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THE JOURNAL OF THE
SCOTTISH ORNITHOLOGISTS' CLUB

Volume 7 No. 1

SPRING 1972

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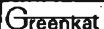
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Vol. 7 No. 1

Spring 1972

Edited by Tom Delaney, assisted by D. G. Andrew

Editorial

Oil in the Forth. Every year a substantial part of the Icelandic Scaup population winters in a small area of the Forth off Leith, forming spectacular rafts containing upwards of 30,000 birds. Large numbers of Eiders, Goldeneye and other sea ducks also winter there, and the site is a vital one for wild-fowl. Because they are so concentrated, however, the birds are extremely vulnerable to oil pollution. This danger was highlighted in 1970, when several hundreds were killed by floating oil, and this winter the Scaup rafts once again narrowly escaped disaster when in early February an oil slick that passed through the area affected some hundreds of the birds.

Oil pollution of our coasts and estuaries is a problem that is likely to remain with us in the foreseeable future, and meanwhile this and other such dense concentrations of seaducks remain entirely at risk, for there is still no effective system to prevent their massive destruction should heavy oil pollution occur in the area.

How then are the birds to be protected? Oil tends to appear without warning, and birds start to be fouled immediately; indeed the occurrence of beached birds is often the first indication of the presence of oil. More extensive monitoring, therefore, might help to provide an early warning, and this, coupled with an organisation for the rapid dispersal of oil on the water, might provide a reasonable measure of protection. Yet it is doubtful whether such methods alone can be relied on in all circumstances, and there is need of an economical and reliable method whereby oil can be positively excluded from such vital areas.

The potential cost of developing and applying effective methods of protection is likely to be high, but the task is essential. Conservation and pollution are international problems, but solutions must often be found locally. It is ironic that we ornithologists in Scotland, who have been pressing the Government of Iceland to protect the Thjorsarver breeding grounds of Pink-footed Geese, have, on our own doorstep, so far failed to protect the main wintering quarters of another species we share with that country.

Current literature. Recent material of Scottish interest includes :

Angus & South Kincardine Bird Report, 1971. G. M. Crighton, T. M. Clegg, 1972. Published by Dundee City Museums and Art Galleries Department, no price given.

Shetland Bird Report, 1971. R. J. Tulloch, 1972. Price 20p + 4p postage from R. J. Tulloch, Mid-Yell, Shetland.

Peregrines—the 1971 situation. D. A. Ratcliffe, 1972. *BTO News* No. 49. Summary of 1971 census results.

Pink-footed Geese of Iceland and Greenland : a population review based on an aerial survey of Thjorsarver in June 1970. R. H. Kerbes, M. A. Ogilvie, H. Boyd, 1971. *Wildfowl* 22: 5-17.

The behaviour of the Ptarmigan (part 1). A. Watson. *Brit. Birds* 65: 6-26.

Cannibalism in Herring Gulls. J. Parsons, 1971. *Brit. Birds* 64: 528-537. Isle of May study.

Field Studies on Foula, 1969 and 1970. Brathay Hall Trust, Ambleside, Westmorland, 1971. Price 20p. Includes accounts of skua studies.

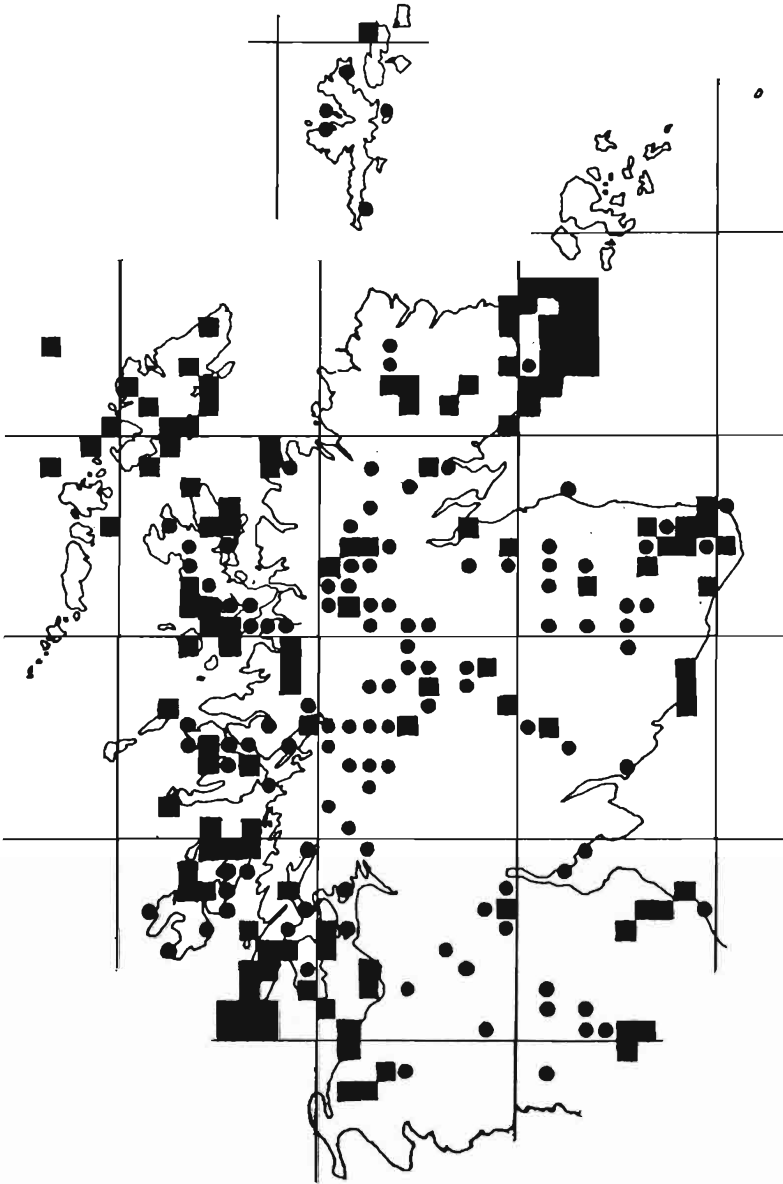
The BTO Atlas in Scotland

The 5-year BTO Atlas project comes to an end after summer 1972, so this year is the last chance to fill in the gaps—the 10-kilometre squares that are still uncovered or only partly covered and the species that are proving elusive and still need to be found in many areas.

The squares that are still in need of a lot of extra work are listed below and also shown on the map by dots; those that are the most blank, and therefore need attention most urgently, are indicated by bold type in the list and by completely black squares on the map. These squares have been selected by comparing Regional Atlas Organisers' estimates of the number of species they think breed in each square with the number of species already found. It is pleasing to find that the majority of squares (most of those blank on the map and unlisted) have already exceeded the 90% level. With a big final effort in 1972, 100% coverage is within reach.

The following species are all badly under-recorded and ALL records in the breeding season (for 1968-71, as well as for 1972) should be submitted: Scaup, Common Scoter, Merlin, Quail, Water Rail, Spotted Crane, Barn Owl, Long-eared Owl and Hawfinch.

Free copies of the 1972 *Atlas Instructions*, with details of the codes, progress maps, full instructions and a list of all under-recorded squares in Britain and Ireland can be obtained from your Regional Atlas Organiser. The SOC Local Recorder is the Regional Atlas Organiser, except in the following cases: **St Kilda** Dr J. J. M. Flegg, B.T.O., Beech Grove, Tring, Hertfordshire. **Sutherland** Dr I. D. Pennie, Varkasaig, Scourie, Sutherland. **Ross-shire** C. G. Headlam, Foulis Mains, Evanton, Ross-shire. **Inverness-shire (more than 18 miles from Inverness)** Hon. D.N. Weir, Creag Dhu Lodge, Newtonmore, Inverness-shire. **East Nairnshire and Moray** Dr R. Richter, Gordonstoun School, Elgin, Moray. **South Kincardineshire and Angus** C. M. Morrison, Innis Righ, Kings Meadows Gar-



BTO Atlas under-recorded squares in Scotland

dens, Peebles, Kinross, West Fife, Stirlingshire and Clackmannanshire H. Robb, 27 Victoria Place, Stirling. Berwickshire, Peeblesshire, Roxburghshire and Selkirkshire Dr J. I. Meikle, Bridgeheugh, Lindean, by Gala-shiels, Selkirkshire. Dunbartonshire, Renfrewshire, West Stirlingshire and North Lanarkshire J. Mitchell, 22 Muirpark Way, Drymen, by Glasgow G63 0DX. South Lanarkshire D. L. Clugston, 95 Courthill Avenue, Cathcart, Glasgow, S4. Buteshire Dr J. A. Gibson, Foremount House, Kilbarchan, Renfrewshire. Ayrshire Dr M. E. Castle, 9 Finlas Avenue, Ayr. Dumfriesshire J. Maxwell, Hayfield, Thornhill, Dumfriesshire.

The map-making and text-writing for *The Atlas of Breeding Birds of Britain and Ireland* will start in early autumn 1972 and all cards must be returned to your Regional Atlas Organiser by 31st August 1972. It will not be possible to include records in the Atlas if they arrive late.

All observers who have contributed to the undoubted success of the Atlas project deserve thanks and congratulations. If all observers make a special effort to visit the under-recorded squares in 1972, we can achieve complete coverage of Scotland.

Under-recorded squares

In order to save space, the code letters (indicating the 100-kilometre square) are given only for the first square to which they refer and at the start of a new line.

Regions are listed from north to south and not in alphabetical order.

Shetland HP40 HU25 26 38 41 56

Outer Hebrides NA64 90 NB02 11 20 30 33 41 42 45

NF68 89 95 NG18 29

Sutherland NC32 33 34 41 42 61 72 90 93 95 96

Caithness ND01 02 03 06 07 12

ND13 14 15 17 23 24 25 26 27 33 34 35 36 37

Ross-shire, Skye, Rhum, Eigg & Coll NG25 31 32 33

NG34 37 40 41 42 45 50 51 54 55 56 60 61 78 79 88

NH02 03 13 14 15 24 26 28 47 53 68 NM26 39 59

Nairnshire & Morayshire NH93 94 NJ13 14 27

Banff NJ10 12 32 33 64 65

Aberdeenshire & N. Kincardineshire NJ30 50 51 61 63 74 75

NJ84 85 92 94 95 96 NK04 06 NO59 88

Inverness-shire (near Inverness) NH34 73 75

Inverness-shire (away from Inverness) NG70 80

NH01 11 12 20 21 23 31 40 50 NM87 88 89 NN27 37

NN48 49 57 58 78 88

S. Kincardineshire & Angus NO53 86 87

Argyllshire (including Mull) NM21 34 35 43 44 53 54

NM63 64 72 75 84 95 96 NN01 04 05 10 13 15 22 23

NN25 33 35 NR50 51 60 61 62 63 65 70 71 73 74 84

NR85 87 96 99 NS17

Perthshire NN45 56 77 96 NO05 15 24

E. Fife NT28 39

Glasgow area NS29 86

Stirling area NS97

Islay, Jura, Colonsay & Oronsay NM40 60 NR16 24

NR37 38 45 47 49 56 57 58 59 68 69

West Lothian NS95 96

East Lothian NT66 76 87

Buteshire NR92 93 NS01 04 05 15

Roxburghshire, Selkirkshire & Peeblesshire NT12 30 31 40 50 55 60

NT96 NY59

Ayrshire NS10 22 23 42 NX17 19

S. Lanarkshire NS64 73

Dumfriesshire NS80 NT11 NY18 47

Kirkcudbrightshire & Wigtownshire NX27 38 48

Birds of prey in Scotland : some conservation problems

I. NEWTON

This paper was read at the Scottish Ornithologists' Club's Annual Conference at Dunblane, 31st October 1971.

Introduction

Several hundred years ago, when Scotland was mainly under forest, its raptor population was rich and varied. Widespread deforestation, mainly 200-300 years ago, would have greatly altered the relative abundance of the various species. Those of open and broken country would have increased and spread, and those of forest declined. But apparently no extinctions took place through change in habitat, and 150 years ago ten species bred numerously, and at least four others sporadically or in smaller numbers (table 1). Then, under widespread persecution, seven species ceased to breed in Scotland (though four were rare anyway), and four others were much reduced in range. Two of those exterminated have recently returned to breed in small numbers. Nonetheless the country still holds only an impoverished remnant of its original bird-of-prey fauna. Key questions facing conservationists are: why does this situation persist?; why do so many species remain restricted and scarce?; and what is slowing or preventing them from recolonising their former ground?

Table 1. Status of breeding birds of prey in Scotland, 1800-1840

Numerous and widespread: Peregrine, Merlin, Kestrel, Golden Eagle, Buzzard, Hen Harrier, Sparrowhawk, Kite*, White-tailed Eagle*, Osprey*

Numerous in a restricted habitat: Goshawk*

Present in small numbers, or sporadic, but not restricted by habitat: Hobby*, Marsh Harrier*, Honey Buzzard*, and doubtfully Montagu's Harrier

Notes: *Ceased to breed in Scotland by 1900 or soon after. (Osprey and Goshawk have since returned and breed in small numbers.) Details mainly from Baxter & Rintoul (1953).

Two species, Golden Eagle and Sparrowhawk, illustrate the range of known problems facing birds of prey in Scotland today: pesticides and pollution, continuing persecution, changing land use, increasing disturbance and so on.

Golden Eagle

Three main factors seem to be important for Golden Eagles: crags or large trees for nesting, open country for feeding, and freedom from human disturbance. The last factor alone excludes them from many otherwise suitable areas, including most of lowland Britain. Their main foods include grouse-sized birds, rabbit-sized mammals, and the young and dead of larger mammals like deer. Their flight enables them to cover large areas with ease, and hence to exploit successfully prey living at low densities.

In Britain deforestation would at first have greatly increased the country available to Golden Eagles, but soon afterwards disturbance and then persecution banished them from England and Wales and later from southern Scotland and Ireland. The present population, estimated at around 250 pairs, is mainly restricted to the Highlands and Islands. Over much of this region the birds have six main foods, Red Grouse and Ptarmigan, hares and rabbits, and dead sheep and dead deer, which vary in proportion in the diet according to their local availability.

Where Golden Eagles are not persecuted, their breeding populations show great stability. The numbers over wide areas do not change from the average by more than a pair or two over long periods of time as shown, for example, by Watson (1957, 1970) for Deeside. Each pair normally has several alternative nests, and the same crags are occupied for many years by a succession of breeding pairs. Each pair hunts over a wide area around their nest. But the hunting ranges of different pairs overlap so that, although the pairs space themselves out, they are not strictly territorial in the usual sense (Brown & Watson 1964). Furthermore, the same ground that is hunted by breeding pairs will also hold throughout the year some non-breeding immatures. Nevertheless, in any one area the breeding population of Golden Eagles is presumably prevented from exceeding a certain level by some form of interaction between pairs. This interaction includes the advertisement of nest-sites by spectacular aerial displays. The density of breeding pairs varies in different parts of Scotland, even where persecution is unimportant and nest sites plentiful. Usually between four and six pairs may be found per 100 square miles of suitable terrain (table 2). This gives each pair an average of 12000-18000 acres, but over smaller areas, some pairs have as little as 5000-6000 acres (Watson 1957). These figures have limited meaning, however, since the ranges of pairs overlap.

The young leave the nest in July, remain on home ground until October or November, and then disperse. Brown & Watson (1964) have estimated that three-quarters of these young

die before they reach sexual maturity in about their fourth year and that each pair takes, on average, ten years to replace itself, and so the turnover in population is slow. Some young stay within the normal range of the species, others move out, as is shown by their regular appearance each year in places

Table 2. Densities of breeding Golden Eagles in Scotland

	Pairs	Pairs/100 sq. miles	Acres/pair
Northeast Highlands	14	6.3	10000
East Highlands	13	6.1	11500
Uists	12	5.3	12000
Northwest Sutherland	16	4.8	13000
Wester Ross, area I	12	4.2	15000
Wester Ross, area II	13	3.9	17500
Argyll	8	3.8	18000

Details from Brown & Watson (1964), Lockie (1964), Newton (unpublished), Watson (1957).

where eagles do not normally nest. No doubt eagles could breed over much more of Scotland than they do, including, for example, more of the Northern and Western Isles or the Border country. Historical evidence shows that, in the past, they were continually prevented from recolonising areas by persistent persecution. But during the last 20 years they have re-established themselves precariously in Ayrshire and Gallogway, more of the Inner Hebrides and the Lake District, while a pair also bred for some years in Northern Ireland. However, Ordnance Survey maps mark several "Creag Iolaire" (Eagle Rocks) in places where eagles are seldom seen now.

Table 3. Primary land use in Scotland

	Million acres	Proportion of total land area
Sheep	7	35%
Grouse	3	15%
Deer	3.5	18%
Forestry	1.5	7%

Although most people associate the Golden Eagle with wilderness, its survival depends on land use and human attitudes. In the Highlands and Islands land is used mostly for sheep, grouse, deer or forestry (table 3). These uses are not all mutually exclusive, and much sheep and deer ground also carries grouse, but it is the primary use of an area that affects the eagles. On sheep ground the birds are often persecuted because they eat lambs, and on grouse areas because they both eat and frighten grouse (which then become more difficult to shoot). In both types of terrain some eagles are killed deliberately by shooting and trapping at nests and roosts, and others are killed incidentally in traps set for foxes. Forestry ground,

except when the trees are young, is not normally used by eagles. Highland deer ground, however, on which eagles are tolerated, has long been the main stronghold of the species in Britain and has provided a reservoir from which the depleted populations of sheep and grouse areas have continually been replenished.

Effects on lambs

In western Scotland sheep are usually kept in greater numbers than the habitat can support. This leads to overgrazing of the vegetation, high mortality of the sheep and poor lambing success. Hares and other natural prey tend to be scarce, perhaps also partly the result of too many sheep, but the abundance of sheep carrion permits eagles to nest at relatively high densities (table 2).

The problem of lamb-killing was investigated by Lockie and Stephen (1959) in Lewis, and Lockie (1964) in Wester Ross. One pair of eagles studied in detail included a variable proportion of lamb in the diet in different years (table 4). In years when dead lambs were scarce the birds made up on other prey and not with extra lamb-killing. Live lambs were vulnerable for only a short time each year, because they soon grew beyond

Table 4. Lamb in the diet of a pair of Golden Eagles, Wester Ross

	1956	1957	1958	1959	1961
Lamb survival	Average	Good	Poor	Poor	Good
Lamb in diet %	45	24	49	44	22
Birds in diet %	50	66	46	50	73
Others in diet %	5	10	5	6	5

Original details in Lockie (1964).

the size of prey preferred by eagles. An examination of those brought to the eyrie revealed which ones had been killed by the eagles and which had been picked up dead. If the lamb had been killed by an eagle, it had a large bruise beneath the skin and talon marks; if it had been picked up dead it showed talon marks alone; if its eyes were out or its ears off a crow or a fox had been at the carcass before the eagle. Seven out of ten lambs had been taken dead and only three killed (and some of the latter might have been weaklings, twins or abandoned). Since this particular pair ate 22-25 lambs in five years, they had probably killed about seven in this time. In the area they hunted, some 4000 lambs were born in the five years, so this pair of eagles took about 0.1% of the available lamb crop. In the same period, 520 lambs died from other causes between birth and June. So in this instance at least the effect of eagles

on the sheep was minute. But whereas an ecologist thinks in terms of numbers, populations and proportions of populations affected by predation, a shepherd inevitably thinks in terms of individuals and their potential cash value and is motivated to take action against eagles by occasional finds of dead lambs.

Similar results have been found in Texas, where Golden Eagles are widely killed by sheep farmers, often from aeroplanes (Arnold 1954, Spofford 1969). Again the shepherding is inadequate, the ground overstocked with sheep and goats, and over-grazing occurs, with a consequent high mortality of sheep and scarcity of wild prey. Eagles are nevertheless abundant, apparently attracted by the availability of carrion. In these circumstances, the shooting of troublesome birds will do less to solve the basic problem than would improved management of the stock.

Effects of pesticides

In the early 1960s the breeding success of eagles in western Scotland declined because of the failure of some pairs to nest, breakage of eggs and other factors generally associated with organo-chlorine pesticides (Lockie & Ratcliffe 1964). In one study, the percentage of non-breeding pairs increased from 3% to 41%, the percentage of pairs breaking eggs increased from 14% to 36%, while the percentage of birds producing young dropped from 72% to 29% (table 5). The evidence that such chemicals were involved was circumstantial but

Table 5. Nesting success of Golden Eagles, Western Scotland

A	Pairs	Percentages		
		non-breeding	breaking eggs	producing young
1937-60	40	3	14	72
1961-63	39	41	36	29

B	Nests	Percentage	
		producing young	Mean dieldrin level (ppm)
1963-65	39	31	0.86
1966-68	69	69	0.34

Details from Lockie & Ratcliffe (1964) and Lockie, Ratcliffe & Balharry (1969).

grew as the years went by. First, dieldrin used in sheep-dips was found to be present in mutton (Egan 1965) and in eagle eggs (Lockie, Ratcliffe & Balharry 1969). Second, dieldrin was withdrawn as a dip in 1966, and soon afterwards eagles began to breed more successfully. The percentage of pairs producing young increased over six years from 31% to 69%, while the mean dieldrin level in the eggs dropped from 0.86 ppm to 0.34 ppm (table 5). Third, the eagles in central and eastern Scot-

land, which ate little or no mutton, bred successfully throughout this period and laid eggs consistently low in pesticides. Thus the species has recovered from this particular problem before any marked decline in the adult population has become apparent.

Effects on grouse

After a good breeding season a moor will normally hold more grouse than can breed there next year. Some of the surplus birds are shot, and the rest are expelled during two periods of territoriality, one in autumn and another in spring.

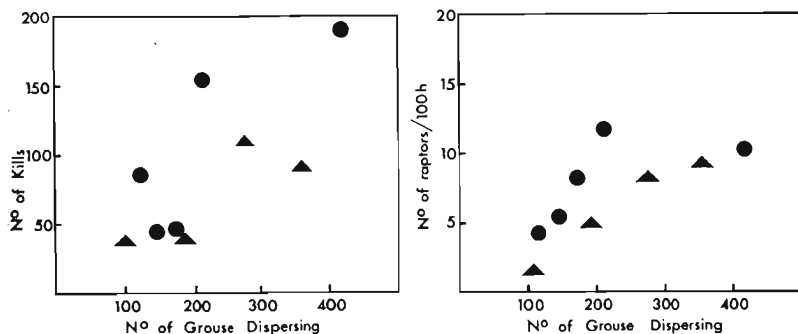


FIG. 1. Relationship between numbers of Red Grouse dispersing, Grouse killed and raptors seen in Glen Esk (Details from Jenkins, Watson & Miller 1964).

Circles indicate low area, triangles indicate high area

Jenkins, Watson and Miller (1964) studied the effects of all predators (including eagles) on grouse in Glen Esk in winter time. They regularly searched the moors and recorded the remains of all the grouse that had been killed by predators and the numbers of predators seen. They made four main points:

Predation was heaviest at the two periods when the grouse were dispersing.

The number of grouse killed varied each year in direct proportion to the number of birds dispersing (fig. 1).

The number of raptors seen over the area was in direct correlation with the number of grouse dispersing (fig. 1). Evidently raptors were attracted to the area in numbers related to the numbers of vulnerable grouse available. In other words, the numbers of predators were influenced by the numbers of their prey and not *vice versa*.

Not all the grouse that dispersed won territories. Those that failed lived in marginal, grassy habitats round the edge of the moor where there were no territorial grouse, and these were killed more often than territory owners (table 6).

Table 6. Predation on Red Grouse by Golden Eagles, Hen Harriers, Foxes and other predators, Glen Esk, 1956-61

	No. tabbed	% killed
Birds with territories in November	383	2
Birds without territories in November	261	14

Details from Jenkins, Watson & Miller (1964).

From these findings, two main conclusions were drawn :

Predators were not affecting the breeding population of grouse because the most vulnerable birds (those killed by eagles and other predators) were the ones that could not breed anyway.

In most years the grouse available for shooting were not being fully exploited, because at the end of the season many surplus birds were still left unshot. Thus predation was not depleting the sporting value.

These conclusions are in general agreement with those of other workers on predation (e.g. Errington 1967, Newton 1970) but are based on work in an area where some predators were controlled and where raptors were seen mostly in winter. The second complaint against eagles, that they frighten the grouse and interfere with the drives, was not investigated. New studies are now being done on a grouse moor where raptors are protected all year.

Effects of persecution

Despite findings on the effects of eagles on sheep and grouse, eagles are still widely shot. However, since this is illegal, it is exceedingly difficult to study. At its most intense it may permanently prevent eagles from settling in an area. Birds may move in every year but be killed so quickly that the outsider knows nothing of it; he only sees suitable habitat unoccupied. Within the regular range of the Golden Eagle, Sandeman (1957)

Table 7. Effects of persecution on Golden Eagles, south Gramplains, 1950-56

	Records	Only one of pair present	One partner immature	Brood-size (successful nests)	Brood-size (all nests with eggs)
Deer	24	0	0	1.4	0.6
Sheep/grouse	51	8	4	1.4	0.3

Details from Sandeman (1957).

compared the success of birds nesting on deer ground with that of birds nesting in sheep and grouse areas (table 7). On deer ground there was no instance of an eagle lacking a mate,

but on sheep and grouse ground eight such instances were recorded. On deer ground there was no instance of an eagle paired to an immature partner, but on sheep and grouse ground there were four such instances. Both these factors are symptoms of excessive shooting. An immature partner in a pair meant that the birds either did not lay or produced infertile eggs. The mean size of successful broods was the same in both areas, but the overall brood size, when pairs that raised no young are taken into account, was 0.6 on deer ground and only 0.3 in sheep and grouse areas. In the latter areas killing of eagles was suppressing breeding success so much that this population could not have been sustained without continual immigration.

Thus the success of the Golden Eagle in Britain is determined primarily by the prevailing land use and the human attitudes fostered thereby. There is no ecological reason why the species should not breed over more of Britain than it does. Young are produced every year, but apparently most are absorbed by killing within the regular range or in the areas they try to colonise. The situation has improved slightly in the last 20 years in that the species is now being allowed to remain in a few areas from which it was formerly eliminated. On the other hand persecution is increasing in the Highlands, especially on grouse moors. Hence, the future of the bird probably depends mainly on future trends in land use, particularly on the extent of game-preservation. If more eagles are killed, their numbers can be expected to decline, and their range to contract. If the management of sheep and deer is changed so as to reduce the number of animals that die, the breeding density of eagles might also decline. Lastly, with increasing tourism in some areas, more pairs can be expected to fail to raise young because of unwitting disturbance, and some sites will probably be deserted.

Birds of prey and forestry

The major change in land use in Britain today is the conversion of open hill ground to plantation forest. Since 1945 nearly a million acres of open ground have been put under trees by the Forestry Commission alone (fig. 2), and in this time private forestry has grown so much that it now takes up more land each year than the Commission itself. More than half this planting is in Scotland, and in some areas, like Galloway, most of the land between the 500 foot and 1500 foot contours will soon be afforested. Still, however, only 7% of Britain is wooded, which is less than in any other country in Europe save Ireland and Holland.

To some raptors and other birds of open country, afforestation means a restriction in range, but to forest species it pro-

vides an increase in habitat. More important, in these new forests birds of prey have so far been free from persecution

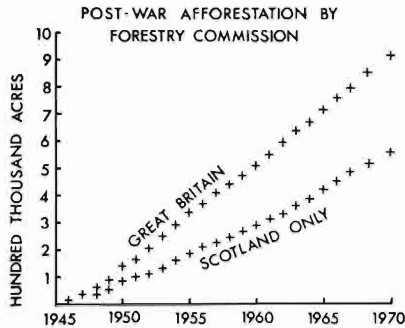


FIG. 2. Post-War afforestation by the Forestry Commission in Britain. (The figures refer only to the planting of new woods, not to the replanting of old ones.)

and pesticides. Coincident with the absence of many gamekeepers during the Second World War, Hen Harriers re-established themselves on the Scottish mainland and have since spread in young plantations, where they are tolerated by the Forestry Commission. Harriers leave these plantations when the trees reach about 20 feet, and it is then that Sparrowhawks come in, another bird that has benefitted greatly from increased afforestation.

Sparrowhawk

Sparrowhawk was one of two species in Britain that, though reduced in numbers, were not reduced in range by 19th-century persecution. Its resilience was probably due to its skulking habits, its ability to nest at high densities, its occasional tendency to nest in unexpected places, the ability of both sexes to breed in their first year and a high reproductive rate, with up to six young in a brood. These characteristics are opposite to those that led to the reduction in so many other species. But the resistance of the Sparrowhawk to persecution was not matched by a similar resistance to organo-chlorine insecticides. In five years the species virtually disappeared from most of lowland Britain and became much reduced elsewhere. It apparently reached a low in the years 1959-63. The evidence that such pesticides were involved was again circumstantial: the decline was unprecedented, yet closely paralleled in time and space the use of these chemicals, which were also found in the bodies and eggs of Sparrowhawks. Then, following restriction in the use of these chemicals in 1962, the species began very slowly to recover. In western Britain, it seems to have increased especially abruptly in the last two or three years.

Fig. 3 shows an index, based on ringing, of the output of young by Sparrowhawks in Britain each year from 1930. The index is the proportion that young Sparrowhawks formed of all nestlings ringed each year. It depends both on the number of breeding adults and on their breeding success. The most striking features are the tremendous increase in the index that took place within two years of the start of the Second World War and the decline within two years of its end. Fewer birds

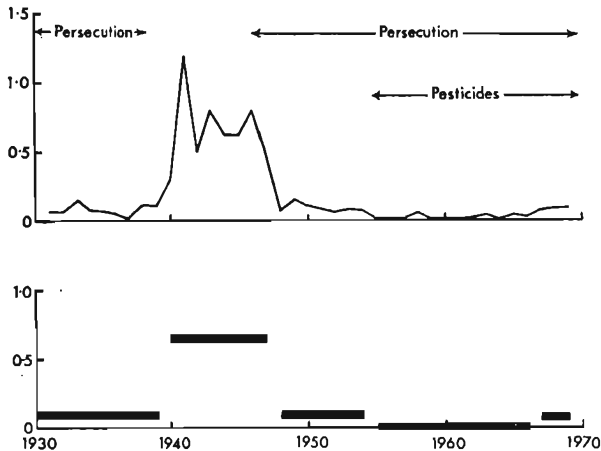


FIG. 3. An index, based on ringing, of the output of young Sparrowhawks in Britain. The index is the percentage that young Sparrowhawks formed of all nestling birds ringed in Britain each year. Over the last 40 years the index has had five main levels, shown in the lower graph.

of all species were ringed during the War, but Sparrowhawks formed a greater proportion of them, presumably because more were available then. This situation was almost certainly due to the wartime decline in game-keeping. Many writers mention the great though temporary increase in various birds of prey at this time, and the index for Merlin over this period is very similar. The index suggests that gamekeepers were depressing the number of young Sparrowhawks produced in Britain each year to about one-seventh of what it might have been. In fact their effect was even greater, for about two-thirds of the habitat in Britain was felled during the early War years. Over the last 40 years the index was at five main levels: low before the War (1930-39); very high during and just after the War (1940-47); low again for the next few years (1948-54); very low, following the widespread use of organo-chlorine compounds (1959-66); and slightly higher since then (1967-70).

Nesting densities

The Sparrowhawk is recovering in an era when vastly more habitat is available in Britain than at any time in the last 300 years. The densities at which the species will nest can be studied meaningfully only in areas of more or less continuous woodland, because in more open country the birds are usually sparse through shortage of nesting cover. Studies must also be confined to areas where the bird is not affected seriously by toxic chemicals. Then pairs normally nest each year in the same restricted areas, which can be recognised by groups of old nests, though the occupancy of particular sites may be broken temporarily by the activity of gamekeepers.

In large Dumfriesshire woodlands, nest-sites are regularly spaced every 0.4 miles, which is equivalent to a density of six pairs per square mile. The greatest concentrations found in 1971 were 19 sites (15 occupied) in 3.5 square miles of one plantation and 11 sites (ten occupied) in 1.5 square miles of another. This density seems high to people who know Spar-

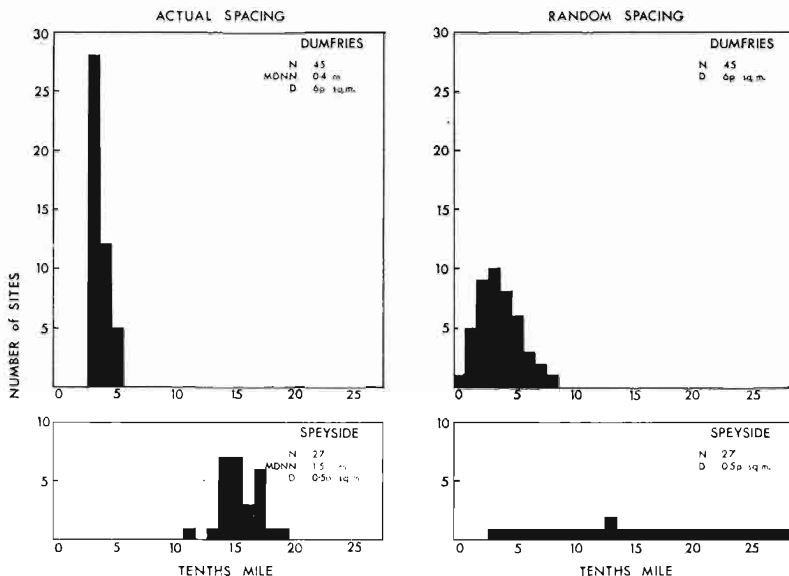


FIG. 4. The regularity of nest-spacing in two areas with different densities of Sparrowhawks. Nest-spacing is measured as the distance of each nest from its nearest neighbour in continuous or almost continuous woodland. Columns on the left show the spacing actually found, and those on the right, the spacing that would be expected if the nests were distributed randomly but at the same density. N - total number of sites; MDNN - mean distance to nearest neighbour; D - density in pairs per square mile.

rowhawks only in fairly open landscapes, but it is not as high as that reached by Tawny Owls in woodland (Southern 1970).

Even with plenty of woods Sparrowhawks do not reach this density everywhere: in wooded parts of the Spey valley, where the species has been studied by Douglas Weir, the nests occur regularly every 1.5 miles, which is equivalent to one pair per two square miles. In other parts of Britain intermediate densities have been found, but whatever the density the nests are always as evenly spaced as the habitat allows (fig. 4). The differences in density between areas may be related to differences in the availability of prey. The numbers of small birds have not been measured, but the Dumfriesshire area is obviously richer both ecologically and agriculturally than Spey-side.

Habitat preferences

In mixed landscapes, in what sort of woods do Sparrowhawks like to nest? Last year every wood in about 200 square miles of Dumfriesshire was checked, and Sparrowhawks were found in a quarter of them. The woods themselves fell into four categories—pure conifer woods, mixed coniferous/hardwoods, birch/sallow woods, and other forms of hardwoods like oak and beech. The birds showed a marked preference for woods containing conifers (table 8). Yet to some extent the woods occupied depended on the local choice available, and types that were rejected as inferior in one part of the area were occupied in another. The size of the wood was also important. Only 2% of woods of less than one hectare (2.5 acres) were occupied, but this proportion increased with increasing size of the wood, and all those exceeding 20 hectares (50 acres) were occupied, usually by more than one pair. This analysis is only a first step in understanding the habitat preferences of the Sparrowhawk; other factors are involved—for example, to be occupied a wood must not be too young, too thick or too open.

Table 8. Occupation of Dumfriesshire woodlands by Sparrowhawks, 1971

A	All woods	Conifer	Conifer/ Hardwood			Birch	Hardwood
			Birch	Hardwood			
Total available	272	176	40	30	24		
No. occupied	64	49	9	4	2		
% occupied	24	28	22	13	9		
B	Area of woodland (hectares)						
	—1	1-5	5-20	20-50	50-100	100+	
Total available	63	79	17	6	4	7	
No. occupied	1	22	9	6	4	7	
% occupied	2	28	55	100	100	100	

Food supplies

A successful pair of Sparrowhawks needs the equivalent of at least 500 small birds in the breeding season (calculated from Tinbergen 1946). If there are six pairs of hawks per square mile of terrain, they need 3000 small birds per square mile. (This figure should not be taken too literally, for the equivalent of 20 small birds is provided by one Wood Pigeon.) Conifer plantations are generally considered to be poor in birds, so the question arises to what extent do the hawks hunt outside the forest and how far is their density within forests supported by outside food supplies? A first step is to find the proportion of woodland to non-woodland prey in the diet. In small woods in farmland about 32% of 802 prey-remains were of species that must have been caught outside, including larks, pipits, buntings and House Sparrows. The medium-sized Greskine Forest is sausage-shaped, with the pairs distributed along its length, all with easy access to open country. In this situation, 41% of 213 prey-remains were of open-country birds like Meadow Pipit. In the larger Ae Forest only about 13% of 236 prey items were caught outside, mainly by pairs on the forest edge. At least one-third of the hawks in this forest fed exclusively or almost exclusively on forest prey, including Chaffinches, Song Thrushes, Goldcrests, Coal Tits and Wood Pigeons. This is not to conclude that, if the size of such forests is increased further, Sparrowhawks will continue to nest at the same high density. Even though the hawks themselves depend mainly on food from within the forest, the prey species depend partly on outside food supplies. This is especially true of Wood Pigeons throughout the year and of Chaffinches in winter.

Remains of prey found at plucking posts and nests showed that male Sparrowhawks regularly kill birds up to the size of Blackbird and females take prey up to the size of Wood Pigeon. The remains of 1500 prey items, including many that had been killed after the young hawks had left the nest, contained only 15 game birds, mainly young Pheasants. In this area, therefore, over much of which game was reared, only 1% of the food consisted of Pheasants, but no nest was known in a wood in which poults were being released; in those circumstances, the hawks would probably have taken more.

The fact of high densities in Dumfriesshire does not necessarily imply that pesticides are no longer important there. First, the county is by no means occupied to the full with Sparrowhawks; many highly suitable, unkept woods exist from which the birds are absent, though some woods contain old nests, showing that they have been occupied in recent years. Secondly, the breeding success of more than half the 113 pairs studied is still reduced by egg breakage, embryonic

deaths and other factors generally associated with toxic chemicals (Newton, in press). But the situation is improving, and with increased afforestation the future for Sparrowhawks in south-west Scotland looks good, at least outside game-rearing areas.

Factors influencing density in breeding birds of prey

This section examines in more general terms various factors that influence density in birds of prey, and begins with the natural factors imposed by the environment and spacing behaviour of the birds.

In continuously suitable habitat, whether forest or open country, the pairs of a given raptor species normally occur throughout, but are sometimes at different densities in different areas. In low-density areas the birds are sparser, with larger home ranges than in high-density areas, as has been found not only in Golden Eagle and Sparrowhawk, but also in Peregrine (Ratcliffe 1969). The breeding populations of such species, whether in high- or low-density areas, normally remain almost constant over many years and do not exceed a certain level. The pairs also tend to be evenly spaced.

Populations of other species like Kestrel and Short-eared Owl, which eat small rodents, fluctuate over the years between high and low density, following cycles in their prey (Elton 1941). An approximate 5-year cycle for Kestrel in the uplands of Britain has been demonstrated by Snow (1968), while peaks in Short-eared Owl numbers have been described by Adair (1892) and Lockie (1955). During the series of vole plagues on the Borders at the end of the 19th century, both predators increased greatly, and Kestrels nested colonially (Bolam 1912).

In some landscapes breeding places are scarce and widely scattered. These may be woods for Sparrowhawks or crags for eagles, but the effect is the same: the pairs will be further apart and the overall breeding population lower than if nest-sites were more plentiful. Pairs are often irregularly spaced according to the distribution of sites; in one sense, the area is occupied to the full, but at low density.

Golden Eagles occasionally oust Peregrines from nesting cliffs, and so if sites are restricted the presence of one species influences the numbers and distribution of the other. Examples involving other birds of prey have been given by Craighead & Craighead (1956).

The Scottish countryside is a mosaic of estates, with intense predator control on some, slight control on others and none on yet others. Without persecution all suitable habitat would be occupied by raptors, but gamekeepers remove the breeding

pairs each year from parts of it. If the remaining birds produce enough young, kept areas may be recolonised afresh each year, and often the newcomers settle in the same places as their predecessors (Rowan 1921-22 for Merlin, Ratcliffe 1969 for Peregrine). This is partly because some nest-sites are intrinsically better than others, but also because incomers are to some extent fitting into a pre-existing territorial framework.

Besides removing each year's breeders, keepers also destroy in autumn and winter part of each year's crop of young, and thereby draw on the population from a wider area. This was more important in the past than it is now, and was always more important in game-producing areas in the Lowlands than in the Highlands, where traps more often froze up. To judge by the vermin lists of the last century, exaggerated though some of them may have been, many more birds of prey were removed each year from some estates than could have been present there at any one time. This was presumably because, as one territorial pair was removed, other young birds moved in to take their place; when these were shot others moved in and so on. Up to a point, keepers by this activity merely crop part of each year's production of young, but if persecution is widespread they may remove so many young that the population declines. The success of a species in such an environment hinges largely on the ratio of kept to unkept ground.

Last century, under widespread persecution, the populations of several species were reduced to a remnant, at which stage collectors of eggs and specimens became important in causing their final demise. The situation produced by pesticides is similar in that the population is low and produces few young. Most birds tend to be concentrated in less contaminated areas, with the others widely scattered. Hence various factors, both natural and man-induced, can cause low density in birds of prey, and over a large area all may be operating in some degree.

Present status of birds of prey in Britain

With the widespread persecution of the 19th and early 20th centuries, all raptors in Britain (except perhaps the Kestrel) were apparently reduced below the level that their habitats, however restricted, would support. But since then certain species have become limited by other factors. Table 9 lists species according to whether their status since 1950 has been limited by shortage of habitat, past persecution, the effects of pesticides or by reasons unknown. The table refers to Britain as a whole.

Three species are rare mainly through shortage of habitat: Marsh Harrier, which needs *Phragmites* beds; Honey Buzzard,

which needs extensive open mature deciduous woodlands, rich in wasps and bees; and Goshawk, which needs extensive mature woodlands, deciduous or coniferous. All these habitats are found in Britain only in restricted areas separated by long distances. It would be unreasonable to expect all such sites to be occupied every year, especially by the migrant species, and perhaps none of these species could have reached a much greater maximum during the last 20-30 years than it did. But since 1960 Marsh Harrier has for unknown reasons declined again almost to extinction, whereas Goshawk has found an increasing habitat as the new forestry plantations have matured.

Table 9. Certain birds of prey listed according to the factors mainly responsible for their post-War distribution and numbers in Britain

Habitat restricted and scattered	Persecution		Pesticides		Scarce for unknown reasons
	Eliminated	Range much restricted	Eliminated	Range much restricted	
Marsh Harrier*	White-tailed Eagle	Golden Eagle	None	Peregrine	Merlin
		Buzzard		Sparrowhawk	Hobby
Goshawk†		Hen Harrier			Montagu's Harrier
Honey Buzzard		Kite			
		Osprey			

Notes *Recently dropped well below the level that the habitat would support.

†Habitat recently increased as a result of afforestation.

Of the species restricted mainly by pesticides Peregrine and Sparrowhawk have been much reduced in range, while Kestrel has been reduced in numbers in most eastern agricultural areas (Ratcliffe 1963, Prestt 1965). All three species have recovered slightly in some areas since 1963. The relevant pesticides have also been found in the bodies or eggs of all other British birds of prey that have been examined. Of these only Marsh and Montagu's Harriers have declined markedly, and a link with pesticides is suspected, but has not been proved.

Of species restricted mainly by persecution Golden Eagle, Hen Harrier, Buzzard and Kite were much reduced in range by 1900, though all four have spread slightly in recent years. Moore (1957) has shown how the status of Buzzard in Britain has fluctuated since 1800 with the intensity of game preservation and has produced a map showing that the distribution of the bird in 1954 was inversely correlated with the distribution

of gamekeepers. Goshawk, Marsh Harrier, Osprey and White-tailed Eagle were eliminated altogether in Britain by persecution, but the first three have since returned and breed in small numbers. White-tailed Eagle is less likely to recolonise naturally, because its population and breeding success in Europe have greatly declined through use of pesticides.

Three species are restricted for unknown reasons. Merlin has declined in parts of Britain during the last 50 years, and many former sites in unchanged habitat are not now occupied. The species suffers from pesticides and from persecution, but some other factor is probably involved. Certainly the decline began before the days of toxic chemicals. For two other species, southern Britain is now the fringe of their range: Hobby is most numerous in Hampshire and is otherwise almost restricted to the five counties that adjoin Hampshire; its numbers probably do not exceed 100 pairs (Parslow 1967). A century ago it was more widespread, and its range contraction, like those of Nightjar and Red-backed Shrike, is possibly due to a decline in large insects consequent on climatic change. In some recent years the breeding success of the Hobby population has been much reduced by egg-collectors. Montagu's Harrier nests in rank vegetation of various kinds, including young conifer plantations, and much habitat in southern Britain remains unoccupied. Parslow (1967) gives the maximum population since the War as 40-50 pairs, but numbers have declined since then for unknown reasons.

Conclusions

Since 1950 a conservation movement has developed in Britain, and full legal protection has been given to all birds of prey. To what extent have such developments helped these birds? The conservation movement has so far had its greatest impact in the field of toxic chemicals. Otherwise such improvements as have occurred have resulted primarily from socio-economic changes—two World Wars, the break-up of large estates and the taking over of large areas by the Forestry Commission, all of which, one way or another, have reduced the ground on which birds of prey are persecuted. Hence the immediate future of birds of prey in Britain will probably depend, as in the past, mainly on trends in land use, while in the long term education may help to change attitudes.

Acknowledgments

I am grateful to W. Murray and H. Ostroznik for cheerful and unremitting help in the field; to Hon. D. N. Weir for kindly allowing me to use his unpublished material on Sparrowhawks; to Dr N. W. Moore and J. G. Young for helpful discussion; and

to Dr D. Jenkins for encouragement and constructive criticism of the manuscript.

Summary

Where they are not heavily persecuted, Golden Eagles may be found in Scotland at densities of 4-6 pairs per 100 square miles of suitable country. Their well-being in any area depends mainly on the prevailing land use and the particular human attitudes that this fosters. On land used mainly for deer, eagles are often left in peace, but in sheep and grouse areas they are often heavily persecuted. They have nonetheless been found to have a negligible impact on sheep and grouse populations.

An index based on ringing suggests that many more young Sparrowhawks were produced in Britain each year during and just after the War, when many gamekeepers were temporarily absent, than in the preceding or following years. Over much of the country the species has now been greatly reduced by certain pesticides, but in some northern and western areas it is still numerous. In more or less continuous woodland it is found in Dumfriesshire at densities of six pairs per square mile and in Speyside at densities of 0.5 pair per square mile. In both areas the spacing of nests is remarkably uniform. In mixed landscapes Sparrowhawks prefer to nest in woods containing conifers and prefer large rather than small woods. Birds nesting in large conifer plantations feed largely on prey from within the forest.

In any raptor species, a low density of breeding pairs might result from a generally poor environment, from a shortage of nesting places, from competition with other species for limited nesting places, from persecution or from pesticides. The distribution of breeding pairs induced by these various factors often differs and sometimes enables their relative importance to be assessed.

Under widespread persecution in the 19th and early 20th centuries, nearly all birds of prey in Britain were reduced below the level that their habitats, however restricted, would support. Four species ceased to breed in Britain, but three have since returned and breed in small numbers. White-tailed Eagle is less likely to recolonise naturally, because its numbers are diminishing in Europe.

Golden Eagle, Hen Harrier, Buzzard, Kite and Osprey owe their present limited ranges in Britain to past persecution, but other species in recent years have been restricted by other factors: Marsh Harrier, Honey Buzzard and Goshawk by extreme shortage of habitat (though the last could now benefit from increased afforestation); Peregrine and Sparrowhawk by certain pesticides; and Merlin, Hobby and Montagu's Harrier by unknown factors. Only Kestrel is about as numerous and widespread as expected, though still sparse in some arable areas.

Those improvements in the status of birds of prey that have occurred in Britain this century have resulted primarily from socio-economic changes, which in turn have reduced the amount of land on which such birds are persecuted.

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Communal roosting of Hen Harriers in southwest Scotland

A. D. WATSON and R. C. DICKSON

Introduction

Communal roosting of Hen Harriers was noted by Sir William Jardine (Jardine 1834-38, MacGillivray 1836). Jardine referred to "general roosting places, either among whins or long heath and always on some open spot of ground." On a moor of considerable extent he had seen seven birds gather in one acre. Walpole-Bond (1914) said that in Orkney a pair in winter "patronise a special roosting site in very long ling", and McIntyre (1947) gave a brief description of Hen Harrier roosting near its breeding area in winter, but the only recent reference to a communal winter roost in Britain is by Walker (1953), who found up to three males and two females or immatures* roosting in march grass growing in six to nine inches of water in November/December 1953 at Wallend Marsh, Kent.

Communal roosting is better known in the conspecific North American Marsh Hawk; Bent (1931) gives an account of a loose group comprising two or three to as many as 30, and a large field "grown up to heavy broomsedge", preferably upon a hill top was chosen. Weller *et al.* (1955) and Craighead and Craighead (1956) have given further accounts of communal ground roosts of Marsh Hawks in winter, the Craigheads recording a peak of 48 birds at one roost in late January/early February.

Communal roosting by other harriers, Montagu's, Marsh, Pallid and Australasian, is well documented, and sizeable congregations often of mixed species have been recorded by many authorities (Weis 1923, Witherby *et al.* 1938-41, Bannerman 1956, Meinertzhagen 1956, Gurr 1968, and Salim Ali 1968).

This paper gives an account of communal winter roosts of Hen Harriers in southwest Scotland and attempts to analyse the results of observations made mainly between 1966 and 1971.

Description of the roosts

Hen Harriers are still subject to persecution in southwest Scotland; because of this and to avoid disturbance of the roosts, locations are not specified.

In September 1966 RCD found two males going to roost A and thereafter made over 100 watches up to March 1970. Further watches were made in 1970/71 by D. L. Irving, RCD and

*Females and immature birds in brown plumage are generally referred to here as "ringtails".

ADW. The roosting area is a low-lying coastal moor, separated from the sea by a series of sandhills planted with a belt of young conifers, mostly Scots and Corsican pines. The roost proper is an area of about 23 hectares, with dense heather dominant and, in the area favoured by the roosting harriers, up to a metre tall, with a field-layer of bog moss and cotton grass; in winter the ground is sometimes waterlogged. The area is ungrazed by domestic animals, and natural regeneration by Scots pine is taking place in some parts of the moor. Around the fringes of the area the moor is covered in rush, purple moor grass, bracken, clumps of willow, rowan, birches and gorse, with a spread of rhododendrons in the northeast corner. Across the moor, running from northeast to southwest, a wire-and-stob fence divides the ground, following the course of a small burn.



The harriers roosted on the ground in the long heather, creating trampled platforms, or forms, half a metre to a metre in diameter of dead, bent, grey heather stalks. Detritus at the larger ones indicated long use; some were whitewashed with droppings, as were the surrounding stalks of heather, and at others a few harriers' feathers, faeces and pellets were found. Some of these forms were found to be used often, some on consecutive nights, but it was not ascertained if they were used by the same birds. At other forms, however, there would be one pellet lying on a clump of cotton grass and a few faeces where presumably a bird had spent only one night. Only one bird appeared to use each form at any one time. Short-eared Owls, whose pellets were also found there, probably used these forms during the day, when they were abandoned by the harriers. No other bird was known to use the forms. Human disturbance on the roosting ground was negligible, but men and vehicles regularly passed close to the edge of the area.

In November 1959 ADW found a ringtail going to roost B. He saw up to three birds using this roost between then and January 1966, when a larger number were reported in the area by A. Paterson. Over 100 watches were made by ADW at this roost between March 1967 and December 1971. L. A. Urquhart, Mr and Mrs E. L. Roberts, A. J. Watson and others also watched this roost. The roosting area is in a wide expanse of flat, boggy land in an inland valley, skirted on the north by a stream, beyond which the ground rises to form a range of hills covered with conifer forest. To the south the land rises to a hillside of heather and grass moor with rocky outcrops. The valley is 225 feet above sea level, and the flat, boggy ground covers an area of about 125 hectares. At times a few harriers roost widely dispersed over this area, but the usual roosting sites are concentrated in a section of about 16 hectares. The vegetation over the whole flat consists of purple moor grass, sedge, cotton grass, with extensive patches of rushes and reed beds in the wetter part; much of the ground is carpeted with sphagnum mosses. Several dry rocky hillocks are partly covered with grasses and sparse heather; the firm stream bank is also partly heathery, but these areas are apparently not used for roosting. Two or three willow bushes are the only tree growth. In winter most of the ground remains more or less waterlogged except in hard frost; nevertheless it is grazed by several score of black-face sheep and at times by a few cattle.

The harriers usually avoided the reed-beds (the wettest area and most difficult for them to drop into) and favoured an area dominated by purple moor grass, sphagnum and rushes. It is not certain whether they sometimes roosted with their feet in water (as Gurr found for Australasian Harrier), but examination of roosting forms suggested that by trampling the long vegetation they were generally able to maintain a firm but sodden platform. More than 20 of these platforms were found, well sheltered by tall growth, many close together, often within one or two metres. The forms were similar in size to those at roost A; all contained at least one pellet, some two or more, and all had the edges lightly splashed with droppings; none showed signs of long, continuous occupation. The roosting ground was rarely disturbed by man, but shooting often took place during the season, close to the edge of the area.

In February 1970 RCD found roost C near roost A and studied it in 1970/71. The roosting area is an expanse of marshy ground, interspersed with dry banks of heather and bracken and situated about 200-300 metres from the high-water mark. It is one and a half miles northeast of roost A, young conifer plantations separating the two. The main features are two extensive areas of willows, forming thick growth,

while to the north there are extensive tracts of heather interspersed with marram grass. The harriers roosted between the trees in the heather, bracken and grasses; sometimes they roosted quite widely over the area, especially in the heather to the north. In all, the area is about 150-200 hectares in extent, but the harriers were concentrated, as at roost B, in an area of about 15-20 hectares. Part of the area remained waterlogged all year except in hard frost. The forms were similar in size to those at roosts A and B; none showed signs of long, continuous occupation, and no other birds were known to use these forms. The vegetation was ungrazed by domestic animals. Human disturbance was slight but occasionally shooting parties crossed the area.

In February 1970 ADW found two or three harriers roosting at roost D, but none was seen there on subsequent visits in December 1970 and 1971. The roosting area is a fairly wide expanse of level, rough grassland, with purple moor grass, rushes and sparse heather. There are no trees or bushes on the ground where harriers were seen to land, but the area is margined at one end by a conifer plantation 12-15 years old and is otherwise surrounded by fields of pasture grass. In the general area there are further tracts of rough grassland and heath. This roosting ground is probably liable at times to disturbance by man.

The general features of roosts A, B and C may be summarised as follows: all were on flat, open ground with patches of tall vegetation and afforded good all-round vision both of possible predators and among the harriers themselves; all were waterlogged for much of the roosting season; all were generally free from human intrusion; all contained well used roosting platforms; and all were used in successive years.

Numbers at the roosts

Fig. 1 shows the numbers of birds at roost A each winter from 1966 to January 1972. In 1966/67 the peak occurred in November, while in 1967/68 and 1968/69 peaks were reached in February; in 1969/70 a smaller peak was also reached in February. Between these months the numbers fluctuated. In 1970/71 there was some evidence of interchange of individuals with roost C, which might explain some of the fluctuations: on 14 occasions up to three harriers were seen flying direct from roost C to roost A, and on 24th December 1971 six ringtails were seen to do so.

Unfortunately records at roost A for 1970/71 are inadequate for precise comparison with numbers at roost C, but in that winter a peak was reached almost simultaneously at these roosts in late January, while in 1971 peaks were recorded in

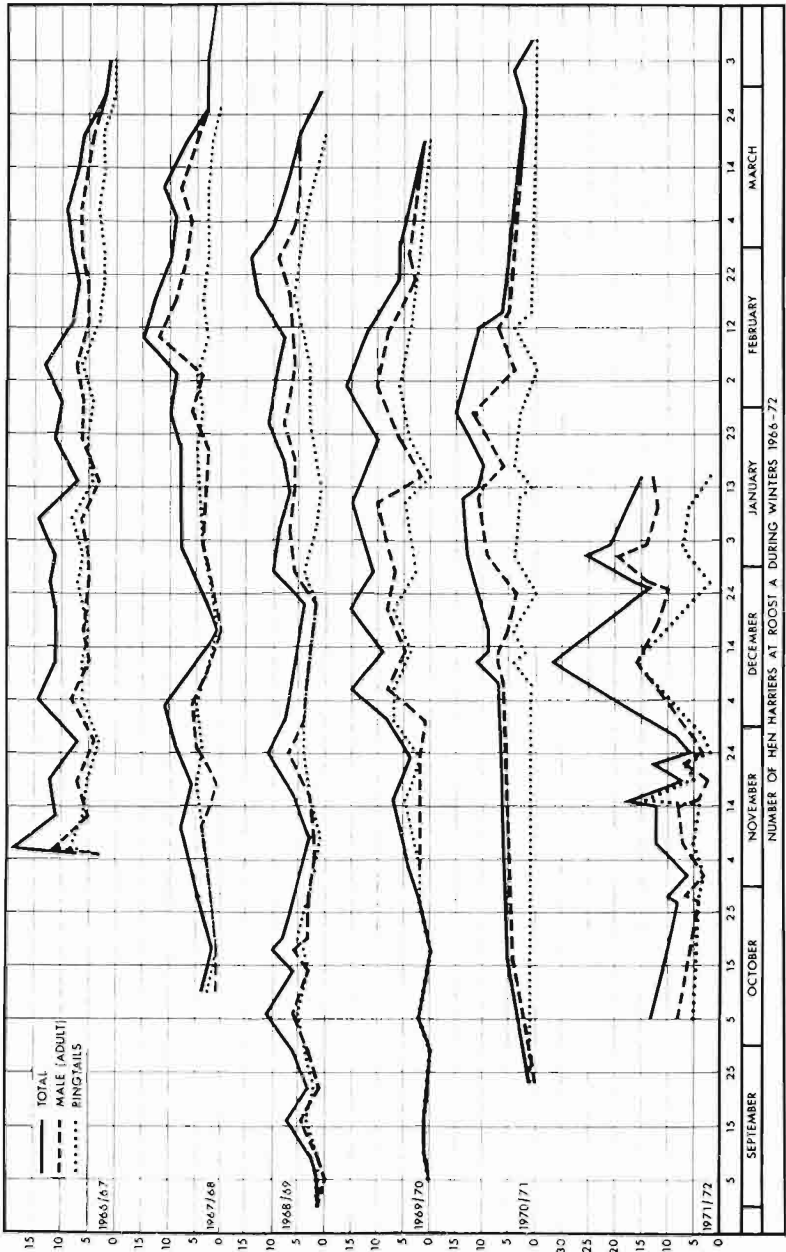


FIG. 1. Numbers of Hen Harriers at roost A, 1966-72.

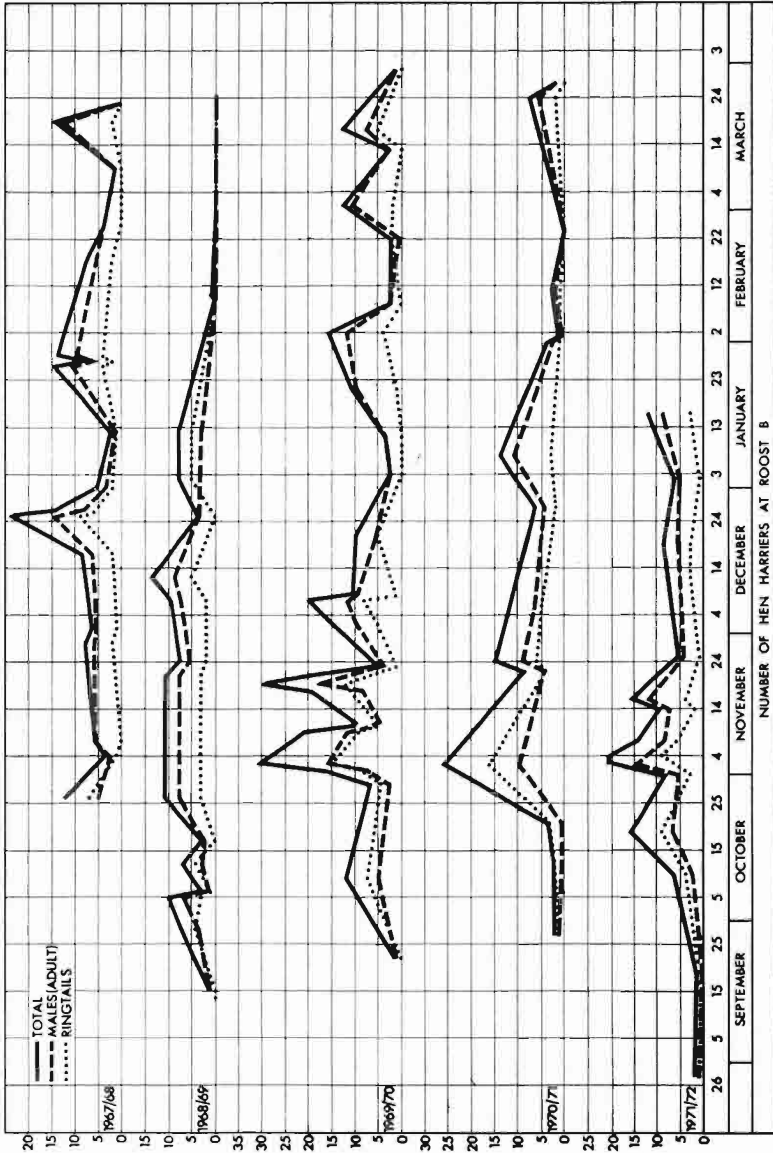


FIG. 2. Numbers of Hen Harriers at roost B, 1967-72.

November and December, in which month some unusually high counts were made. The ratio between adult males and ringtails varied throughout all the years, sometimes markedly, but usually there were more ringtails. In November/December 1971, however, exceptionally high counts of adult males were recorded. All the figures show a decline in numbers in late February or March, particularly of adult males. By April nearly all the ringtails had also deserted the roosts. Sporadic visits were made by the observer between April and August, and occasional birds were found using the roosts; in 1967 and 1968 a ringtail and in 1969 an adult male used the roost during this period.

Table 1. Summary of observations of Hen Harriers at roost B, before October 1967

	Males	Ringtails	Total
1.11.59	0	1	1
6.11.60	1	0	1
20.11.60	1	1	2
5.2.61	0	1	1
1.11.64	0	1	1
24.1.65	0	3	3
21.11.65	0	1	1
2.1.66	4	6	10
3.1.66	?	?	4
7.1.66	1	1	2
18.1.66	0	0	0
20.1.66	0	1	1
29.10.66	1	0	1
6.12.66	0	1	1
9.1.67	0	0	0
18.2.67	0	1-2	1-2
19.3.67	2	11	13
21.3.67	0	7	7
5.8.67	0	0	0
27.8.67	0	0	0

Fig. 2 shows the numbers of birds at roost B each winter from 1967 to January 1972. Table 1 summarises observations at the roost between October 1959 and March 1967. In 1967/68 and 1968/69 the highest counts were in December, but in the next two seasons the peaks were in November. In November/December 1969 high counts were recorded intermittently over about five weeks. Numbers generally appear to have been low in 1968/69, but gaps in observations during November in 1967, 1968 and 1970 may have resulted in some high numbers being missed.

Table 2 shows the highest counts of adult males and ringtails separately and the highest total counts of both together in each month, September to March. Adult males consistently equalled or exceeded ringtails in late autumn (October and early November) of each year (table 3) but were generally



PLATES 1-4. Birds of prey in Scotland. Since the main papers in this issue deal with raptors we take this opportunity to present a selection of photographs of some of the species discussed. *Above* Golden Eagle, female at eyrie, North Uist, 1957 (plate 1) *A. Gilpin*. *Over* Sparrowhawk, female with well grown young, Dumfriesshire, 1971 (plate 2a) *R. T. Smith*. Merlin, male incubating eggs, Orkney, 1947 (plate 2b) *A. Gilpin*. Kestrel, male at nest on ground, Orkney, 1969 (plate 3a) *A. Gilpin*. Hen Harrier, male attempting to brood young, Orkney, 1947 (plate 3b)







PLATE 4. Hen Harrier, portrait of a young female, Kincardineshire, September 1971.

N. Picozzi.

Table 2. Peak counts at roost B, 1966-71

	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Peak males	4	9	16	9	5	4	5
Peak ringtails	3	8	18	15	11	12	13
Peak males and ringtails	7	16	31	24	15	16	15

Table 3. Dates when males exceeded ringtails at roost B

	Males	Ringtails		Males	Ringtails
26.10.67	7	5	13.10.70	2	0
28.9.68	4	3	21.10.70	3	0
12.10.68	4	3	2.11.70	16	10
2.1.69	5	3			
12.1.69	5	3	19.9.71	1	0
10.2.69	1	0	10.10.71	4	2
			19.10.71	9	7
9.10.69	7	5			
29.10.69	4	2			
1.11.69	9	7			
11.11.69	5	4			
22.2.70	2	0			

Of 17 dates in all years when males exceeded ringtails, 13 were between 28th September and 11th November

Largest total of males 28th September - 11th November — 16

Largest total of males February/March — 5

Largest total of ringtails February/March — 13

appreciably scarcer than ringtails from November or December onwards. Yet, as at roost A, the ratio of adult males to ringtails often varied, apparently erratically. Fluctuation of total numbers was even more marked than at roost A, and peak totals were considerably higher except in 1971. In March the numbers did not decline gradually as at roost A but rose to small peaks, mainly of ringtails, before the roost was deserted at the end of this month. The absence of a late-March peak in 1969 is probably due to burning of vegetation at the roost in mid March that year. No harriers were seen to use roost B on occasional visits by observers in summer, but an adult male and a ringtail roosted there on 28th August 1971, the earliest autumn date. Birds from neighbouring breeding grounds were occasionally seen by day over roost B during the summer.

At roost C in 1970/71 the pattern of counts was fairly similar to that at roost A, but peaks of ten birds, with ringtails exceeding males, were recorded on 21st November and 6th December, during the period when no counts were made at roost A. A peak of 15 birds (nine ringtails, six males) occurred at roost C on 2nd January (c.f. the peak of 15 at roost A on 27th January). Numbers at roost C were generally lower in the period October 1971-January 1972, with no high peaks comparable with those at roost A.

Discussion of numbers at roosts A and B

Each year the numbers at both roosts fluctuated, and sometimes there were large differences from week to week. At roost A some of the fluctuations might be explained by interchange of birds between roosts A and C, but there were probably other factors. On the other hand no alternative communal roost has been found in the vicinity of roost B. The November/December peaks certainly suggest an influx of migrants, and it is consistent with the evidence from ringing recoveries that ringtails would predominate among migrants moving south from breeding grounds in Orkney or other areas north of the region; of 16 males ringed as young in Orkney and recovered in winter, 12 (75%) were recovered in Orkney and only four (25%) outside Orkney, whereas of 26 females, 15 (57%) were recovered in Orkney and 11 (43%) outside Orkney. If recoveries of fledged birds at all seasons are included, the figures are: for males, 29 (74.5%) in Orkney, ten (25.5%) outside Orkney; for females, 29 (62%) in Orkney), 18 (38%) outside Orkney. Hen Harriers ringed in Orkney have been recovered in widely scattered places in Britain and Ireland, some reaching continental Europe; one Argyll bird has been recovered in its first winter in Ireland, and another in the Basses-Pyrénées. It was strongly suspected that a ringtail seen at roost B in November/December 1971 was carrying wing-tags similar to those put on Hen Harriers by N. Picozzi in Glen Dye, Kincardineshire, and proof of movement from there to southwest Scotland was obtained when a young male, wing-tagged as a pullus in Glen Dye on 6th July 1971, was recovered near roost A on 10th December 1971. Nevertheless the near neighbourhood of roost B was the most important breeding area in the region, and it seems probable that some at least of the birds using this roost were local breeders. The preponderance of adult males at roost B in autumn might be explained by the emigration of local ringtails, including young, at this season, while there may be a movement of adult males into the region. No such regular preponderance of adult males was noted at roosts A and C, which were distant from any breeding area. Presumably immigrants could find the roosts by observing the movements of others already using them. High counts, mainly of ringtails, in February or March might be explained by a return movement of migrants. The scarcity of adult males at the roosts at this season may be due to their earlier occupation of breeding grounds.

The very high counts at roost A in November/December 1971, including an exceptional number of adult males for this roost, might be explained if the neighbourhood of the roost provided particularly good hunting in a very mild win-

ter; the only very high December counts at roost B in 1967 also occurred in unusually mild weather for the season.

Numbers and weather

At roost B fluctuation of numbers in relation to weather was noted; in nearly all cases the highest counts were recorded in mild, windy conditions, and the lowest on calm, often cold nights. Very low numbers were recorded only twice with fresh winds (on one of these dates the wind was moderating) and never with strong winds. Eight out of 17 very low counts with light winds were in fairly mild weather; at least in spring such conditions might be expected to encourage birds to occupy (and perhaps remain overnight on) breeding grounds. The possibility that fine weather at any time during the winter might stimulate roosting in breeding areas is perhaps worth investigation. The 20 highest counts (12 or more birds) were recorded in fairly mild or mild weather, 18 with fresh or strong winds and only two with light winds. After a sudden change of weather the harriers might take a day or two to change their habits, but a change from wet, windy conditions to calm, cold weather appeared to have an immediate effect; for example, there were 30 on 19th November 1969, but only four on 23rd November 1969, the day conditions changed. The possibility that the roosting ground was unsuitable in hard frost because of extreme cold or discomfort or because it was then easily accessible to predators such as foxes was considered. But the considerable number of very low counts on mild, calm nights could not of course be accounted for in those ways. On cold nights harriers sometimes settled briefly at the roost and flew away before dark or alighted in the vicinity and left without entering the roost proper or merely flew over the roost without settling. On 27th December 1970 (cold, moderate northeast wind) a ringtail settled and rose again from a roost site three times before finally rising and spiralling into the sky, where it was joined by two other incoming ring-tails, and all three flew out of sight, losing height above forest west of the roost; when last seen they appeared to be going to land within a breeding area.

Behaviour on arrival

Craighead and Craighead (1956) stated that Marsh Hawks arrived at a roost as one flock. At roosts A and B the harriers generally arrived singly, but when numbers were high several might arrive more or less simultaneously. On 7th December 1968 a party of five arrived together at roost B. Arrival at each roost in the evening took place from all directions, before and after sunset. For example table 4, which gives the arrival times of the first and last birds at roost A in 1966/67, shows

that there was sometimes over an hour between the first and last arrivals. The majority at roost B usually arrived from a quarter of an hour before sunset to half an hour after sunset. At roost B arrivals tended to be early on dark evenings with low cloud or rain; for example on 2nd November 1969 the maximum count, at least 31 birds, all arrived between sunset—31 and sunset—1 minutes. Arrivals tended to be late on clear nights with good visibility; for example on 8th December 1969 at roost B all ten birds arrived between sunset+21 and sunset+52 minutes.

At both roosts the manner of arrival varied. In inclement weather, particularly in strong winds and heavy rain, the birds usually dropped almost immediately into cover, though in any weather they often rose again to settle in a different spot. Late arrivals usually settled quickly to roost. On most evenings, however, many birds spent up to five minutes beating to and fro or circling and gliding over the roosts before settling, often perching for several minutes on rocky hillocks, fence posts, stone dykes or tussocks of grass or heather,



either preening or sitting apparently idly. In strong winds, low cloud and rain nearly all the birds approached into the wind, often almost brushing the tops of the vegetation in low, steady flight. On such nights two or more might be seen approaching one behind the other. On calm nights birds would frequently glide slowly in from a height from various directions, while on fine, windy nights six or eight birds, both males and ringtails, sometimes soared together above the roost, looking not unlike kites.

At roost B these flights sometimes had a playful appearance, with diving attacks by one bird on another of the same or different sex. On the fine mild evening of 9th October 1969, a male and female circled high together, the male keeping above as in the courtship flight of a pair in spring; these two birds,

Table 4. Times of arrival and arising of Hen Harriers at roost A, 1966/67

	Morning		Spread of	Evening		Spread of	Weather
	Departure	First		Arrival	Last		
	First	Last	Time	First	Last	Time	
	Bird	Bird		Bird	Bird		
12.11.66	—1	+39	40	—8	+34	42	1)light rain 2)heavy rain
19.11.66				—47	+27	74	1)sunny periods
26.11.66				—32	—9	12	1)cloudy
4.12.66	—20	+9	29	—56	+17	73	1)3/8 cloud 2)rain showers
11.12.66	—19	+43	62	—30	+27	57	1)heavy rain 2)cloudy
17.12.66	—8	+3	11	—73	+1	74	1)8/8 cloud 2)8/8 cloud
26.12.66				—19	+2	21	1)8/8 cloud
31.12.66	—18	—3	15	—2	+22	24	1)heavy showers 2)cloudy
7. 1.67	—13	+6	19	—34	+29	63	1)broken cloud 2)clear skies
14. 1.67	—11	+5	16	—14	+19	33	1)8/8 cloud 2)8/8 cloud
22. 1.67	—31	+2	33	—32	+26	58	1)8/8 cloud 2)clear skies
29. 1.67				—26	+20	46	1)heavy rain
5/6.2.67	—10	—1	9	—15	+28	43	1)some cloud 2)6/8 cloud
13/14.2.67	—9	+9	18	+6	+22	28	1)clear skies 2)clear skies
20/21.2.67	±0	+20	20	—14	+19	33	1)8/8 cloud 2)low cloud
26/27.2.67	±0	+30	30	—28	+24	52	1)rain showers 2)heavy rain
5/6.3.67	—13	+11	24	—41	+3	44	1)rain showers 2)clear skies
13/14.3.67	—17	+10	27	—44	+29	73	1)3/8 cloud 2)7/8 cloud
19/20.3.67	—14	+11	25	—24	+19	43	1)gale 2)8/8 cloud
27/28.3.67	—1	+44	45	—43	+16	59	1)squally showers 2)heavy sleet
2. 4.67				—8			1)rain showers

Times are given in minutes before (—) or after (+) sunrise and sunset. A blank indicates no recording.

Times of morning departure are those when the birds left their roosting form. Times of evening arrival are those when the birds arrived at the roosting area but not necessarily when they settled at a roosting form.

Double dates refer to evening of first and morning of second date.

in fact, disappeared over a nesting area but may have returned to the roost later. On 17th March 1970 two males had alighted in exposed positions among tussocks of grass about 50 yards apart, when two ringtails (one, from its size, obviously a female) settled each within a few yards of a male. The two couples remained amicably in this situation for several minutes before all four birds flew independently to roosting sites. On 19th December 1971, in very mild weather, two males and a ringtail (a female from size) soared together before gliding down; one male and the ringtail alighted close together on exposed ground and so remained for two or three minutes. Both birds rose again and separated, the male rejoining the other male, both males then flying to and fro at low level, one keeping just below the other as if trying to prevent it from alighting. This behaviour was considered by A. J. Watson to be similar to the "escorting" behaviour noted by E. Balfour near the boundaries of summer territories in Orkney.



Throughout the winter there were conflicts over roosting places. Newcomers or birds that had risen after alighting often threatened birds already in occupation of roosting forms by diving at them; an incumbent would be forced to take flight as the other bird landed almost on top of it or hovered persistently close above it, frequently with feet lowered. Birds also displaced each other from pre-roosting sites. With high numbers, displacement was especially common. Ringtails displaced males in 34 out of 55 observations of this behaviour at roost A, but six times these ringtails were repulsed in the attempt by the males; four times a male displaced a ringtail and six times a male displaced another male, while once the attempt was repulsed; 11 times ringtails displaced ringtails, and once the attempt was repulsed. A ringtail displaced two males in succession during these encounters on 11th December and again on 22nd December 1968, and on 5th January 1969 one ringtail displaced another three times in succession. Sometimes a brief

conflict, with contact between the birds, occurred in these disputes.

No similar detailed assessment of displacements was made at roost B; they were no less frequent, but no case of a male displacing a ringtail was recorded at this roost, and displacement of males by ringtails was by far the commonest. On 19th November 1969 among 30 birds arriving at roost B, a first-year male and a second-year male were both displaced repeatedly by ringtails and, as a result, spent an unusually long time flying to and fro attempting to find roosting sites. It seems unlikely that adult females would be displaced by males, and it may be that ringtails displaced by males were immatures.

Weis (1923) recorded that male Montagu's Harriers tended to roost separately from females and young in autumn. No apparent segregation of the sexes was noted at the Hen Harrier roosts, mixed groups of males and ringtails roosting in close association. Some birds at roost A were only a metre or so apart, while others roosted up to 35 metres from their nearest neighbour. Sometimes, at this roost, there were two groups of mixed birds 100-200 metres apart, with a wire-and-stob fence separating them. At roost B many birds roosted close together, some only one or two metres apart; others in the most favoured area were up to 100 metres from their nearest neighbours, while at times separate small groups or isolated birds roosted in different parts of the area, up to a 1000 metres from the main group. The birds at this roost tended to be most concentrated in the favourite area in wet, windy conditions, as many as 20 sometimes roosting in about four hectares. In these conditions a preference was shown for roosting sites sheltered by rushes, which grew taller than the surrounding grasses.

Behaviour on departure

The first birds usually left the roost before sunrise and table 4 shows the times of departure of the first and last birds from roost A in 1966/67: there was sometimes a difference of more than an hour between the departures of the first and last birds. In the mornings the harriers rose singly and usually shook their feathers in flight. Some flew on a few metres and settled again, usually on some prominence, a tussock, a clump of heather or a fence post. Others rose and flew steadily away in various directions, sometimes gaining height slowly or, particularly at roost B, circled to a height of 100 feet or more before setting course away from the area. On other occasions, if they did not leave the roost immediately, they settled on fence posts or rocky outcrops to preen or sit idly, and as many as six have been seen sitting together at roost A until they later flew away singly. Once a ringtail remained preening on

a rock at roost B for about an hour after rising from its roost. On one occasion at roost A three males flew away together in the same direction; on another occasion four males and four ringtails flew away together after one of them had uttered a chattering call.

Response to mammalian predators and man

Potential predators of the harriers were seen at both roosts, and reactions to these were observed. Fox was considered the most important, while otter may have been important at roost B; both observers have been subject to reaction from the harriers. Harriers were not seen to dive at sheep or cattle at roost B, although on breeding grounds they often dive at sheep near a nest. Foxes were seen once or twice at both roosts. At roost A on 12 occasions all the birds rose, circling and wheeling, and it was some minutes before they eventually settled; on one of these occasions they were heard chattering together. This behaviour suggested a communal response to a predator, as was borne out by later observations at roost C. On the occasion when RCD found the roost a ringtail rose, uttering a quick chatter, after which the other harriers began to call and circle overhead; this behaviour was noted on subsequent visits when the harriers were disturbed. On another occasion all 12 harriers in the vicinity were observed to circle, dive, swoop and follow an unknown predator (probably fox) through the undergrowth after one of them had uttered a quick chatter; a male and a ringtail continued the pursuit well clear of the roost.



On 8th December 1969 at roost B a ringtail, which had spotted ADW, flew out from the roost and made two diving attacks, chattering persistently. The manner of the second attack, with wings flexed, was reminiscent of harriers' behaviour in defence of a nest. Within seconds of this attack at least six harriers, including one male, came out from the roost area and circled close above the observer, two ringtails and the male swooping down but rising again well above head height. After ADW had

made himself less conspicuous they soon became quiet and drifted back to the roost.

The duck-shooting that sometimes occurred close to the edge of roost B did not deter the harriers from continuing to favour the part of the roosting ground nearest the main shooting stance. Harriers were, however, sometimes seen to rise and fly to a more distant part of the area or even leave the roost, when shots were fired, and it was suspected that incoming harriers were occasionally fired at. An otter was frequently seen at roost B, and once two otters, at the edge of the roosting area.

Relations with other avian predators

There was some tolerance by the harriers of other avian predators at the roosts, but aerial conflicts with Short-eared Owls and Merlins were observed throughout the winter at roost A. These encounters usually took the form of aerial manoeuvres without contact. Yet all three species of moorland predator, Hen Harrier, Merlin and Owl, have been seen at roost A sitting within five metres of one another on fence posts. Neither Merlins nor Short-eared Owls were seen regularly at roost B, but the harriers paid no attention to single Merlins and Sparrowhawks, which sometimes flew over this roost. A Peregrine, however, which remained perched on a rock at roost B until well after sunset on 22nd February 1970 was dived at strongly three times by a male harrier, which then left it alone and flew away without settling. On two other occasions a Peregrine entered the roost area without causing any reaction from the harriers. A Barn Owl often hunted the fringe of roost B, and so occasionally did a Short-eared Owl, but no conflict between the owls and the harriers was observed there. Carrion Crows regularly passed over or alighted on posts, stone dykes etc. at the roosts, and there were sometimes conflicts between them and the harriers. Crows dived at and pursued harriers, and occasionally a harrier drove a crow from a perch.

Relations with other birds

The harriers showed little interest in most other birds in the roost areas, except that frequently at roost A some of the harriers hunted the neighbouring willow clumps and rhododendrons where small passerines gathered to roost (Dickson 1970). A few Black Grouse (at both roosts) and Red Grouse (at roost B), which roosted regularly among the harriers, were never seriously attacked or pursued, although they were alarmed by harriers flying close above them and took flight. At roost B a ringtail was once seen to make a rather casual attempt to capture a Snipe that had risen ahead of it. When flying about over roost B, before settling to roost, harriers

were sometimes seen to make pounces into the long grass, as if hunting, but only one was seen to rise with prey, probably a small bird. The harrier then flew over the roost with its prey, dropped it and retrieved it in flight before settling again. Harriers that sometimes disappeared temporarily among the conifers near roost B may have been hunting passerines there.

Food

A number of pellets dropped by harriers were collected from roosts A and B. It is not known whether the harriers eject a pellet every night, but, from the rather small number of pellets found there, it seems unlikely. The following analysis gives some indication of the winter diet of these harriers and the nature of the terrain they hunted over. At roost A, 32 pellets were collected in December 1966, January 1967, and September 1968. The pellets contained the remains of 35 birds, three mice or voles, a shrew and two small beetles (Dickson 1970 (a)).

At roost B, 23 pellets and a quantity of broken-up pellets were collected in April 1968 and analysed by the late E. Blezard. At that time the roost was too waterlogged to obtain pellets from roosting forms, but EB was satisfied that all those collected were Hen Harriers' pellets. On 7th February 1971, 27 pellets and a quantity of broken-up pellets were collected from roosting forms and analysed by M. A. Macdonald with the assistance of A. J. Watson. It was notable that in 1968 food included hare and mountain hare, which were not identified in 1971. It is possible that these were taken as carrion; Bent (1937) gives carrion or dead game as food of the Marsh Hawk and notes that in the salt-marshes of South Carolina and Georgia its winter food is mostly marsh rabbit. EB identified a "fair number" of bones of water vole among broken-down pellets in 1968. Red Grouse were identified in five pellets out of 23 in 1968 and in only two out of 27 in 1971, field voles in four in 1968 and in two in 1971. Beetles occurred in both years, particularly in 1968, when the dor beetle *Geotrupes sylvaticus* was found in five pellets, the great water beetle *Dysiscus marginalis* in two, and the dor beetle *Geotrupes stercorarius* and the ground beetle *Carabus catimulates* in one each. A pygmy shrew was found in one pellet in 1971. The results of the 1971 pellet analysis at roost B were as follows: 24 birds (generally not specifically identified, the majority smaller than Starling size), two field voles, one pygmy shrew, one unidentified mammal, one beetle, one moth cocoon, thus showing a close similarity to pellets from roost A in 1966-68. It would be interesting to know if some of the prey items found at roost B, such as water voles and water beetles were taken by the harriers at the roost.

Hunting range from roost

The harriers used the roosts as a base from which they travelled to hunt in the surrounding countryside. The Craighheads found that Marsh Hawks radiated from a roost "without coursing" until they reached individual hunting areas from one to five and a half miles distant, which varied in size from 30 or 40 acres to one square mile or more. Following birds for more than half a mile from the roosts was not generally possible in the present study, however, owing to the terrain. At roost A some harriers began to hunt as soon as they were on the wing, but at roost B they gave no clear indication of starting to hunt immediately; they were, however, soon widely dispersed. The harriers hunted by coursing and by quartering the ground, fairly low, sometimes for long periods without landing, sometimes hovering, but generally beating to and fro. Sometimes they hunted by alternately flying and landing. No data were gathered at either study area on the time the birds occupied hunting perches, which varied from alighting momentarily to perching for longer periods.

Diurnal sightings of birds hunting in the areas of roosts A and B during the period 25th September to 31st March are summarized in table 6.

Table 5. Hunting ranges from each roost

	Range (miles)	Sightings		Range (miles)	Sightings
Roost A	up to 2	34	Roost B	up to 2	10
	2 - 4	13		2 - 4	19
	4 - 6	3		4 - 6	37
	6 - 8	4		6 - 8	30
	8 - 10	1		8 - 10	9

The large number of sightings within two miles of roost A (table 5) may be partly due to observational bias in favour of this area, but there is probably a real difference in the spread of birds from the two roosts, many of those from roost B having to travel further to find the best hunting areas, on low ground.

Table 6 gives sightings and activity of birds within one hour of sunset, within ten miles of roost B. The large number of sightings northeast of the roost reflects more regular observer cover in that area. It is probable that the same ringtail frequently flew to the roost from a hunting area six or seven miles distant in that direction; a ringtail was sometimes seen hunting in this area earlier in the day, and on one occasion it was recognised by L. A. Urquhart (due to its distinctive light wing-patches) as a bird previously seen at the roost. Hunting areas included a wide variety of habitats: estuaries, rough pasture, arable (especially rape and turnip) fields, marsh, conifer forest up to 20 years old and grass or heather moor below 1500 feet. Harriers usually hunted singly, but on several occasions a male and a female were seen hunting near each other.

Table 6. Sightings of Hen Harriers within one hour of sunset, within ten miles of roost B

Date	M/R	Time	Distance (miles) and bearing from roost	Activity
13.12.68	R	-46	5 $\frac{3}{4}$ SE	T
7.12.70	R	-15	4 $\frac{3}{4}$ S	H
31.12.70	M	late afternoon	5 $\frac{1}{2}$ NW	T
27.1.71	M	-45	5 $\frac{3}{4}$ N	T
29.1.71	R	-30	3 $\frac{1}{2}$ NNE	H
29.1.71	R	-5	2 $\frac{1}{2}$ NE	T
13.1.71	M	-44	4 $\frac{1}{4}$ N	H
19.1.71	R	-35	7 SE	? H
16.10.71	M	+2	1 $\frac{3}{4}$ E	T
22.10.71	R	-35	2 $\frac{3}{4}$ NNE	T
9.11.71	M	+1	1 $\frac{3}{4}$ E	T
9.11.71	M	+11	1 $\frac{3}{4}$ E	T
20.11.71	R	-3	4 $\frac{1}{2}$ N	?
23.11.71	R	-20	6 $\frac{1}{4}$ N	T
2.12.71	R	-7	4 NNE	T
11.12.71	R	+12	4 NNE	T
13.12.71	R	+12	6 $\frac{1}{4}$ N	T
17.12.71	R	+2	6 $\frac{1}{4}$ N	T
21.12.71	R	+14	4 NNE	T
27.12.71	R	+20	4 NNE	T
29.12.71	R	-22	6 $\frac{1}{4}$ N	T
1.1.72	R	-34	5 $\frac{3}{4}$ NNE	T
4.1.72	M	-27	5 $\frac{1}{2}$ NNE	T
5.1.72	R	-4	7 $\frac{1}{2}$ NNE	T
13.1.72	R	-31	2 $\frac{3}{4}$ NNE	T

Notes Times are given in minutes before (—) or after (+) sunset. Activity is given as T, travelling towards the roost, or H, hunting.

Conclusions

The nature and location of the roosting grounds provided a high degree of safety for the harriers while roosting. By rising and giving the alarm call one harrier could quickly alert all the others to danger. Thus a communal, aggressive reaction to a predator was achieved.

The marked fluctuation of numbers may be partly explained by movement of birds into and out of the region. The birds using roost B could possibly be mainly local residents, but the summer population in the neighbourhood of roost A is too small to account for the numbers at this roost in winter. There is, therefore, some movement away from breeding areas to wintering grounds. The predominance of adult males at roost B in October/early November might be due to greater emigration from the breeding areas by ringtails (i.e. mainly females), but these autumn peaks of adult males could be caused by immigration in advance of the main arrival of ringtails. Ringing recoveries suggest that in the Orkney population females are more migratory than males. The high counts, mainly of ring-

tails, at the roosts during November and sometimes later in the winter, would be consistent with immigration into the region, while peaks in February and March might be caused by the return movement of birds which had left the region in mid winter. Proof of immigration was obtained by a December recovery of a bird bred in Kincardineshire.

Fluctuations at roost B also showed a pattern in relation to weather. The coincidence of high counts with mild, windy weather might be explained by the greater need for shelter in these conditions, but there was some evidence that more birds remained in the region in the mid-winter months, in prolonged mild weather. Solitary roosting has been noted (J. G. Young pers. comm.), and it is likely that sometimes birds that could have joined a communal roosts did not do so.

Wynne-Edwards (1962) argued that the prime function of communal roosting was to bring numbers of the species together so that they can hold epideictic demonstrations, stimulating population adjustments by emigration. Communal soaring over the roosts and conflicts over roosting sites and pre-roosting perches might possibly be interpreted as significant in this respect. The good mutual observation provided by the open nature of the ground could also be important in population assessment by the harriers.

Gurr has suggested that in Australasian Harrier communal roosting may facilitate pairing; on three occasions, at roost B, association between male and female suggestive of paired or pairing behaviour was observed.

The spread of arrival time and diurnal sightings away from the roosts suggest a wide dispersal to hunting areas. Proof that one ringtail hunted six and a half miles from roost B was obtained, and it is highly probable that some birds hunted at greater distances from the roosts. Birds were observed travelling towards roost B in the evening at distances up to seven and a half miles.

Birds, mainly small species, were probably the most important prey of the harriers using the roosts, but there was evidence of differences in diet between 1968 and 1971 at roost B.

Acknowledgments

We thank Dr I. Newton for his constructive criticism of the first draft of this paper, which we have fully revised as a result. L. A. Urquhart also made a number of helpful comments on the paper and maintained valuable records of diurnal sightings. We are indebted to E. Balfour for permitting A. J. Watson to examine the ringing data on Orkney Hen Harriers, to the late E. Blezard and M. A. Macdonald for their work on

the analysis of pellets. Our thanks are also due to all the observers who contributed notes and/or observations, especially L. A. Urquhart, D. L. Irving and A. J. Watson.

Summary

Between 1966 and 1971 communal winter roosting of Hen Harriers was studied at two places in southwest Scotland 35 miles apart. The paper describes the roosting grounds, gives the results of counts of the birds and considers the reasons for fluctuation of the numbers present and of the ratio of adult males to ringtails. The effect of weather on the numbers using one of the roosts is described. Arrival at and departure from the roosts are described, and behaviour at the roosts is discussed. Information on winter food of Hen Harriers in the region is given from analysis of pellets found at the roosts. Diurnal distribution is considered in regard to dispersal from the roosts to hunting areas.

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Appendix

Breeding distribution of Hen Harrier in southwest Scotland

According to Baxter and Rintoul (1953) Hen Harrier was a common breeding bird in Scotland in the 19th century; a pair or two were still breeding in 1869 in southwest Scotland, but "its terrible diminution was largely due to persecution in the interests of game preservation." In 1902 Service said, "seems to have been quite abundant till shortly after game preservation set in, now only odd birds [are seen] chiefly at migration seasons." Breeding was suspected in the 1920's (Gladstone 1923, Baxter and Rintoul 1953). Between 1953 and 1958 a slight increase in winter sightings was noted in the area, while by 1953, further north, in the Clyde area, seven pairs were found in summer, at least three breeding successfully. Although the first nest in southwest Scotland this century was not found until 1959 (Watson and Young 1966), it is likely that nesting began earlier; a shepherd had seen a ringtail in the 1959 breeding area for eight seasons previously, and a male was present at least in 1958. The female of the 1959 pair, judged by iris colour, was at least six years old (Balfour 1970) and may have bred locally before. This nest, from which four young flew, was only five miles from roost B, where a ringtail was seen going to roost for the first time in October 1959. Since 1959 a small breeding population has become established in the region and has slightly increased. Most of the known breeding pairs have been found within six miles of roost B, seven pairs, of which four reared young, being in this zone in summer 1970. A few pairs are known to have bred in some years over a much wider area, but some bias may exist in favour of pairs being found at no great distance from the known roosts. It appears, however, that there may be a connection between the establishment of a breeding population and the development of roost B. From 1959, and particularly since 1966, the number of diurnal sightings of harriers within ten miles of roost B has greatly increased. The first proved breeding near roost A was in 1968, when three young were reared at a site about ten miles distant. A pair was also successful there in 1969, 1970 and 1971 (two young from the 1971 pair, however, being found dead at the nest site), and two pairs may have bred in 1968. At least one pair was present and may have bred in the same area from 1965 or earlier. A male was seen over roost A as long ago as 10th July 1959 (during the day). Diurnal winter sightings of harriers within ten miles of roost A were less well documented until 1966, but they have certainly greatly increased in recent years.

Short Notes

Cory's Shearwater in Aberdeenshire

On 21st August 1970, during a sea watch at Collieston lasting about 1½ hours, three Great Shearwaters and one Cory's Shearwater were seen flying north. All four birds were noticeably larger and more heavily built than the Manx and Sooty Shearwaters in the same seabird movement. The Great Shearwaters were dark above and light below and all showed a pronounced darker cap on the head. Two birds had easily visible white V-shaped rump-patches; in the third individual the patch was narrower and therefore not so readily visible.

The Cory's Shearwater was paler above than the Great Shearwaters, lacked the white V on the rump and also lacked the dark cap, the crown and nape being the same colour as the upperparts. In flight the four birds were typical shearwaters, following the wave contours with stiff wings and only occasional flaps, but they flew closer inshore than the Manx and Sooty Shearwaters (200-400 yards as against quarter to half a mile for the smaller species).

These birds were in a considerable movement of Kittiwakes, Fulmars, Gannets, Manx and Sooty Shearwaters, which also included Arctic and Great Skuas and auks. All the birds were being kept inshore by a bank of fog about half a mile out to sea, and although the sky was overcast it was bright and provided good viewing conditions.

C. J. FEARE.

On 21st August 1970 at 1830 hrs, during a seawatch at Rattray Head, I saw a Cory's Shearwater about 200 yards off shore.

It was about the same size as a Great Shearwater (three of which I had seen that morning), brown above, with a patchy appearance (lighter than Great Shearwater) and white below. The bird lacked the capped appearance of the Great Shearwater and had no white tail-patch. It flapped its wings a great deal in flight with only short glides between.

M. R. WILLIAMS.

(The coastal distance between the two places is about 25 miles, and Dr Feare reports that on comparing notes with M. R. Williams it turned out that he saw his bird almost exactly one hour before MRW saw his. It would appear likely, therefore, that these records refer to the same bird. This is not the first Aberdeen record, as the first Scottish one was there

(*Brit. Birds* 41: 88). Not counting the 1970 Orkney record (*Scot. Birds* 6: 330), because it is later, this is the 6th Scottish record, apart from the passage of 88 at Fair Isle in September 1965 (*Scot. Birds* 4: 218).

It has been pointed out that no mention was made of the colour of the underparts of the Orkney Cory's Shearwater (*Scot. Birds* 6: 330). The observer has since reported that the underparts were "if not white, very pale".—Ed.)

Surf Scoter in Aberdeenshire

On 22nd June 1971, while counting Common and Velvet Scoters at Murcar, I located a bird which, from its characteristics, I identified as an adult drake Surf Scoter.

Although the scoter flock was approximately quarter of a mile offshore a high vantage point on an old concrete fortification and bright sunlight from behind allowed excellent views with a tripod-mounted telescope. The bird was initially observed for about 15 minutes, during which time it was either preening or sleeping close to both Common and Velvet Scoters.

A second visit was made about an hour later by J. K. Charles, J. A. Love, R. W. Summers and myself, and the bird was relocated with no difficulty, all four observers obtaining good views in bright sunlight.

It was seen later on 22nd by Dr W. R. P. Bourne, S. Cramp and Dr G. M. Dunnet. It was seen again on 23rd and 24th by Dr C. J. Feare, W. M. Murray and myself. The following description is compiled from notes made by J. A. Love and myself.

Size similar to Velvet Scoter, somewhat larger than Common Scoter; body uniformly black; head black, with two conspicuous white patches; the larger patch, on the nape, was especially obvious when the bird was asleep, giving an impression of a black duck with a white head; the second patch, on the forehead, extended laterally almost to the eyes and frontally almost to the bill, where there was a distinct dark band between it and the bill; white was also evident around the eyes, though it was not certain whether this was the eye colour or a circle of white feathers around the eye; bill much heavier than that of either Common or Velvet Scoter, giving a somewhat Eider-like shape to the head, predominantly orange-red, with some white laterally at the base; wings uniformly dark, with no white wing-patch.

L. H. CAMPBELL.

(This is the first for Dee and Aberdeenshire.—Ed.)

Corncrakes breeding in Stirlingshire

On 24th April 1971 I noted a pair of Corncrakes in a 15-acre hayfield in flat agricultural land near my home in Stirlingshire. They remained in the hayfield until August. I watched the birds regularly and closely during the 15-week period, spending about three hours daily on observation (six hours at weekends) at distances down to 20 yards.

Until 15th May the male craked almost continuously, day and night, but he gradually stopped craking after that until in the final two weeks of observation he was silent most of the time. Generally the birds skulked in the long grass in the hayfield but sometimes flew from one part of the field to another and from one field to another, especially after about 9.30 p.m. I found the nest, a grass-lined hollow in the earth, on 14th May. The female started laying on 15th and laid one egg every day until 22nd. Incubation started that day and lasted 16 days, the chicks all hatching on 7th June. The young were fed on small insects, slugs, snails, worms and seeds.

At 6.35 a.m. on 15th June I was driving to the hayfield when I saw a stoat running along the road towards me; before it ran across the road and disappeared into the hedgerow I saw it had a small ball of brown-black-down-covered flesh in its mouth. When I arrived at the hayfield at 6.37 a.m. I located only seven chicks, and I presume the stoat had just killed one and taken it off to eat elsewhere.

From 6th July I often saw the young birds flapping their wings and saw three making short, tentative flights on 13th. I saw all seven making short but strong flights on 15th July, 38 days after hatching.

The hay was cut on 17th July; I was able to walk just behind the mechanical mower used by the farmer and saw four young ones killed, the first at 8.30 a.m. when it ran into the machine. At 9.25 a.m. two others were crushed by a wheel as they crouched close to the ground. A fourth young bird was crushed and killed at 10.17 a.m. None of the birds attempted to fly away while the mowing was in progress—they just hid in the long grass.

After this date the birds tended to fly further afield (anything up to four miles from the nest site) to feed for increasing periods every day; from 30th July they left the field at about 6.00 a.m. and returned there to roost after about 10.00 p.m. I last saw one young bird with an adult on 6th August, and my final observation was on 8th August when I saw one old bird.

JAMES G. GILMOUR.

Buff-breasted Sandpiper in Inner Hebrides

On 28th September 1971 at Kilchoman Bay, Isle of Islay, we spotted a distinctive wader on the shore. A first good look showed a small, elegant, warm-coloured wader, about the size of Sanderling. In general appearance it was very Reeve-like, with long, yellow legs and a boldly patterned back. We identified it as a Buff-breasted Sandpiper.

It had a small, rounded head, with large, black eyes, and the bill was short, dark, slightly tapered and very slightly down-curved at the tip. There was no eye-stripe. The head, neck and underparts were warm cinnamon-buff, the vent paler. The back and scapulars showed a bold admixture of blackish and creamy white.

The bird's left wing was drooping, the primary tips sometimes being close to the ground. In two spells of vigorous wing-stretching, only the right wing was raised, showing a pale whitish bar on the upper surface, seemingly formed by the bases of the primaries and secondaries. There was no white in or near the tail or rump. The longest primaries seemed the darkest feathers in the wing. No call was heard. On a few occasions the bird ran swiftly, its head held high, which transformed its appearance. These spurts were usually preceded by a bout of head-raising and neck-stretching.

Something was obviously wrong with its wing, but we didn't pursue the bird to see if it could fly. Although we searched the area thoroughly on the next two days, we did not see the bird again.

G. H. EVANS, F. EVANS, G. F. WALTON.

(This is the sixth Scottish record and the first for the Inner Hebrides.—Ed.)

Stone Curlew in Peeblesshire

On 26th October 1971 at about 10.30 p.m. a Stone Curlew was seen running up the drive in front of their car by the Bell family as they drove up to their home at West Linton. Because the bird seemed unable to fly, they caught it and put it in a box in the chicken house for the night. It was very wet and bedraggled.

The next morning they brought it to me, and I put it in a box beside a radiator. The bird seemed unable to move and simply crouched there. Having consulted the *Handbook* concerning its normal food and the RSPB about the advisability of force feeding, my wife and I pushed several worms down its throat to the point of no return. At the second feed the bird was showing more strength, and one person had to hold its beak while the other pushed the worms in. We also gave it a

few drops of water and glucose. By 1.00 p.m. the bird had recovered sufficiently to fly up onto the furniture

My mother and nephew took the bird in a box to Aberlady Bay that afternoon, having shown it to Frank Hamilton of the RSPB to confirm its identification. After its release it was last seen running among flocks of other waders, apparently hunting for food.

B. MARSHALL.

(There are ten previous Scottish records.—ED.)

Caspian Terns in East Lothian

On 20th June 1971 near the tern colony at Aberlady Bay Nature Reserve my attention was caught by a very large tern standing among a group of terns and gulls nearby. It was bigger than the Common Gulls and only slightly smaller than a Herring Gull beside it. The bird had a long stout luminous-red bill, black legs that seemed fairly long for a tern and a sooty black cap that extended to just below the eye and well down the nape. The back and wings were grey, paler than in Common Tern, and the underparts were white. The tail had no long streamers and indeed was hardly forked at all. When the bird flew the underside of the primaries appeared dark; the wing-beat was most like that of a heavy Common Gull, but with the jerkiness of a tern's flight. There was no doubt as to its identification as a Caspian Tern.

D. G. Andrew, who, with others also saw the bird, particularly remarked on the massive bill, especially deep at the base, and the very broad-based wings, which gave an almost Gyr Falcon-like effect.

The bird was first seen at 1300 hrs; during the afternoon it showed signs of increasing restlessness and finally flew off west along the coast at 1600 hrs.

On 1st July at the same place, I was watching the tern colony from the hide when I saw two birds which I immediately identified as Caspian Terns. They were in the colony, about ten feet from a brooding Arctic Tern; one bird was sitting, the other was standing two feet away, preening. They dwarfed the nearby Arctic Tern, appearing twice as large (though this may have been due partly to their longer legs). The cap, which appeared almost shining black and showed some slight cresting at the back of the head, extended well down the nape, terminating sharply in a narrow white band and not meeting the grey of the back, as in Arctic Tern. The back and wings were grey and seemed fairly dark. The bill was large and scarlet. After five minutes the sitting bird flew off, showing the distinct dark underside of the primaries and the broad, slightly forked tail.

The flight was like that of a buoyant Herring Gull. The other bird remained for about 20 minutes.

A. D. K. RAMSAY.

(The first Scottish record was at Loch Lomond in August 1968; these are the second and third for Scotland and first for Forth and East Lothian.—ED.)

Scops Owl in Orkney

On 27th November 1970 W. Groundwater found a Scops Owl dead under telephone wires at Holm. The body was sent to the Royal Scottish Museum, where the following description was made:

All upperparts brownish grey to rufous brown, each feather having a black-brown streak along the distal half of the shaft, and fine, wavy cross-bars and minute patches of darker grey-brown covering most of the exposed half of the feather. On the crown the black feather-stripe is larger, and both here, on the ear-tufts, nape and upper breast whitish grey subterminal patches are fairly common, making the feather stripe more noticeable than on the back. The facial disc is outlined by feathers with fairly broad blackish brown tips, while the feathers surrounding the eyes are minutely speckled with grey. The outer webs of the scapulars are creamy white, with a blackish brown tip.

Underparts lighter than upperparts, with less speckling, which tends to form discrete but irregular cross-bars; shaft-stripe much broader, giving an overall effect of a grey, streaked breast and belly; under tail-coverts and lower belly paler still, shaft-stripe thin; outer webs of all primaries show distinct alternating bars of dark grey-brown and grey or buff-white, the latter becoming more speckled towards the tip of the feather, shafts brown, inner webs also barred but less distinctly, since, except on the margin, the whole web is heavily washed with dark brown; secondaries show successively less barring and more a fine speckling of grey-brown; greater and median coverts as back; lesser coverts rather more rufous, forming a fairly distinct patch on the edge of the wing; tail as back but with irregular bars of pale grey, edged on the proximal side with a thin band of dark brown; feather of tarsus pale grey-brown, with the usual darker shaft-stripe; toes unfeathered, dark horny brown; bill dark grey-brown; iris yellow.

Measurements: weight 61.25gm; wing (flattened) 155mm; tail 67mm; bill (to skull) 19mm.

I. H. J. LYSTER.

(The last Scottish record (*Scot. Birds* 3: 418) was in June 1965, also in Orkney. Occurrences to date are: Scottish mainland six, Orkney (including the present one) four, Shetland six.—ED.)

Roller in Shetland

On the morning of 5th June 1971 I received a message from Bertie Moar, the local grave-digger, that the previous evening at Semblister he had seen a strange bird he was unable to identify. He described it as larger than a Blackbird, brown on top and vivid green below, with a heavy bill with bristles at

the base. He had watched it for several minutes as it made sorties to the ground from telegraph and fence wires. I went to the place and, with Dennis Coutts, saw the bird; it was, as I had suspected, a Roller.

The bird was vivid blue and orange-brown, about the size of Turtle Dove or Lapwing, though less bulky than the latter. The bird's flight was strong and purposeful, not unlike that of Collared Dove. The wings, which were not noticeably broad or rounded, were markedly angled when the bird landed on perches. The bird was fairly approachable and spent most of the time on the ground, low banks or stones, occasionally perching on fences and once on overhead wires. It fed actively, sometimes in fairly long grass, and we saw it eat several grubs. Its prey was usually taken to a low perch, and in swallowing it the bird thrust its head forward. The Roller was mobbed occasionally by Skylarks and almost incessantly by Meadow Pipits. We watched it for about half an hour. It was not heard to call.

The Roller was seen by several others during the day, and was last seen by a crofter's wife at about tea time.

B. MARSHALL.

(A detailed description of the bird was submitted, and the record is accepted by the Rarities Committee.—ED.)

Nutcrackers in Peeblesshire

At about 8 a.m. on Saturday 28th August 1971 at my home a mile north of Eddleston, my wife drew my attention to several large brown birds that had appeared on the power line and fence bordering the garden. My wife had a good view of one of the birds from below at a range of ten yards and reported it as larger than a Missel Thrush, a heavy bird, with a rather short tail conspicuously bordered with white.

During the scramble for binoculars the birds, five in number, moved to the lower end of the garden, settling on the grass and fence posts. I watched them through binoculars as they moved across the road to a pasture field and at a range of 50 yards had a good view of their back and side profile as they probed the ground in the manner of Starlings. From the side, the head and underparts were dark brown mottled with white, the back was darker in colour, with a distinct violet-blue tinge. From above, the dark tail was seen to be white-tipped. After a few minutes the birds moved off to the southwest.

On consulting the *Handbook* and Bannerman and Lodge, *The Birds of the British Isles*, I was left in no doubt that the birds were Nutcrackers.

M. E. BALL.

(There are four previous Scottish records. This is the first for Tweed and Peeblesshire.—ED.)

Red-flanked Bluetail in Shetland

Digby P. Cyrus found an adult male Red-flanked Bluetail at Leagarth, Fetlar, at about 1030 hrs on 31st May 1971. After watching it for some time he fetched other observers, and it was seen on several occasions later in the morning and afternoon along the nearby Feal Burn by Clive A. Ball, Rob M. Munro, David Hulme and David Lea; DPC took some photographs that showed the general features of the bird. At 2130 hrs my wife and I refound it slightly further up the burn, still frequenting the wire fences as it had done most of the day. The bird was caught in a mist-net, ringed, weighed, measured and released as soon as possible to allow it time to find a suitable roosting site.

The bird was very Redstart-like in shape, size, character and behaviour. It was generally dark blue above and whitish below, with orange flanks. The dark blue of the upperparts extended down the sides of throat and upper breast to meet the orange of the flanks, giving the appearance of very large moustaches. A light stripe extending from the forehead above and behind the eye was whitish in front of the eye and pale blue behind it, adding further to its Redstart-like appearance. The inner lesser coverts were a brilliant Kingfisher blue, the rump and upper tail-coverts were the same colour but not quite so bright. The upper breast in particular showed very slight streaking. Eye, legs, bill and inside of bill were all black. Measurements were: wing 78mm; bill 13mm; tarsus 23.5mm; tail 59mm. At 22.15 hrs the bird weighed 14gm.

For much of the time that it was watched the bird sat on the wire fences near the burn and fed by diving down into the grass like a Redstart or flycatcher. On one occasion DL saw it catch and eat a grub about three-quarters of an inch long. The bird frequently flicked its tail. It was generally fairly shy, not allowing closer approach than about 30 or 40 yards. No calls were heard.

According to Svensson (*Identification guide to European Passerines*), a male in its second year (i.e. reared the previous summer) would still be greyish olive on crown to back and lesser coverts, and the brilliant blue on the coverts and rump are typical of an adult bird at least nearly two years old.

I searched the area early next morning, but was unable to find it again, though it was seen briefly at about 1100 hrs by J. K. Hughson and Miss H. B. Jamieson; it was not seen again in spite of extensive searches.

This is the second record for Shetland and Scotland and the fifth for Britain. All the previous records were in autumn.

A. R. MAINWOOD.

Obituary

Lt.-Col. J. K. STANFORD, O.B.E., M.C.

J. K. Stanford's friends were distressed to hear that he had collapsed during the summer of 1971 while working in the Edward Grey Institute, and he died in September. He would have been grateful for not being ill for too long, as he enjoyed life too much for that. He even enjoyed, it seems, having been exactly of the right age to see active service in not one but two wars, in the interval between which he worked as a colonial administrator in Burma. He was one of that admirable band of servants of the British Empire who passed the few hours of leisure they had in enriching, or even founding, the ornithology of the remote areas where they were stationed, and it is as an authority on Burmese fauna that J.K.'s name will largely survive. For those to whom the birds of Burma are somewhat of a mystery, he has provided simple accounts in *Far Ridges* and in *A Bewilderment of Birds*. Most of his life went into his very readable books.

In his retirement, first to Wiltshire and then to the Suffolk he had known as a boy, he wrote unceasingly, both on birds and on sport, sometimes on both at once, as in *The Twelfth*, in which the grouse-shooter is himself metamorphosed into a grouse. *Guns Wanted* contains the best descriptions of a grouse-shoot and a fox-hunt of our time. He also enriched the pages of *The Field* and *The Shooting Times*, mixing entertainment with much interesting information.

At the same time he was an active protector of birds, and his novella *Bledgrave Hall* is a fictionalised account of the return of the Avocet to Britain, with which he and his brother Brigadier H. M. Stanford were closely concerned. He also acted as warden of the Ospreys in Scotland.

His attitude to bird protection was the old-fashioned one, that secrecy is better than publicity, and he deplored the writing of information about birds that might harm the birds themselves. His bird protection activities did not, however, blind him to the scientific necessity of collecting in poorly worked areas, but he ridiculed the folly of trivial research, such as counting the number of times a bird performed some trivial action. For him the study of birds was a deeply interesting subject that should not be turned into a boring one.

He was for many years a member of the SOC, and some will remember an early conference in Edinburgh at which he recited: "By far the rarest bird of all is the bird on the lawn of my aunt"; in 1970, at the age of 78, he drove from Suffolk to Dunblane for his last conference. His visits to Scotland were

inspired often by the dream that he might discover the nest of some arctic wader, such as the Turnstone, and he was overjoyed to see, late in life, the nest of the Wood Sandpiper in the Highlands. With the present writer he carried out in 1954 a survey of the breeding birds of Islay and on one day on that occasion covered 16 miles and climbed a sizeable hill on the way.

Always a conservative by nature ("my house is full of pictures of Churchill and bits of foxes"), he was the best company in the world, especially when you disagreed with him. He was chairman of the Kipling Society, however, not only on account of his Burmese background, but also from a real love of poetry, for which his memory was prodigious; one of my fondest memories is of him looking at a duck Eider with her family and beginning on a long passage from Tennyson: "O Ida, mother Ida!" His knowledgeable, literate, cheerful, energetic figure is not replaceable.

M.F.M.M.

Review

Ecological Isolation in Birds. By David Lack. Oxford, Blackwell, 1971
Pp. xi+404; 55 figures. 22 x 14cm, £4.25.

"Two species of animals can coexist in the same area only if they differ in ecology." This principle, boldly proclaimed as the first sentence, is the theme of Dr Lack's latest book. To explore the ways in which the principle operates in birds and some of its ecological and evolutionary consequences, we are conducted on a grand tour of all those birds whose ecology is sufficiently well known. And we are conducted by a master. Not only is his style direct, but the whole book is designed to convey his message with ease and clarity. In addition, each of Robert Gillmor's fine illustrations really is worth a thousand words, and the publishers have produced the whole in a pleasant format (though with too many misprints). The book will surely delight any ornithologist. Some will be content to wander through it, as fascinating new aspects of bird life are revealed to them. Others will be stimulated to further thought on a dozen side issues, or driven to explore more deeply the basic data recorded in the 30 appendices and multitude of references.

Yet the technical excellence of the book as a means of conveying ideas is perhaps its major fault. Although the author writes in personal style, which, unlike the falsely "objective", indirect style taught to scientists at school, should remind us that this is just one man's view, he is so persuasive that it is easy to overlook the paucity of direct information. Many of the cases discussed rely on the impressions of one or two observers or on indirect inference and so often they are "consistent with" the hypotheses presented, not "explicable only by" them. As long as bird ecologists realise this, the book will be a most useful stimulus.

It is unfortunate that there is not a more detailed discussion of the conceptual framework into which the information available might be fitted. The mathematics of the theoreticians may be somewhat removed from reality but they do prod us into asking further questions, such as "How much competition can occur between coexisting species?" This underdevelopment of the theoretical side shows itself in other ways: in

the discussion of the unusually high percentage of congeners on oceanic islands that are isolated by habitat and of the greater percentage of congeners that are segregated by food when generic definitions are broader, the difficulties associated with the logarithmic series distribution of species within genera are not mentioned, (it was incidentally these that accounted for most of the differences between the views of Elton and of Williams, not the broadness of definition of habitats).

Despite these criticisms, I believe that most readers of this book will find themselves afterwards to be wiser, more excited and more fascinated than ever by the wonders of bird life.

J. J. D. GREENWOOD.

Request for Information

Little Gull. D. W. Oliver is preparing a paper on the status of Little Gull in Scotland and would welcome any information, no matter how limited, that would help in the compilation. The period under review is 1960 to the present, during which time a notable increase in sightings and numbers has taken place. He is interested in counts, age ratios, types of habitat frequented, distribution, time of year of occurrences, behaviour patterns and local knowledge of the species. All information (which will be acknowledged) should be addressed to East Cottage, Balass, Cupar, Fife.

The Scottish Ornithologists' Club

SUMMER EXCURSIONS

Important Notes

1. Members may attend excursions of any Branch in addition to those arranged by the Branch they attend regularly.
2. Where transport is by private car please inform the organiser if you can bring a car and how many spare seats are available. All petrol expenses will be shared.
3. Please inform the organiser in good time if you are prevented from attending an excursion where special hire of boats is involved. Failure to turn up may mean you are asked to pay for the place to avoid additional expense to the rest of the party.
4. Members, friends and visitors attending any Club excursion do so at their own risk. Neither the Leader nor the Club can be held responsible for an accident or injury sustained on an excursion.
5. Please bring meals as indicated (in brackets) below.

ABERDEEN

Applications, not later than one week before each excursion, to Miss F. J. Greig, 22 Loanhead Terrace, Aberdeen AB2 4SY (tel. 0224 40241 Old Aberdeen Ext 342—Monday to Friday 9 a.m. - 5 p.m.).

Saturday 3rd June. DINNET, BALLOCHBUIE, MORRONE.

Sunday 20th August. YTHAN and the LOCHS. Meet at CULTERTY FIELD STATION 10.30 a.m. (lunch and tea).

Sunday 15th October. LOCH OF STRATHBEG.

AYR

Saturday 20th May. NESS GLEN, DALMELLINGTON. Meet Wellington Square, Ayr, 10 a.m. (lunch).

Wednesday 7th June. DOONHOLM (by kind permission of Mr & Mrs Bruce Kennedy). Meet Wellington Square, Ayr, 6.30 p.m.

Sunday 25th June. HORSE ISLAND, ARDROSSAN (by arrangement with the RSPB). Ayr Branch Members only (limited to 12). Early application to the Branch Secretary is essential. Meet Wellington Square, Ayr, 12.45 p.m. (tea).

Saturday 26th August. NEW CUMNOCK LOCHS. Meet Wellington Square, Ayr, 1.30 p.m. (tea).

Saturday 16th September. PORTPATRICK. Sea-watching. Meet Wellington Square, Ayr, 8.30 a.m. (lunch and tea).

Further information about all excursions from the Branch Secretary, R. M. Ramage, 57B St Quivox Road, Prestwick, Ayrshire KA9 1JF (tel. 0292 79192).

DUMFRIES

Saturday 15th April. WATERFOOT, ANNAN, for migrant waders. Leader: R. T. Smith. Leave Ewart Library, Dumfries, 1 p.m. (tea).

Sunday 14th May. LANGHOLM MOOR. Leader: T. Irving. Leave Ewart Library, Dumfries, 1.30 p.m. (tea).

Sunday 4th June. MEIKLE ROSS POINT. Leader: B. S. Turner. Leave Ewart Library, Dumfries, 1.30 p.m. (tea).

Sunday 9th July. MULL OF GALLOWAY. Leader: A. D. Watson. Leave Ewart Library, Dumfries, 9.30 a.m. and join members from West Galloway at DRUMMORE HARBOUR 12 noon (lunch and tea)

Sunday 3rd September. BAMBURGH, NORTHUMBERLAND. Leader: W. Austin. Leave Ewart Library, Dumfries, 9 a.m. (lunch and tea).

DUNDEE

All excursions by private car leaving City Square, Dundee (lunch and tea for all excursions). Information about all excursions from the Branch Secretary, Mrs A. Noltie, 14 Menteith Street, Broughty Ferry, Dundee DD5 3EN (tel. 0382 75074).

Sunday 21st May. INVERBERVIE AND CATTERLINE. Depart 8 a.m.

Sunday 11th June. GLEN LETHNOT AND GLEN ESK. Depart 8 a.m.

Sunday 9th July. LOCH OF LOWES AND LOCH ORDIE. Depart 9 a.m.

Sunday 10th September. FIFE NESS AND EDEN ESTUARY. Depart 9 a.m.

EDINBURGH

Saturday 29th April. ABERLADY BAY NATURE RESERVE. Leader: K. S. Macgregor. Meet Timber Bridge 2.30 p.m. (tea).

Saturday 13th May. PENICUIK HOUSE GROUNDS (by kind permission of Sir John D. Clerk). Leader: Dr L. L. J. Vick. Meet South Church, Peebles Road, Penicuik, 2 p.m. (tea).

Sunday 28th May. THE HIRSEL, COLDSTREAM (by kind permission of Sir Alec Douglas-Home). Excursion by private cars leaving Edinburgh from square behind National Gallery 10.30 a.m. for Hirsell 12 noon (lunch and tea). Applications to J. A. Stewart, 109 Greenbank Crescent,

Edinburgh EH10 5TA (tel. 031-447 4210), stating number of seats available or required.

Sunday 18th June. FARNE ISLANDS. Leader : H. Dickinson. Excursion by private cars. Applications to the Organiser, J. K. A. Hastings, 61 Spottiswood Road, Edinburgh EH9 1DA (tel. 031-447 7052). This will be a full-day excursion (lunch and tea).

Saturday 22nd July. BASS ROCK (by kind permission of Sir Hew Hamilton-Dalrymple). Leader : F. D. Hamilton. Numbers limited. Boat leaves North Berwick Harbour 2.30 p.m. (tea). Applications with s.a.e. and boat fare of 90p to R. J. E. Whitworth, Netherton, 6 Charteris Court, Longniddry, East Lothian (tel. Longniddry 2101) by 16th July.

Saturday 9th September. ABERLADY BAY NATURE RESERVE. Leader : K. S. Macgregor. Meet Timber Bridge 2.30 p.m. (tea).

GLASGOW

Saturday 6th May BARR LOCH. Leader : Robert Caldwell. Meet Lochwinnoch Station Yard 2.30 p.m. (tea).

Saturday 13th May. ISLE OF MAY. Meet Anstruther Centre Pier 11.45 a.m. for noon departure (lunch and tea). Boat fare 75p. Applications with fare and s.a.e. to Ronald Jeffrey, 4 Victoria Road, Paisley, Renfrewshire, by 3rd May.

Sunday 21st May. AILSA CRAIG (by kind permission of Lt. Col. the Marquis of Ailsa). Boat limited to 12. Leave Girvan Harbour 10 a.m. (lunch and tea). Applications with boat fare (£1.50) and s.a.e. to John Mitchell, 22 Muirpark Way, Drymen, Glasgow G63 0DX, by 6th May.

Saturday 10th June. LOCH OF LOWES (by permission of the Scottish Wildlife Trust). Excursion by private car. Meet north side car park, Glasgow Art Gallery, Kelvingrove, 10 a.m. (lunch and tea). Applications to Russell Nisbet, 46 Greenwood Road, Clarkston, Renfrewshire, by 3rd June, stating if car seats are available.

Saturday 17th June. LADY ISLAND (by kind permission of Mr J. M. McKellar). Numbers limited to 10. Full details, and applications with s.a.e., to E. T. Idle, 4 Conic Way, Drymen, by Glasgow (lunch and tea).

Sunday 25th June. LESMAHAGOW AREA (Square NS 73). Survey of the square for the final season of the BTO ATLAS. Applications to David Clugston (BTO Regional Organiser, South Lanarkshire), 72 Meikleriggs Drive, Paisley, Renfrewshire, by 13th June. Please state if car seats are available (lunch and tea).

Sunday 9th July. BASS ROCK (by kind permission of Sir Hew Hamilton-Dalrymple). Meet at North Berwick Harbour 11.45 a.m. for departure at noon. Boat fare 90p. Applications with fare and s.a.e. to Mrs Muriel Draper, 6 Southview Drive, Blanefield, by Glasgow G63 9JF, by 30th June (lunch and tea).

INVERNESS

Excursions by private car. Applications to Outings Secretary, Mrs W. Morrison, 83 Dochfour Drive, Inverness (tel. 0463 32666).

Sunday 16th April. SPRING ON THE MORAY COAST. Leader : Roy Dennis. Meet Station Square, Inverness, 9.30 a.m. (lunch and tea).

Saturday 20th May. GLEN AFFRIC. Leader : Christopher Headlam. Meet 'A.A.' office in Cathedral car park, Inverness, 9.30 a.m. (lunch and tea).

Friday 16th June to Sunday 18th June. SUTHERLAND WEEKEND. Applications by 15th May to Inverness Branch Secretary, Mrs W. A. Sinclair, 4 Aultnaskiach House, 36 Culduthel Road, Inverness (tel. 0463 30053), from whom all details about the weekend should be obtained.

Sunday 3rd September. WADERS AND WILDFOWL—FIRTHS. Leader : Malcolm Harvey. Meet Kessock Ferry, Inverness, 10 a.m. (lunch and tea).

ST ANDREWS

Applications, not later than one week before each excursion, to Miss M. M. Spires, 4 Kinburn Place, St Andrews (tel. 033-481 3523).

Saturday 6th May. KILCONQUHAR LOCH (by kind permission of Elie Estates). Meet North Lodge, 2.30 p.m. (tea).

Saturday 10th June. RED HEAD AND CLIFFS. Cars leave car park, Kennedy Gardens, by Kinburn Park, St Andrews, 2 p.m. (tea).

Sunday 18th June. AN ANGUS GLEN. Cars leave St Andrews bus station 9.30 a.m. (lunch and tea).

Saturday 1st July. TENTSMUIR. Cars leave car park Kennedy Gardens, by Kinburn Park, St Andrews, 2 p.m. (tea).

STIRLING

The Stirling Branch will be holding excursions each weekend during the summer from the beginning of May. All excursions are in connection with the BTO Atlas and will be covering squares in Argyllshire, Clackmannanshire, Perthshire and Stirlingshire. Full details can be obtained from Henry Robb, 27 Victoria Road, Stirling (tel. 0786 3618).

CLUB AND BRANCH OFFICIALS

The following extracts from the Constitution of the Club are printed for information :

“4. MANAGEMENT AND OFFICIALS

(a) Office-bearers

The Office-bearers shall be : (1) the President; (2) the Vice-President; (3) the Secretary; and (4) the Hon. Treasurer. Each of these (except the Secretary) shall hold office for three years and shall then be eligible for re-election. The Club may also elect one or more Honorary Presidents in recognition of services to Scottish Ornithology.

(b) Council

The Council shall be composed of the Hon. Presidents, the President, the Vice-President, the Hon. Treasurer, the Editor and Business Editor of *Scottish Birds*, the Hon. Treasurer of the House Fabric Fund, one Representative from each Branch Committee appointed annually by the Branch, and ten other members of the Club elected at the Annual General Meeting. Two of the last named shall retire annually by rotation and shall not be eligible for re-election for one year. The Council shall have power to fill temporary vacancies occurring among the Office-bearers or elected members of Council, and shall have power to co-opt up to three additional members.

(c) Nominations

Nominations for vacancies among Office-bearers or the elected members of Council must be received by the Club Secretary **not later than 31st July each year.** Intimation of all nominations shall be given in the Notice calling the Annual General Meeting. Nominations for any vacancy in a Branch Committee must be received

by the Branch Secretary not later than one week before the Annual General Meeting of the Branch.

(e) **Branch Committees**

The Office-bearers of each Branch shall be: (1) the Chairman; (2) the Vice-Chairman; (3) the Branch Secretary. Each of these shall hold office for three years and shall then be eligible for re-election. These, together with the addition of such members of the Branch up to a maximum of four, as each Branch shall deem necessary at each Annual General Meeting of the Branch, shall constitute the Branch Committee. Each Branch shall elect annually one member of the Branch Committee to represent the Branch on the Council.

(g) **Annual General Meetings**

Notice of not less than 10 days shall be given of all General Meetings.

The Club shall hold an Annual General Meeting in October each year to receive the Report of Council, Statement of Accounts, and to elect the Council and Office-bearers.

Each Branch shall hold an Annual General Meeting to receive a Report from its Committee, and to transact other business."

GENERAL MEETINGS 1972

The Annual General Meeting of the Club will take place during the Annual Conference weekend which will be held from 27th to 29th October 1972 at the Hotel Dunblane Hydro, Dunblane, Perthshire.

Branch Annual General Meetings are normally held during the first winter Meeting of each Session at the end of September or early October as arranged by Branches.

PINK-FOOTED GEESE IN ICELAND

In a recent Editorial (*Scot. Birds* 6: 406) attention was drawn to the need for research workers to help scientists in Iceland. There is a large programme of study on the Pink-footed Geese and their breeding grounds, and qualified research workers are urgently required.

Anyone who is interested in helping with this work should contact the Club Secretary for further details.

LOCAL RECORDERS

- Shetland (except Fair Isle)** R. J. Tulloch, Reafirth, Mid Yell, Shetland.
- Fair Isle** R. Broad, Bird Observatory, Fair Isle, Shetland.
- Orkney** E. Balfour, Isbister House, Rendall, Orkney.
- Outer Hebrides (except St Kilda)** W. A. J. Cunningham, Aros, 10 Barony Square, Stornoway, Isle of Lewis.
- St Kilda** Dr I. D. Pennie, Varkasaig, Scourie, Lairg, Sutherland.
- Caithness** Mrs P. Collett, Sandyquoy, East Gills, Scrabster, Caithness.
- Sutherland, Ross-shire (except Black Isle)** D. Macdonald, Elmbank, Dornoch, Sutherland.
- Inverness-shire (within 18 miles of Inverness) Ross-shire (Black Isle only)** Dr Maeve Rusk, Arniston, 51 Old Edinburgh Road, Inverness.
- Inverness-shire (mainland more than 18 miles from Inverness)** R. H. Dennis, The Old Manse, Rothiemurchus, Aviemore, Inverness-shire.
- Nairnshire, Morayshire, Banffshire** J. Edelsten, 14 South High Street, Portsoy, Banffshire, AB4 2NT.
- Aberdeenshire, North Kincardineshire** N. Picozzi, Nature Conservancy, Blackhall, Banchory, Kincardineshire, AB3 3PS, and W. Murray, Culterty Field Station, Newburgh, Aberdeenshire, AB4 0AA.
- South Kincardineshire, Angus** G. M. Crighton, 23 Church Street, Brechin, Angus.
- Perthshire** Miss V. M. Thom, 19 Braeside Gardens, Perth.
- Kinross-shire** Miss Bridget H. Moore, Vane Farm Reserve, Kinross.
- Isle of May** Miss N. J. Gordon, Nature Conservancy, 12 Hope Terrace, Edinburgh EH9 2AS.
- Fife, Clackmannanshire, East Stirlingshire** D. W. Oliver, East Cottage, Balass, Cupar, Fife.
- West Lothian** Prof. T. C. Smout, 19 South Gillsland Road, Edinburgh EH10 5DE.
- Forth Islands (except May), Midlothian** R. W. J. Smith, 33 Hunter Terrace, Loanhead, Midlothian.
- East Lothian, Berwickshire** K. S. Macgregor, 16 Merchiston Avenue, Edinburgh EH10 4NY.
- Peeblesshire, Roxburghshire, Selkirkshire** A. J. Smith, Glenview, Selkirk.
- Argyllshire, Inner Hebrides, Skye** M. J. P. Gregory, 4 High Bank Park, Lochgilphead, Argyllshire.
- Dunbartonshire, West Stirlingshire, Renfrewshire, Lanarkshire, Ayrshire, Arran, Bute** R. W. Forrester, 29 Crandleyhill Road, Prestwick, Ayrshire.
- Dumfriesshire** D. Skilling, 86 Auchenkeld Avenue, Heathhall, Dumfries and R. T. Smith, Applegarthtown, Lockerbie, Dumfriesshire.
- Kirkcudbrightshire, Wigtownshire** A. D. Watson, Barone, Dalry, Castle Douglas, Kirkcudbrightshire.

THE SCOTTISH ORNITHOLOGISTS' CLUB

THE Scottish Ornithologists' Club was formed in 1936 and membership is open to all interested in Scottish Ornithology. Meetings are held during the winter months in Aberdeen, Ayr, Dumfries, Dundee, Edinburgh, Glasgow, Inverness, St Andrews, Stirling and elsewhere at which lectures by prominent ornithologists are given and films exhibited. Expeditions are organised in the summer to places of ornithological interest.

The aims of the Club are to (a) encourage and direct the study of Scottish ornithology; (b) co-ordinate the efforts of Scottish Ornithologists; (c) encourage ornithological research in Scotland; (d) hold meetings at which Lectures are given, films exhibited and discussions held, and (e) publish information regarding Scottish ornithology.

There are no entry fees for Membership. The Annual subscription is £2.00, or 50p in the case of Members under twenty one years of age or University undergraduates who satisfy Council of their status as such at the times at which their subscriptions fall due. The Life subscription is £50. Joint Membership is available to married couples at an Annual subscription of £3.00, or a Life subscription of £75. 'Scottish Birds' is issued free to Members but Joint Members will receive only one copy between them. Subscriptions are payable on 1st October annually.

'Scottish Birds' is the Journal of the Club. Published quarterly it includes papers, articles and short notes on all aspects of ornithology in Scotland. The Scottish Bird Report is published in the Journal.

The affairs of the Club are controlled by a Council composed of the Hon. Presidents, the President, the Vice-President, the Hon. Treasurer, the Editor of 'Scottish Birds', the Hon. Treasurer of the House Fabric Fund, and ten other Members of the Club elected at an Annual General Meeting. On the Council is also one Representative of each Branch Committee appointed annually by the Branch.

The Scottish Bird Records' Committee, appointed by Council, produces an annual Report on 'Ornithological Changes in Scotland'.

The Club tie in dark green, navy or maroon terylene and a brooch in silver and blue, both displaying the Club emblem, a Crested Tit, can be obtained by Members only from the Club Secretary or from Hon. Branch Secretaries.

The Club-room and Library at 21 Regent Terrace, Edinburgh EH7 5BT is available to Members during office hours (Monday to Friday 9 a.m. to 1 p.m. and 2 to 5 p.m.), and, by prior arrangement, in the evenings during the week in the winter months from 7 to 10 p.m. Members may use the Reference Library, and there is a small duplicate section, consisting of standard reference books and important journals which can be lent to students and others wishing to read a particular subject.

The Bird Bookshop is also at 21 Regent Terrace, Edinburgh. It is managed by the Club and the profits help to maintain services to ornithologists at the Scottish Centre.

Application for Membership form, copy of the Club Constitution, and other literature are obtainable from the Club Secretary, Major A. D. Peirse-Duncombe, Scottish Centre for Ornithology and Bird Protection, 21 Regent Terrace, Edinburgh EH7 5BT (Tel. 031-556 6042).

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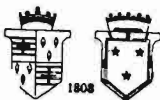
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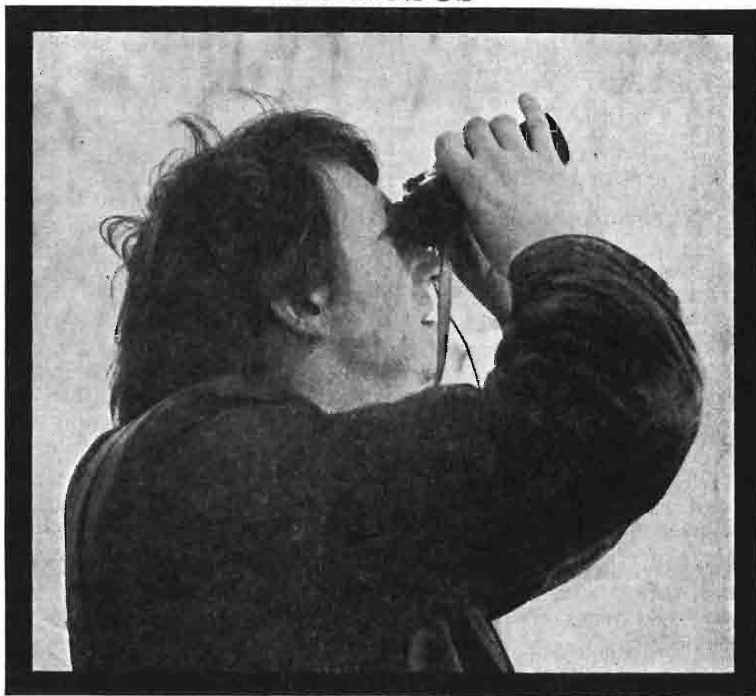
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