded.

There is no record for Caithness.

(*To be continued*)

## ZOOLOGICAL NOTES

**Imported Earwigs at Leith.**—Several foreign species of Dermaptera (as also insects of other orders) are frequently imported with cargoes at our sea-ports. Some of these are able to maintain themselves in warehouses or heated premises for greater or lesser periods, and may even increase to the extent of becoming nuisances, while others fail to become established.

My father, Mr. D. K. Kevan of Edinburgh, has forwarded to me several males, females and nymphs of the cosmopolitan species *Prolabia arachidis* (Yers.) and *Anisolabis* (*Euborellia*) *annulipes* (Lucas) taken on timber which formed part of a mixed oriental cargo landed at Leith on 28th September 1948.

Two less commonly imported species, *Labia curvicauda* (Mots.) and *Spongovostox gestroi* (Burr), each represented by single males, were taken by him in a Leith timber yard about a year previously (23rd September 1947) under the bark of African mahogany. The former is known to have established itself under glass at York but the latter has not, so far, managed to maintain itself in this country.

I am indebted to Mr. W. D. Hincks of the Manchester Museum for determining or confirming the species mentioned.—D. K. McE. Kevan, Nottingham.

**Humming-bird Hawk-moth in Cupar.**—At 1.30 p.m. and again at 7.30 p.m. on 22nd July 1950, a humming-bird hawk-moth *Macroglossa stellatarum*, was seen working the jasmine creeper on the south side of my house. I understand that it is comparatively rare in this district.—A. E. Thomson, Cupar, Fife.

**Courtship Feeding of Carrion Crow.**—After a very wet morning on 19th March 1950, with rain still falling, two carrion crows *Corvus corone* alighted on our garden wall. The dominant bird, which I presumed to be the male, flew down to the lawn and proceeded without hesitation to some bread crumbs on the path. The other bird followed to the lawn, but apparently could not pluck up courage to approach the crumbs on the path. The male, after feeding, returned to the lawn, and just at once both birds seemed to catch sight of a crumb on the lawn. The male roughly pushed its mate aside, whereupon the female postured in a soliciting manner with wings partly spread and lowered. Upon this display the male fed the crumb to the female.—Hugh Halliday, Midlothian.

**Pied Flycatcher in Midlothian.**—I was pleased to see a male flycatcher *Muscicapa hypoleuca* near Penicuik on 14th May 1950.—Ian Hay, Edinburgh.

**Pied Flycatcher in Argyll.**—On 21st May 1950, about midday B.S.T., I first heard and then saw a male pied flycatcher *Muscicapa hypoleuca* in a wooded glen close to Loch Sunart, North Argyll. About 4 p.m. I returned with Theed Pearse, Niall Campbell and Clifford Simmons. After a few minutes' wait, the bird reappeared in the same spot and we watched it for about half an hour. It had one or two song perches, mainly on a tall ash growing beside the burn, and from these it made periodic excursions, at tree-top height, for at least a hundred yards in several directions. The song was full and sustained and compared favourably with the majority of those heard where the species nests ; there was nothing to suggest that this bird had a mate, though it was unfortunately not possible to re-visit the locality, which was ecologically very similar to valleys in Wales where the species is common.

I cannot find any previous record of the pied flycatcher in Argyll. An alleged record on 16th April 1911 (*Bull. B.O.C.*, 30 : 112) was subsequently shown to refer to the spotted flycatcher *M. striata* (*Glas. Nat.* 5 : 47 and 6 : 55).—Bruce Campbell, Oxford.

**Pied Flycatcher Nesting in Perthshire.**—On 24th May 1950, I found a nest of the pied flycatcher *Muscicapa hypoleuca* in one of my nest boxes on the north shore of Loch Tay, with six eggs and the hen sitting. I had the bird in my hand for identification, and the eggs were seen. The nest was of the type which I have found usual, perhaps because most of the two to three hundred I have seen have been in oak woods or scrub : a base of dried oak leaves with bark, dry grass and roots and a little moss, quite different from the tits and redstart, the other species using boxes here. The box was ten feet up, in an oak in the hardwood scrub along the shores and within about twenty feet of the water's edge.

I returned later, and the hen came off and performed all the usual flycatcher tricks, hawking insects but alighting on a different branch, and flirting the tail and wings.

I could not see the cock, but this is not unusual while the hen is sitting. I thought I heard his song once, but cannot be sure. The hen, the nest and site, and the eggs make the identification certain.

As far as I know, this is the first definite record of this species nesting in Perthshire, but I think it has been seen recently. Loch Tay-side is warmer than the rest of the country, and the north

shore gets all the sun there is, so the locality is a likely one for the start of the colonisation from the south which has been expected for two or three years now.

On 6th June, four young had just hatched out, with two eggs ; on 13th June, there were five young and an addled egg, now in the Perth museum ; on 4th July, there were two fully-fledged dead nestlings, so three had flown. The box was one of six along the shore, in a stretch of about 150 yards—the one furthest down the loch, that is the one which would be reached first by a bird coming up the loch from below. Elsewhere when valleys are newly colonised, I have found that colonisation proceeds from below up-stream.

The male of this pair was still in immature plumage. I have seen this in Yorkshire and Northumberland, and in one case the bird bore a ring indicating that it was only a year old. (There was another normal, black and white male here of the same age.) The sexes are difficult to tell unless they can be seen together, as the difference is that the white is slightly more extensive in the male than in the female, and the male usually has a white forehead. While watching the nest, there seemed to be two birds, one with more white than the other, and once a bird flew off up the loch from the nest, and within ten seconds a bird came from the opposite direction ; apart from any colour differences, I do not think the first bird could possibly have got round in the time. I could never definitely see the white forehead, which is in any case variable. G. L. Aitchison, C. G. Andrews and H. A. Rowlands were with me on 13th June and agreed that there were two birds.

The circumstances suggest that the male was not very vigorous : coming so far north, he has presumably been unable to hold a territory in the normal habitat ; he failed to assume adult plumage ; there was an addled egg ; and two out of five nestlings died, six eggs not being a big clutch. The first egg was laid about 16th-17th May, about normal, but perhaps late for this year.

There was a box in a Douglas plantation, close to the edge and about a hundred yards away, which contained the beginnings of a nest of oak leaves, a type which I have not found used by any other bird here in boxes. From the date at which it was found, this looks like the abandoned start of a second nest. If events elsewhere are a guide, this pair should be the first of a new colony, part of the general spread already noted in the borders and south Scotland.—J. M. D. Mackenzie, Balbeggie, Perthshire.

The above records of the pied flycatcher are important as they supply further evidence of an extension of range, which we have been expecting for some time. There are, of course, previous

records for Midlothian, including breeding, and breeding has also once been recorded near Pitlochry for North Perth (*Scot. Nat.*, 1934 : 128 and *Brit. Birds*, 28 : 87).

As there has been some doubt concerning the latter record, we have made further enquiries, and are much indebted to Dr. Bruce Campbell for the information that there is in fact insufficient evidence to substantiate a record of actual breeding. Colonel Ronald Campbell, Dr. Campbell's father, who first recorded the pied flycatcher near Pitlochry, saw only a male visiting an old nesting hole of a great spotted woodpecker ; no female, nest, eggs, or young were ever seen. Indeed, subsequently the hole visited by the flycatcher was found to be occupied by starlings.

We have not traced any further published record of breeding in North Perth, so that Mr. Mackenzie's record appears to be the first. Several occurrences of pied flycatchers seen in recent years in North Perth were reported in the *Scottish Naturalist* (61 : 119).

Since the receipt of Dr. Bruce Campbell's record for Argyll, Dr. James Campbell has informed us that Mr. Arthur Duncan heard or saw at least six males south of Oban in spring 1949. We are also indebted to Miss Lees for permission to record the breeding of a pair of pied flycatchers in 1948, 1949 and 1950 in West Inverness. It is probable that breeding occurred also in 1947 ; although the nest was not found, the birds frequented the same site as that used in the following years.

In the past, breeding has been recorded in East Inverness and East Ross.

There seems little doubt, in view of the above evidence, that a genuine extension of range is in progress ; indeed, owing to the scarcity of observers throughout the Highlands, it is possible that this is already more advanced than existing information suggests. Elsewhere pied flycatchers have taken readily to nest-boxes, and in view of the scarcity nowadays of attractive nest sites in otherwise suitable habitat in the Highlands, it seems very probable that an intelligent distribution of nest-boxes would produce useful results.

It will be interesting to trace this change in status, and therefore we will welcome further records of the pied flycatcher in the Highlands.—Editors.

**Osprey in Morayshire.**—On 13th June 1950, while walking down the banks of the Findhorn River between Dunphail and Forres, my wife and I saw an osprey *Pandion haliætus* which suddenly appeared over the tree-line and obligingly circled us for some ten minutes at about thirty feet. At that short distance and with 8 × 30 binoculars identification was greatly simplified.

The bird was being indifferently mobbed by a few black-headed gulls who soon made off. The pale underparts, the black line running from the ear coverts down the side of the neck, the rather mottled brown and white head were clearly seen and during the whole period the alarm note "keeyick keeyick" was uttered almost incessantly.

The wing angling during soaring was somewhat different from that of the buzzard which is seen in the area, being more marked in the case of the osprey. The bird flew off in a westerly direction and was not seen again.

Although keepers are frequently on the river, especially in June when fish are running, enquiries of them elicted no further information and none had seen, or heard of, osprey in the district for some years.

Two subsequent visits within the week were abortive.—Eric M. Hunter, London.

**Garganey in Outer Hebrides.**—On 3rd June 1950 a pair of gargeney *Anas querquedula* was seen by us on a marshy lochan in South Uist. Excellent views were obtained of the pale blue shoulders and the white band on the head of the drake. Dr. James Campbell informs us that the only previous record for the Outer Hebridies is of a female shot in Benbecula on 10th November 1927 (*Brit. Birds*, 21 : 284).—F. Hamilton, R. J. W. Smith, C. Walker, Edinburgh.

**Wood Sandpiper in East Inverness-shire.**—An unexpected visitor, on 5th June 1950, to a hill pool at 1000 feet above Newtonmore, where one or two pairs of redshanks nest, was a wood sandpiper *Tringa glareola*. Feeding industriously in the mud surround, this bird was perhaps unusual in being absolutley silent and in its reluctance to get on the wing, preferring to run swiftly. Salient plumage features were the prominent whitish superciliary stripe and, in flight, the ragged and indefinite whitish patch on the rump. Other points were rusty-brown shoulders, spotted back and wings, marked brownish band, crown and nape. Flight with irregular wing-beats like redshank. Bobbing on ground persistent.

The previous day a tern, probably *Sterna macrura*, possibly *hirundo*, had visited the shingle beaches in the Spey, on which a few common gulls nest.—Richard Perry, Newtonmore.

There appears to be only one other record of the wood sandpiper in East Inverness, one—said to be "very tame"—having been seen by the late Ian Molteno at Loch Insh, near Kingussie on 18th May 1940 (*Brit. Birds*, 34 : 68).—Editors.

**Dotterel in Wester Ross.**—On 2nd July 1950 a dotterel *Charadrius morinellus* was seen at the summit cairn of a high hill, over 3000 feet, in Wester Ross. The bird was very tame and followed us closely as we wandered around the top.—MARGARET SWAN, Newcastle-upon-Tyne.

This is an interesting record as the dotterel formerly bred in Wester Ross.—EDITORS.

**White Oyster-catcher on Handa Island.**—Mr. R. W. Hayman and I spent the 21st and 22nd June 1950 on Handa Island and, whilse there, had several views of a white oyster-catcher *Haematopus ostralegus*. It was first seen flying singly over the sea at about 11.30 a.m. on the 21st, and puzzled us for a moment till we caught sight of its bill. At about 9 a.m. on the 22nd it was standing rather dejectedly on a small grassy area near the rocks, and an excellent view was obtained through 9 × 35 binoculars at about fifty yards. The bird was pure white all over except for a yellowish tinge about the face that may well have been due to some stain from feeding. Its bill and feet were normal, but the bill appeared a slightly less intense red and with a larger pale area at the tip than other adults seen. When a breeding pair disturbed by my presence flew near it, expostulating (at me), it seemed alarmed and flew off to the tidal rocks where it perched near a pair of hooded crows. After five minutes or so the hoodies left and a few minutes later a normal oyster-catcher alighted near and ran at the white one aggressively. The latter ran away at once and was not pursued, but it seemed cowed and ill at ease and when the normal bird approached it (this time so far as I could see merely in the course of its foraging and without ill intent) it took wing and flew away. That afternoon R. W. Hayman saw it flying with the flock of about thirty non-breeding (?) birds, the members of which constantly attacked it.—DEREK GOODWIN, Virginia Water, Surrey.

**Early Arrival of Sandwich Tern on Ayrshire Coast.**—On 25th March 1950, while walking on the beach north of Ballantrae harbour in Ayrshire, I observed a tern diving some hundred yards or so off shore. On returning ten minutes later with × 6 bincoulars I was able to identify the bird as a Sandwich tern *Sterna sandvicensis*.

The day was one of brilliant sunshine with strong S.E. to S.S.E wind.—S. D. STEVENSON, Glasgow.

**A High Blackheaded Gull's Colony**—Walking last month in the deserted hill country of Galloway, I was surprised to find

on Loch Enoch, Kirkcudbrightshire (twelve miles north of Newton Stewart as the gull flies) the highest and loneliest loch in the "province", a flourishing colony of blackheaded gulls *Larus ridibundus*. The nests were on two islands in the loch, and although it is difficult single-handed to arrive at a satisfactory estimate, I am of the opinion that there were not less than 1500 birds present.

The Ordnance Survey gives the height of the loch above sea-level as 1617 feet. Although there are, of course, many sheets of water further north at a higher altitude than Loch Enoch, I am wondering whether you have details of any higher gullery in Scotland.—J. M. P. Whipp, Knutsford, Cheshire.

*The Report on the 1939 Survey of Black-headed Gull Colonies*, carried out by P. A. D. Hollom for the British Trust for Ornithology, gives a colony on Greensett Moss, Yorks, at about 1925 feet as the highest in England (*British Birds*, 33 : 203, etc.). No details of altitude are given for Scotland, and a check with a map, of some of the colonies known to us personally in the Highlands has not revealed any so high above sea-level as that recorded above. The colony at Loch Enoch was not included in the list of sites for Kirkcudbright in the 1938 census, but it is stated that little information was received concerning this county.—Editors.

## Unusual Records as exemplified by Bone Relics

Great Northern Diver *Colymbus immer*.—This bird is found in in northern localities of Great Britain, most frequently seen in coastal waters. In winter it visits singly inland deep freshwater lakes more than other related species of Divers. It was therefore rather a surprise to find remains of the great northern diver in material obtained from an excavation placed as far south as Essex and well inland at Chesterford. This site is dated as between third and fourth century A.D. It is possible that early in the Christian era there was at this place an extension of the Fen country. Today there is here an upper stretch of the River Cam, a water scarcely extensive enough to attract a bird favouring deep water for its normal habitat.

Common Crane *Grus grus*.—This bird bred in East Anglia up to 1590, and subsequently became a winter visitor ; though of late it is little more than a very rare bird of passage during migration in any part of Great Britain. It must, however, have been widely dispersed in most parts of Britain in early historic time, for then conditions were more suitable, e.g. fens and marshland were more widespread than at present. Consequently it was hardly surprising, though none the less interesting, to find bones of the

common crane among Mesolithic remains at Seamer in Yorkshire. They were indicative of our rich native fauna, which is fast disappearing as a result of the encroachment of civilisation.—MARGERY I. PLATT, Royal Scottish Museum.

**Barnacle Geese in East Lothian.** On 15th October 1950, while watching a group of waders on the shore at Aberlady Bay, East Lothian, we observed 21 barnacle geese *Branta leucopsis*. They flew in low over the sea and turned parallel with the edge of the tide, which was high at the time, giving us excellent close views. The wings and body appeared silvery grey, while the head, neck and upper breast were black, with white cheeks and foreheads. The call was short and guttural, like a bark. After turning again they flew towards the middle of the bay and alighted on the water.

It is interesting to note that barnacle geese were seen in Berwickshire in November 1949 (*Scot. Nat.*, 62 : 126-127).—FRANK D. HAMILTON and KEITH S. MACGREGOR, Edinburgh.

**Pheasant × Capercaillie hybrid.** Messrs. A. G. and W. J. Riddoch recently forwarded for identification a bird shot on their estate of Tarryblake, near Rothiemay, Banffshire, on 18th November 1950. It is evidently a pheasant-caper hybrid, and, like the four previous authentic records in this country, it is a cock bird. (Eagle Clarke, *A.S.N.H.*, 1898 : 17-21.)

This specimen was quite appropriately described to me as " a rather unusual capercailzie ". Its most pheasant-like characters are (i) the patch of vermilion skin surrounding the eye ; (ii) the almost bare tarsus, with ' phasianine ' feet (as in all previous cases) ; and (iii) the long middle tail feathers, which, though black-tipped, bear transverse dark bars through most of their length. The bird is marked with buff barring and vermiculations on the top of the head, back and upperside of the wings ; the rest of the head, the neck and upper breast have black feathers with glossy green tips, and on the lower breast and underside most of the feathers are deep chestnut and black, darker than a cock pheasant's. The tail is longer than that shown in Millais' illustration (*Game Birds and Shooting Sketches*, 1892, facing p. 16), but shorter than that in Sim's photograph (*Vert. Fauna of Dee*, 1903, facing p. 163). In general our bird resembles the latter more closely than the former.

It is not desirable to give a fuller description here ; the skin is preserved in the Aberdeen University collection and is available for study if required. The length was 87 cm. (34.3 in.), wing 33 cm.

(13.0 in.) ; full extent of wings 104 cm. (41 in.). The bird appeared to be in its first winter ; the testes were small and flecked with dark pigment on their peritoneal surface ; the crop and stomach were filled with oat grains, probably picked up in the stubbles.

No such hybrid appears to have been obtained since 1897. This and the much commoner blackcock-caper cross are frequently associated with periods of expansion of the capercaillie's range, when the hens apparently do the pioneering, and accept alien cocks for want of their own. Dr. Pennie records (*Scot. Nat.* 62 : 87) a sudden increase in the caper population at Rothiemay in the last two (now three) years, which might imply some such conditions of rapid expansion.—V. C. Wynne-Edwards, Aberdeen.

## BOOK REVIEWS

*The Tunicata.* By N. J. Berrill. Pp. iii + 354. London: The Ray Society, 1950. 27s. 6d.

This book, written by an acknowledged authority, fills a very real need for the British naturalist. Until recently he has had to rely on Alder & Hancock's *British Tunicates*, written nearly eighty years ago, and never completed, Dr. H. Thompson's *Tunicates of the Scottish Area*, which covers only Scottish and Arctic Ascidiacea, and Harant & Vernières' volumes in the *Faune de France* series. Much remains to be known about tunicates, particularly about their remarkable life histories, but in order to investigate an organism one must first identify it, and the great external variability of tunicates makes their identification particularly difficult. As a result the early naturalists regarded as specifically distinct many forms which are now known to be ecological varieties, and the 141 species appearing in Alder & Hancock have been reduced in the course of time to 46 in the present volume.

The first fifty pages are devoted to an account of structure, physiology and classification which is completely up to date, papers as late as 1949 being quoted. Then each of the 76 species now known from British waters is treated in turn. Under each name is to be found an adequate synonymy, an account of distribution, habitat and life history, and a clear description. The numerous line drawings illustrating the distinctive characteristics of the various species are an important feature. There is also a useful bibliography of 23 pages, and an index.

The only omission noted was *Cyclosalpa bakeri*, which has been taken off the coast of Sutherland in 1932 and 1937. Unfortunately the published records of these finds are rather easily missed, and Dr. J. H. Fraser's paper *The Distribution of Thaliacea in Scottish Waters* doubtless appeared too late for consideration.

It is interesting to notice that the author supports the opinions of Garstang and Van Name that the Larvacea are the most advanced of the tunicates, standing close to the origin of the vertebrates, while the sessile Ascidiacea are primitive rather than degenerate. Accordingly, in the arrangement of species the Ascidiacea have been placed at the beginning, and the Larvacea at the end.

The number and arrangement of the families in the Ascidiacea has been the subject of much discussion in recent years. The old method of classification according to branchial structure was very convenient, but has been shown to be incorrect, while the more correct method—according to the form of the epicardium—makes use of a character which is very difficult to observe. Prof. Berrill is known to support the latter method, but the system adopted here is a compromise which should give the field naturalist no trouble.

A few misprints were seen, but none of them, not even the unpronounceable anagram on page 82, appeared likely to mislead.

P. A. O.

*Natural History of Ireland.* By R. Lloyd Praeger. London : Collins, 1950. Pp. 350. 25s.

Since the publication in 1856 of the last volume of William Thompson's *Natural History of Ireland* (published after his death) a great deal has been written about Irish Natural History, but unfortunately widely scattered in different journals. Dr. Praeger, who has long been recognised as one of Ireland's most distinguished naturalists, has now collected this information into a long awaited volume.

The book is divided into several sections starting with a general account of the geography and geology of the country followed by a discussion of the general structure and history of the flora and fauna. There follow sections on ecological and topographical regions and finally the second half of the book is devoted to sections discussing the different groups of the flora and fauna respectively. This lay-out seems clumsy and involves a certain amount of repetition ; one particularly feels that the sections on ecological and topographical regions might have been united, or at least that the topographical regions should be grouped according to the type of habitat they represent.

The biological interest of Ireland chiefly centres around its position in relation to the European continent and in consequence the paucity of its flora and fauna. Throughout the book the author pays special attention to the smaller species-composition of Ireland in relation to Great Britain, and also to the origin and history of the different groups. As the whole country was at one time or another covered by ice, but never all at one time, these latter points are of especial interest. Some organisms may have survived in refugia of unglaciated areas ; support for this thesis is drawn from present day conditions in Greenland where many species exist near the limits of the ice. Others probably arrived across post-glacial land connections with the continent or mainland Britain. Special attention is paid in these respects to the Lusitanian, American and Arctic elements of the flora and fauna. The later sections on the flora and fauna are valuable chiefly for the references they give to the literature on the groups in question and for showing the enormous gaps in our knowledge of Irish biology.

A few small points deserve criticism. Rarities seem to be given undue prominence in relation to their importance ; this is particularly so in the case of the Fishes. The statement that the " Carrion Crow is strangely rare " makes peculiar reading to those familiar with the geographical distribution of this species and the hooded crow. One must also deplore the haphazard use of trinomials in some of the scientific names ; thus two bones of the great spotted woodpecker found in caves, are referred to *Dryobates m. major.* However, these are small points when one considers the size of the task which Dr. Praeger has undertaken and fulfilled in such a brilliant manner. We owe him a deep debt of gratitude for collecting together this wealth of information which was previously so hard to find.

I. M. G.

*Studies in Bird Migration, being the collected papers of H. Chr. C. Mortensen, 1856-1921.* Edited by Paul Jespersen and A. Vedel Tåning. Copenhagen : Ejnar Munksgaard, 1950. Pp. 272. 18 Danish Crowns.

Nineteen papers and articles by the pioneer of scientific bird-marking are presented in English translation. The book is edited by our good friends Jespersen and Tåning, who were among the most eager of Mortensen's youthful assistants in the early days before the 1914-18 war. Dr. Taning contributes a brief but illuminating account of Mortensen's life and work : he was a quiet, kindly man, the son of a well-known amateur botanist, and for over forty years a schoolmaster in Copenhagen and at the Cathedral school in Viborg. He had equal gifts as an experimenter, as a naturalist of meticulous accuracy, and as an inspiration to his devoted pupils and friends.

After various trials he devised leg-rings made from flat aluminium strips, stamped with a serial number and address and then bent into the required shape : the design, in fact, which has undergone practically no alteration in the succeeding half century. The first ring of this successful type was placed on a starling in June, 1899. Much of his earlier attention was given to starlings, which he caught for marking in a useful automatic trap called a " starling-pincher " ; it is noteworthy that he experimented also with individual colour markings. From the outset he was in close touch with Eagle Clarke, and one of the original international notices of his starling experiments was inserted in the *Annals of Scottish Natural History* in 1900.

In spite of serious ill-health, which brought sadness to his later years, Mortensen marked (with hand-made rings) over 5000 birds of thirty-three species. His classical results were derived from distant recoveries of the starling and white stork : of the former he ringed 2133 (one of the recoveries being made in East Lothian) ; and of the latter 1633, which brought seventeen recoveries in Africa south of the equator, and clearly established the migration route of the Danish breeding population.

Mortensen deserves the greatest respect from ornithologists in general and bird-ringers in particular. The memory of the rising generation is necessarily short, and it has evidently been the editors' purpose to make this book an international memorial of his work. The papers presented vary a good deal in interest : some are largely devoted to details of recoveries ; two or more are not directly concerned with migration ; and there is a certain amount of repetition. The translation is the work of Dr. H. M. Kyle, well-known author of *The Biology of Fishes ;* it carries an unmistakable air of contact with the original Danish. The editing and printing are very good ; the cover is of heavy paper, attractively designed. British booksellers now have the book in stock.

V. C. W-E.

*Robin Redbreast.* By David Lack. Pp. 224. 8 plates in colour and 15 illustrations in text. London : Oxford University Press, 1950. 15s.

Dr. Lack's newest book is, in some sense, a return to the eighteenth century " collection ", a miscellany of writings which deal with a single subject : but the compiler has not followed the old tradition of asking his friends for original contributions on that subject—which might have produced some bizarre results— ; he has, instead, collected what has been written about the robin in our literature and sub-literature. The result is an odd mixture of the sublime, the curious and the trivial : Shakespeare and Mrs. Trimmer, with the *Brighton Herald* between them, are strange bedfellows. Less interesting mentions of the robin have been omitted, but are referred to in the notes : an unfortunate oversight is the robin which sang in the cell of the Hermit of Gouda, in *The Cloister and the Hearth.* Dr. Lack has always written well and here shows, in addition, a good critical sense, though we note a slight Victorian tendency towards *Goldzweigismus* (or Preoccupation with the Golden Bough), as in his supposition that *The Death of Cock Robin* may be based on " an ancient and widespread but now forgotten rite ". He insists, however, that the object of the book is entertainment, and entertain it certainly does. Not least successful are the well-chosen illustrations. The book provides an admirable Christmas present for erithacophils, young and old. M.F.M.M.

*The Birds of Greenland.* By Finn Salomonsen (text) and Gitz-Johansen (plates). Part 1. Copenhagen : Ejnar Munksgaard, 1950. Pp. 158, small 4to ; 22 plates. 60 Crowns per part.

This handsome and important work is to be completed in three parts. The part under review contains a foreword by the Danish Prime Minister, followed by a brief introduction, and articles on twenty-two species, namely divers (2), petrels and shearwaters (3), swans, geese and ducks (16), and the cormorant. The text is bilingually printed in two columns, Danish on the left and English (in italics) on the right, in excellent type on high quality paper with wide margins. Each article is illustrated by one of Gitz-Johansen's plates, and bears a title decorated by a small line-cut of the bird, with the name in Danish, English and Eskimo, and the scientific name.

The coloured plates are a notable departure from traditional bird-book portraits. Mr. Gitz-Johansen is a gifted water-colourist with a direct style, well-known for his Greenland studies. Each plate shows a single bird drawn on a large scale, in a very free but tolerably accurate manner ; of the ducks, only the drake is shown. The background gives an impression of the arctic scene, and a bold, but not uniformly successful, attempt is made to depict the birds in the rapid and difficult technique of the water-colour sketch.

Dr. Salomonsen is the foremost living authority on Greenland birds, and his text is wisely confined to giving an accurate and documented account

of the status of each bird in Greenland, of its habits there, and of details about it that are either new or known to comparatively few students. This will insure the book a lasting value to palaearctic and nearctic ornithologists, whether they are specially interested in Greenland or not. Less than half the information in these pages is in fact available elsewhere in English, and much of it concerns habits and life-history material of general interest.

The author is also an authority on systematics, and it may be noted that he favours the division of the Atlantic fulmar into two subspecies on the basis of size, the smaller form breeding only in Arctic Canada, but visiting Greenland waters (and the western Atlantic) ; our own experience confirms this. He combines the blue and snow geese, recognises the Greenland white-fronted goose of Dalgety and Scott, and rejects the American race of the pintail.

The reviewer himself read the proofs of this volume, and should therefore have no criticism to make. However, there is a minor inconsistency in the selection of English (and Danish) bird-names ; some, like ' Greenland Mallard ', ' Richardson's Goose ' or ' Arctic Eider ', designate particular subspecies of widespread birds ; others, for example ' Teal ' and ' Cormorant ', do not even identify the species precisely, at least to American and other non-European readers, who are familiar with several kinds of both teal and cormorant. For a book which will have such wide currency the selection of acceptable ' international ' names is clearly desirable, though undeniably difficult.—V. C. W-E.

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