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The illegal persecution of raptors in Scotland

A report from the Scottish Raptor Study Groups

Extended summary

This document uses data from the files of the Scottish Raptor Study Groups to give examples of the scale and widespread nature of human interference with raptors. Where the data are sufficiently detailed we quantified the levels of impact by comparing breeding performance and numbers in places where raptors are apparently unmolested with places where human interference has been shown to occur.

In south east Scotland human interference occurred at both lowland and upland Peregrine breeding sites, but particularly at those on or adjacent to moorland managed for grouse shooting. At the lowland sites, recorded human interference involved the robbing of about one fifth of breeding attempts with an estimated loss of 19% of the production of young. At grouse moor sites, we recorded nest robbing, nest destruction and/or the killing of adults in about half of nesting attempts reducing potential production of young by at least 33%. Taking into account the reduced occupancy of sites, the estimated loss was 52%. At other upland sites, human interference involved nest robbing in about a third of first nesting attempts resulting in an estimated loss of 3% of overall production. In the whole study area, human interference was probably responsible for the loss of about 27% of potential production of young in the years 1990-96.

At Peregrine nests in north east Scotland human interference was involved in failures at 8-22% of nesting attempts each year up to 1991, and has continued since. It was frequent on 2 estates leading to the loss of about 74% of the production of young. On 2 other estates persecution was less frequently recorded and was probably responsible for a loss of 12% in production. Persecution remained unrecorded on 3 further estates. The overall loss of production of young in the area, attributable to persecution, was at least 24%. No account could be taken of losses due to lowered occupancy or reduced population expansion resulting from low production and the killing of full grown birds.

In central Scotland each year a similar number of Peregrine sites were

checked on kept and unkept ground. There was little difference in the pattern of occupancy of these sites but a large difference in their productivity, those on kept ground producing 38% fewer young than those on unkept ground. This was not because kept ground was particularly poor in food but was due to the large number of breeding attempts that failed completely at 6 sites, suggesting intensive human interference with a third of Peregrine pairs in kept areas. Were this the case, human interference was affecting about one fifth of the Peregrine breeding population in central Scotland, reducing overall production of young by about 18% in the years from 1981 to 1996.

In the Highland Council area there is circumstantial evidence of the effect of poisoning on the distribution of breeding Golden Eagles. Illegal poisoning in the northern half of Badenoch and Strathspey coincides closely with a conspicuous lack of breeding eagles in suitable habitat that has held nesting pairs in the past. A similar gap in Golden Eagle distribution occurs in east Sutherland where there have also been recent cases of poison abuse. It is likely that between 10 and 20 Golden Eagle ranges are affected.

In Tayside, the breeding performance of unmolested Golden Eagles in 15 ranges was high. Performance was lower at 3 ranges due to egg robbing, and poorest at 14 ranges where other human interference (poisoning, trapping and shooting) occurred and at 5 ranges on moorland managed for Red Grouse. On the basis of breeding performance figures for unmolested ranges we might have expected an average of 21.6 eaglets to fledge in the Tayside ranges each year, but average production was 12.3, about 43% less.

In north east Scotland, 21 Golden Eagle ranges have been monitored. Fifteen are on ground mainly managed for deer and are relatively successful (0.64 young/range/annum, 1990-96). The remaining 6 are on ground managed for Red Grouse with some plantation forestry and have poor production (0.26 young/range/annum, 1990-96). Here there was intermittent occupancy by Golden Eagles in immature plumage, poisoning and nest destruction, but at 3 ranges persecution has apparently ceased with pairs surviving to breed successfully. Assuming that all ranges could produce 0.64 young/range/annum, an average of 13.4 eaglets would have fledged each year from the 21 ranges in the area, but existing production of 11.2 eaglets was 17% less. Within the existing population there are also gaps where there is suitable habitat, suggesting that at least 2 more breeding pairs could exist if the population were allowed to build up.

In Argyll, the occupancy of Golden Eagle ranges was high and success reasonably good but some persecution occurred. In south Argyll over a 25 year period, up to 3 of 19 ranges suffered persecution in any one year. Had such human interference not taken place we would have expected 7% more successful breeding attempts (equivalent to 19 more eaglets fledged) during this time. This is a minimal figure as only known instances of persecution were used in calculations; suspected instances were not included nor were those ranges where pairs have disappeared.

On 3 moors in south west Scotland, Hen Harrier breeding success and/or numbers increased after persecution ceased. Such an increase was at odds with trends on managed grouse moors elsewhere, where harriers were formerly present. By 1996, there was decline, in places virtually to extinction, in parts of the Outer Isles, in the Ladder Hills and the Cabrach/Fiddich/Glass area (Grampian) and in Kincardineshire.

The results are discussed briefly, an appendix catalogues examples of the persecution of Golden Eagles in Tayside and another details persecution at a communal roost of Buzzards and Ravens.

Introduction

In the 1950s and 60s, raptors were scarce in Britain as a result of past persecution and the effect of pesticide pollution (Newton 1979). Through the 1970s and 80s raptors increased as a result of the combined effects of special protection and the alleviation of pesticide poisoning. However, despite legal protection, the killing of raptors continues, including the poisoning, shooting and trapping of full grown birds and the destruction of nests and their contents (da Prato & Laing 1996) leading to recent population declines in some areas. Persecution occurs mainly because some people believe that raptor predation interferes with their interests. Specifically, raptors are accused of reducing the abundance of gamebirds for shooting and of killing racing pigeons and other breeds of domestic pigeon. Though less common than in the past (Morton

1995, Ratcliffe 1993) there is also still a problem with the illegal removal of eggs by egg collectors and of eggs and young to be reared for captivity.

The main raptor species concerned are Hen Harrier, Goshawk, Buzzard, Golden Eagle and Peregrine, but other species such as Sparrowhawk and Raven (not a raptor) are affected, as well as some of our rarest birds of prey such as Red Kite, White-tailed Eagle, Marsh Harrier and Osprey. The Raptor Study Groups in Scotland were set up to enable liaison between fieldworkers and other interested parties, mainly to co-ordinate and standardise the monitoring of raptor populations. All the Scottish Raptor Study Groups regularly record the illegal persecution and nest robbing of birds of prey. Instances are given in every annual review, the *Raptor Roundup*, formerly in *Scottish Bird News* and

now a supplement to *Scottish Birds*, and the Groups are convinced that such activities are widespread and even increasing. This paper gives evidence for this and attempts to quantify the problem for some areas and species.

The impact of human interference on the Goshawk population has been assessed in the past by comparing their performance in areas with proven persecution compared with areas where, in the absence of hard evidence, it was thought that there was none (Marquiss & Newton 1982). Though still scarce in Britain, Goshawks have slowly increased and more data on the effects of persecution are now accumulating (Petty & Anderson in progress). Intensive research on Hen Harriers (RSPB and Raptor Study Groups) also compared areas with and without persecution to estimate its effect on harrier populations. The work showed that the killing of adult Hen Harriers and the destruction of their nests was widespread on moorland managed for grouse shooting. This sort of moorland is good harrier habitat so the killing there created a 'sump' effect, recruiting many young harriers from elsewhere and effectively limiting the whole Scottish population (Etheridge *et al* 1997).

In the present paper we also compare areas or nest sites with and without persecution, reviewing recent Peregrine and Golden Eagle breeding data from specific areas where it is detailed enough to allow quantitative investigation. We provide some notes on the localised recovery of Hen Harrier numbers after cessation of persecution on 2 estates in contrast to declines elsewhere. We append documents detailing the recent history of persecution of Golden Eagles in Tayside and an instance of persecution at a communal Buzzard and Raven roost.

1 Peregrines in south east Scotland, east of the A74/M74 trunk road

In this area there are 67 nesting territories or 'sites' recorded to date (1996). We have classified these broadly into 3 categories:

- (i) Fifteen lowland sites surrounded by a mixture of land uses but with a high proportion of arable land
- (ii) Twenty six upland sites that included un-kept heather moorland, pasture and forestry ground, and
- (iii) Twenty six grouse moorland sites, surrounded by or adjacent to land managed by gamekeepers for Red Grouse shooting.

The number of pairs recorded on nesting territories increased over the last 7 years from 31 pairs (and one single bird) in 1990, to 44 pairs (with 3 singletons) in 1996, but peaked in 1994 at 54 pairs (with 1 singleton). As the population increased more sites became occupied and were added to the inventory of sites to be checked. A few sites remained unchecked in some years including the peak year, 1994, but this was not the reason for the recorded decline, which was largely the result of a fall in the proportion of sites occupied (Table 1.1), particularly on moorland managed for grouse shooting.

The protection afforded to birds on Buccleuch Estates ground meant that some new sites became occupied there but, elsewhere on managed grouse moor, 5 sites previously holding pairs on a regular basis became deserted or occupied only sporadically by single birds. In the other categories of nesting territories (lowland and upland) the pattern was for the occupation of new sites and continued occupancy by breeding pairs at already established sites, only occasionally broken by gaps of one or 2 years apparently associated with a change in birds.

Table 1.1 *The occupancy of and breeding success at 67 nesting territories of Peregrines in south east Scotland 1990-96.*

Year	Sites visited	Occupied by pair	Occupied by single	Percent occupied by pair	Known breeding attempts	Number of pairs successful	Total young per pair	Young per pair	Failures due to human interference (%)
Lowland									
1990	7	7	0	100	6	6	11	1.57	1
1991	10	7	3	70	6	4	10	1.43	1
1992	9	9	0	100	8	7	18	2.00	0
1993	11	10	0	91	8	8	15	1.50	0
1994	15	14	1	93	12	7	22	1.57	0
1995	15	12	0	80	11	10	32	2.67	1
1996	14	12	0	86	12	8	20	1.67	2
Total	81	71	4	88	63	50	128	1.80	5 (8%)
Upland									
1990	14	12	0	86	12	7	16	1.33	3
1991	14	14	0	100	14	8	21	1.50	5
1992	14	14	0	100	12	6	13	0.93	0
1993	17	17	0	100	17	8	19	1.12	5
1994	20	20	0	100	20	15	37	1.85	2
1995	17	16	0	94	15	13	37	2.30	0
1996	18	18	0	100	18	13	34	1.89	1
Total	114	111	0	97	108	70	177	1.59	16 (15%)
Grouse moorland									
1990	16	12	1	75	12	3	10	0.83	8
1991	18	16	1	89	13	5	9	0.56	6
1992	20	15	2	75	11	6	14	0.93	6
1993	22	16	3	73	14	4	8	0.50	6
1994	22	20	0	91	19	9	22	1.10	5
1995	21	15	1	71	14	7	19	1.27	4
1996	23	14	3	61	14	8	26	1.86	4
Total	142	108	11	76	97	42	108	1.00	39 (40%)

The breeding performance of Peregrines also varied between categories of sites, with those sites on or adjacent to grouse moorland producing far fewer young than those elsewhere, associated with the greater incidence of human interference on grouse moorland. The evidence for this interference was usually the disappearance or destruction of nest contents coupled with ground signs of a human visit. The main problem in trying to quantify this fully was that many nest failures did not have accompanying hard evidence of interference, so we could not entirely disentangle persecution from natural nest failure. We tried to estimate breeding performance in the absence of persecution, including natural failures, by comparing the

performance of individual sites where there was overt evidence of human interference with those where there was none (Table 1.2).

There were differences in the overall breeding performance at sites in the 3 land use categories, with lowland sites producing more young than upland and grouse moor sites. There were also major differences in breeding performance associated with recorded human interference and particularly poor performance at frequently persecuted grouse moor sites. The relatively small difference in performance between upland sites with and without evidence of human interference was attributable to the low frequency of such

Table 1.2 *The frequency of known human interference compared with overall breeding performance at 67 Peregrine breeding sites in south east Scotland. Data are from the years 1990 to 1996 inclusive, segregated into sites in the lowlands, in upland and on grouse moor.*

		Number of sites	% breeding attempts lost to known human interference	Breeding performance	
				mean young per attempt	(se)
Lowland					
	interference	5	20	1.66	(0.41)
	interference not recorded	10	0	2.51	(0.24)
Upland					
	interference	8	29	1.63	(0.19)
	interference not recorded	18	0	1.69	(0.28)
Grouse moor					
	interference	16	51	0.45	(0.14)
	interference not recorded	10	0	1.67	(0.41)

A two factor analysis of variance in breeding performance showed significant statistical effects of both land use ($F=5.36, p<0.01$) and whether or not interference was recorded ($F=7.74, p<0.01$)

interference, mainly by egg robbings, there and to the fact that this was often followed by a successful repeat breeding attempt. At grouse moor sites the latter was infrequent; interference was rarely followed by a repeat attempt suggesting that second attempts were also destroyed or, more likely, that the adults had been killed. The poor occupancy at these sites and, in particular, the complete absence of adult pairs at 5 of these sites in the last 3 years, suggested that adults were being killed repeatedly or that production was so low that it started to affect recruitment in the last 3 years.

We can estimate the minimum effect of human interference by assuming that, in the absence of such interference, those sites where it was recorded would have produced as many young as those where it was not recorded (Table 1.3). Thus we would have expected 158 young to be produced at lowland sites as opposed to the observed production of 128, 183 at upland sites as opposed to 177 and 162 at grouse moor sites as opposed to 108.

This estimate is minimal because it does not take into account the effect of the killing of adults or the potential effects of low production on subsequent recruitment, both of which would have depressed population increase and reduced the occupancy of known sites by breeding pairs.

Bearing this in mind, a more realistic estimate of the effects of persecution on breeding production might be derived by assuming that the occupancy and proportion of pairs laying clutches at grouse moor sites would have been similar to that recorded at upland sites where killing of adults was not recorded. There, laying pairs of Peregrines were recorded at 95% of sites checked, a much higher figure than that observed at grouse moor sites (68%). If this were the case, we would estimate at least 135 breeding attempts at grouse moor sites between 1990 and 1996, with an overall production of at least 225 young. Observed production over these 7 years was only 108 young, so the loss due to persecution was about 52% of the potential. This would mean that in the overall Peregrine population of south east Scotland the production of 413 young was only 73% of the potential (566 young) in these years.

Table 1.3. Minimal estimates of the loss in breeding production of Peregrines in south east Scotland due to human interference.

	Number of nesting attempts 1990-96	Young produced per attempt in the absence of recorded human interference	Potential production of young	Observed production of young	Loss ascribed to human interference (% of potential)
Lowland	63	2.51	158	128	30 (19%)
Upland	108	1.69	183	177	6 (3%)
Grouse moor	97	1.67	162	108	54 (33%)

In summary, the data on breeding Peregrines in south east Scotland showed that persecution or other human interference occurred in all 3 categories of site, but particularly at sites on or adjacent to moorland managed for grouse shooting. At the lowland sites, recorded human interference involved the robbing of about one fifth of breeding attempts at 5 of the 15 known breeding sites, leading to an estimated loss of 19% of the production of young. At grouse moor sites, recorded human interference involved nest robbing, nest destruction and/or the killing of adult birds in about half of the nesting attempts at 16 of the 26 known breeding sites. This resulted in the loss of at least 33% of potential production of young, but this figure did not take into account the reduced occupancy of sites, particularly in the last 3 years. Assuming a breeding pair occupancy figure close to that of upland sites would increase this estimated loss to 52%. At upland sites, human interference involved nest robbing in about a third of first nesting attempts at 8 of the known 26 breeding sites, resulting in an estimated loss of 3% of potential production. In the whole study area, human interference was probably responsible for the loss of about 27% of potential production in the 7 years 1990-1996.

2 Peregrines in north east Scotland

In this area, as elsewhere in Britain, breeding Peregrines have increased, numbers more than doubling from 1981 to 1991 (Hardey 1991), though less so since then. Breeding success varied between years, apparently mainly influenced by weather as much of the population breeds in mountainous areas where late snow can influence laying and rain the survival of small young. Nevertheless nest robbing and the destruction of nests and

adults was also a major influence. Robbing of nests (for eggs and chicks) was less frequent in the 1990s than in the early 1980s, but nest destruction and the killing of adults has increased, being recorded at between 8% and 22% of occupied sites from 1981 to 1991 (Hardey 1991) and since then. Much of this human interference took place on areas of ground managed by only a few estates.

From 1992 to 1995, annual monitoring of breeding has included at least 34 nesting sites on moorland managed for Red Grouse and 32 sites in other upland areas: deer forest, hill pasture and forestry. Each year these sites were checked to see if they were occupied, whether they were successful and, if so, how many young they produced. By comparison with south east Scotland, site occupancy was low (about 70%) and overall breeding performance was poor with no more than 1.14 young per occupied upland site (Table 2.1). The breeding performance on grouse moorland averaged about a third less young produced per occupied site, compared with other upland sites, possibly the direct result of the greater levels of human interference but alternatively it could have been merely due to poor food supply there. This alternative is unlikely because those nests on grouse moorland that were successful produced no fewer young than those at other upland sites in the same year (paired comparison over the 4 years 1992-95, $t=0.57$, $df=3$, $p>0.1$).

One of the problems with this comparison was that human interference was associated with particular estates. On some estates it was not confined to grouse moors and on others it was not practised even on grouse moor. We therefore regrouped the data into those derived from the 7 main estates (Table 2.2).

Table 2.1. The breeding of Peregrines at sites on moorland managed for Red Grouse shooting compared with those at other upland sites managed for deer, hill farming and forestry in north east Scotland, 1992-95.

Year	Sites checked	Sites occupied (%)	Successful (%)	Young fledged	Young per successful nest	Young per occupied site
Grouse moor						
1992	34	23 (68)	2 (9)	5	2.50	0.22
1993	39	27 (69)	13 (48)	29	2.23	1.07
1994	35	24 (69)	7 (29)	13	1.86	0.54
1995	34	27 (79)	9 (33)	17	1.89	0.63
Total	142	101 (71)	31 (31)	64	2.06	0.63
Other uplands						
1992	32	22 (69)	12 (55)	25	2.08	1.14
1993	34	25 (74)	12 (48)	18	1.50	0.72
1994	33	22 (67)	11 (50)	20	1.82	0.91
1995	35	25 (71)	11 (44)	27	2.45	1.08
Total	134	94 (70)	46 (49)	90	1.96	0.96

Table 2.2 The breeding success of Peregrines from 1992 to 1995 on 7 different estates in north east Scotland.

	Sites checked per year	Number occupied per year (%)	Number successful per year (%)	Number young per occupied site	Land use	Recorded human interference
A	5.25	4.00 (76)	0.75 (19)	0.19	grouse	frequent
B	3.75	3.25 (87)	1.00 (31)	0.69	grouse	none
C	5.00	3.75 (75)	1.25 (33)	0.80	grouse/deer	some
D	10.00	6.00 (60)	1.25 (21)	0.33	grouse/forestry	frequent
E	7.50	5.50 (73)	3.50 (64)	1.23	deer	none
F	8.00	6.00 (75)	1.75 (29)	0.96	grouse/deer	some
G	7.25	5.50 (76)	3.75 (68)	1.09	deer	none

There was no significant relationship between the level of human interference with Peregrines on an estate and the occupancy of sites there (ANOVA, $F=1.153, p=0.4$) but a significant relationship with the numbers of young produced ($F=7.86, p=0.04$).

There was no significant relationship between the occupancy of sites on an estate and the level of human interference with Peregrines on that estate. However, there were fewer successful nests and far fewer young produced per occupied site on the 2 estates where persecution was frequent (0.26 young/occupied site) compared with those 2 where persecution was infrequent (0.88) and those 3 where it was not recorded (1.00). Human interference thus probably reduced the production of young Peregrines by 74% on 2 estates and by 12% on another 2, equivalent to a loss of 33 young over the 4 years. There were 106 young produced on these estates in this time so the overall loss attributable to persecution was about 24% of overall potential production.

In summary, recorded persecution at Peregrine nests in north east Scotland involved between 8% and 22% of nesting attempts each year from 1981 to 1991, and has continued since then. It was frequent on 2 estates leading to the loss of probably 74% of the production of young. On 2 other estates persecution was less frequently recorded and was probably responsible for a loss of 12% in production. Persecution remained unrecorded on 3 other estates. The overall loss of breeding production in the area attributable to persecution was at least 24%. No account could be taken of losses due to lowered occupancy or reduced population expansion resulting from low production and the killing of full grown birds.

3 Peregrines in central Scotland

Peregrines have been monitored in one area in central Scotland since 1978. At that time there were only 13 pairs recorded, all in the uplands, and 6 of them on ground managed for game, mainly Red Grouse. As monitoring

effort increased with the progress of the study and as the population grew throughout the 1980s, new breeding sites were added until by 1996 a total of 36 different nesting territories were located, 19 of them on kept ground. The population peaked in 1991 at 29 pairs (15 pairs and 2 singletons on kept areas) and fell to 15 pairs and 9 singletons by 1996.

Before 1981, only a few sites were checked annually but afterwards to 1996, each year there was a sample of 10 or more eyries examined. The occupancy of breeding sites (proportion of sites occupied by a pair), the average brood size of successful nests and the overall productivity (number of young produced per pair) varied from year to year so these measures of Peregrine performance were compared for kept and unkept ground within years using paired 't' tests (Table 3.1). Kept ground was defined here as an area where there was at least some element of grouse as opposed to other game keeping or deer stalking.

Each year a similar number of sites were checked on kept and unkept ground. There was no significant difference in the pattern of occupancy of these sites but a large difference in their productivity, those on kept ground producing 38% fewer young than sites on unkept ground. This was not because kept ground was particularly poor in food because there was little difference in the fledged brood sizes there. Poor production of young on kept ground was principally due to the large number of breeding attempts that failed completely.

Many such failures were known to be the result of human interference, including the destruction of nests and the trapping of full grown birds, but this was not recorded at all kept sites. Some Peregrine pairs on

Table 3.1. A comparison of Peregrine breeding performance between sites on keptered and unkeptered ground in central Scotland (average annual values for the 16 years 1981-96).

	Keptered (se)	Unkeptered (se)	Paired 't' (df=15)	P
Sites checked per year	13.6	13.6		ns
Occupied by pair	10.6 (0.6)	11.1 (0.4)		ns
Occupied by single bird	2.1 (0.4)	1.8 (0.3)		ns
% occupied	79 (4)	82 (3)		ns
% successful	43 (5)	63 (5)	2.96	<0.01
Mean brood size	2.09 (0.19)	2.35 (0.11)		ns
Young/pair	0.88 (0.11)	1.42 (0.12)	4.09	<0.001

keptered ground appeared to have been totally unmolested. Examination of the overall productivity on a site by site basis showed that productivity was much more variable on keptered ground than elsewhere. Very low production at 6 sites was sufficient to account for the overall reduced production there, suggesting intensive human interference with only a third of Peregrine pairs in keptered areas. Were this the case, human interference was affecting about one fifth of the Peregrine breeding population in central Scotland, reducing overall production by about 18% in the years 1981 to 1996.

4 Golden Eagles in the Highland Council area west of the River Spey

Information on the persecution of Golden Eagles in Scotland is reviewed in Watson (1997). The evidence for poisoning in the Highland Council area is inevitably patchy and incomplete. In recent years, the majority of cases of illegal use of poisons in upland areas have occurred in Badenoch and Strathspey and in east Sutherland. Maps presented in Watson (1997) on pages 34 and 229 provide strong circumstantial evidence

on the effect of poisoning on the distribution of breeding Golden Eagles in both these areas. A scatter of confirmed incidents of illegal poisoning in the northern half of Badenoch and Strathspey, notably in the Monadhliath mountains, coincides closely with a conspicuous lack of breeding eagles. This is despite the fact that in terms of food and nest site availability this area is suitable for eagles and certainly has held nesting pairs in the past. Media attention has been directed at this area (Cramb 1993) when individual estates on which poisoned eagles had been found were named. A similar gap in the Golden Eagle range occurs in east Sutherland where again there have been several recent cases of poison abuse. It is likely that 10 - 20 pairs of Golden Eagles continue to be 'displaced' by chronic persecution, notably poison abuse, in the eastern part of the Highland Council area.

5 Golden Eagles in Tayside

Tayside has good habitat for Golden Eagles and could support a large and productive population. At present, between 24 and 37 nest territories are checked annually by the

Tayside Raptor Study Group but many are occupied only sporadically by mainly immature eagles. This situation has persisted for a long time and characterises persistent persecution (Sandeman 1957) which still continues (Appendix I).

The population west of the A9 trunk road includes 21 eagle home ranges and has been monitored since the Golden Eagle national census of 1982. Breeding performance is poor (Table 5.1) but varies much between ranges; only 5 have produced 6 or more young in 15 years. Twelve of the ranges have been occupied consistently by adult pairs, all of them on areas managed for sheep or deer. In total, since 1982 they have produced at least 0.37 young/range/annum. This was despite one range being robbed of eggs by collectors continually, another frequently and another once. If we exclude the sites known to have been robbed, production was at least 0.42 young/range/annum. Without egg robbing we would have expected another 9 eaglets to have fledged over the 15 year period.

In contrast, breeding success on the remaining 9 ranges has been very poor with only 2 young produced over the 15 year period. This was mainly because the sites were intermittently occupied and usually by birds in immature plumage. Occasionally pairs would reach maturity and build nests but within a year or so were replaced by immatures. This suggested that mortality of eagles was high. Six of these ranges were on ground managed for Red Grouse shooting. Persecution of Golden Eagles or other raptors was recorded in 6 ranges, including 2 instances of eagles having been poisoned, one of a shot bird and one instance of the removal of young from a nest. On another range, a dead decomposed eagle was found and at another there was hearsay rumour of an eagle having been poisoned. Had Golden Eagles been allowed to mature and breed unmolested on these ranges we would have expected production to be about 0.42 young/range/annum (as above) and 57 additional eaglets might have fledged in west Tayside over this time.

Table 5.1 Breeding performance at Golden Eagle ranges in 2 parts of Tayside, 1982-96, grouping ranges according to levels of human interference.

	Number of ranges	Breeding performance (young/range/annum)
West of A9 trunk road (live prey less abundant)		
unmolested ranges	9	0.42
ranges robbed of eggs	3	0.37
ranges where actual persecution was recorded	9	0.02
East of A9 trunk road (live prey abundant)		
unmolested ranges	6	0.80
grouse moorland ranges	5	0.08
ranges where actual persecution was recorded	5	0.41

The population east of the A9 trunk road includes 16 home ranges and has also been monitored consistently since 1982. Breeding performance in ranges where there has been no human interference is good (Table 5.1), probably influenced by a more continental climate and the high density of prey such as Mountain Hare, Red Grouse and Ptarmigan (Watson 1997). However, the overall situation is poorer because of the high incidence of persecution (Appendix I).

Over the 15 year period 1982-96, 104 eaglets are known to have fledged from the area. At 6 ranges known to be free from human interference, the average production was 0.80 young per range per annum. In contrast, 5 ranges that included much ground managed for Red Grouse shooting had poor breeding success (2 ranges reared 0.20 young per range per annum) or were occupied by a succession of immature eagles and produced no young. The remaining 5 ranges (on ground that included both deer forest and grouse moor) were almost continuously occupied by breeding pairs but there is strong circumstantial evidence that these were subject to direct interference by gamekeepers. Their breeding production was 0.41 young per range per annum.

In 1988-89 the males in one range were poisoned and shot in respective years. In another range the pair has only succeeded in rearing young in the 2 years when the eyrie was on a high cliff where deliberate interference was difficult. Their favoured eyries were on a lower, less weather vulnerable cliff, but easily accessible to disturbance. The breeding attempts here failed each year when the chicks were hatching or still required brooding. Failure coincided with the head keeper visiting the area to control Foxes. At another range the eyries were in 2 glens that

had different keepers. The pair always failed when nesting in the eastern glen where the keeper was known for his dislike of eagles. This man's beat included another eagle range with a history of persecution incidents.

Considering that the productivity figures for unmolested ranges in Tayside were 0.42 young/range/year (west) and 0.80 young/range/year (east) we might have expected an average of 21.6 eaglets to fledge in Tayside each year, but actual production averaged 12.3. Our best estimate was that human interference reduced production by 43% in these years.

6 Golden Eagles in north east Scotland

In the past, the fortunes of Golden Eagles in north east Scotland have varied, this variation being associated with land use and food supply but also with the impact of persecution (Watson et al 1989). In recent years 21 ranges have been monitored. Fifteen of these are on ground mainly managed for deer, and these are relatively successful (0.64 young/range/annum, 1990-96). The remaining 6 are on ground managed for Red Grouse with some plantation forestry and have poor production (0.26 young/range/annum, 1990-96).

These 6 ranges were for many years characterised by intermittent occupancy by eagles in immature plumage. At one range 2 poisoned eagles have been found and on one occasion when a pair survived for at least 2 years, 2 nests that had been built were destroyed. No young have been produced and in 1996 the range was occupied by 2 immature birds. At another 2 ranges there has been no record of a pair in recent years; only single immatures were seen and a dead decomposed eagle was found concealed in a

peat hag. At the other 3 ranges persecution has apparently ceased with pairs surviving to breed successfully. On 2 of these ranges the keepers are well known for their positive attitude towards raptors. On the third, the birds may still be vulnerable as this range spans 3 estates.

If we assume that Golden Eagles on these 6 ranges would have been at least as productive as others in north east Scotland (0.64 young/range/annum) we can calculate that an average of 13.4 eaglets would have fledged each year from the 21 ranges in the area. Existing production of 11.2 eaglets is 17% less than this potential productivity.

Within the existing population distribution there are also gaps where there is heather moorland suitable for Golden Eagles with potential nest sites, suggesting that at least 2 further breeding pairs might exist if the population were allowed to build up.

7 Golden Eagles in south Argyll

In this area Golden Eagles have been monitored since 1964. In Argyll, the recorded range occupancy is high and success reasonably good; at least 85% of monitored ranges have been occupied in the 1990s and about 38% of pairs have produced 0.52 young/pair/annum. However, persecution persists at least in south Argyll where monitoring has been intensive and over the last 25 years, up to 3 of the 19 ranges suffered persecution in any one year. The proportion of pairs producing young varied from year to year but overall was 0.53 in the 11 years when persecution) was recorded, about 14% less than the figure of 0.62 in the other 14 years (Man-Whitney 'U' test, $Z=2.11$, $p=0.035$). Had such human interference not taken place we would have expected 7% more successful

breeding attempts, equivalent to 19 more eaglets fledged during this 25 year period.

This is a minimal figure as only known instances of persecution were used in the calculation. Other suspected instances were not included. Moreover, the calculation only includes breeding attempts, ie those where birds were known to have laid eggs. Ranges where pairs have disappeared are not included. At one range the eagles were successful in 9 years from 1970 to 1981, but, in 1983 the chick was removed and in 1984 the incubating bird was seen to be put off by a shepherd during a snowstorm. In 1986 a dead female eagle was found on the nest, and a male nearby later the same year. Since then there has been no nest building on this range and only occasionally have birds been seen.

At another range eagles started to breed successfully but, following allegations of lamb killing, a chick was found dead in the nest and, in 9 subsequent breeding attempts, the eggs were deserted, broken or removed. Ground immediately adjacent to the nest was often set on fire and one nest on bare rock was deliberately burned. Finally, after a winter when there was hearsay evidence that 2 eagles had been poisoned, the range became vacant; despite frequent sightings of birds in immature plumage a breeding pair has not become reestablished.

At another range the breeding success of eagles was related to the locations where they nested. When nesting on an estate managed for sheep, breeding was successful in only the first year. The next 4 years' attempts failed as a chick was shot on the nest and eggs were broken or removed. The pair then moved to nesting on afforested land and on a sheep farm with a sympathetic owner and they were successful in 11 of 12 years.

At 2 other traditional Golden Eagle ranges, birds have failed to establish adult breeding pairs in recent years and persecution is suspected. Where this occurs it is difficult to disentangle the effects of persecution from land use change, principally afforestation, so the full impact of persecution in Argyll, and over the whole of Scotland, will remain unquantified until it stops and breeding eagles achieve their full potential distribution and breeding success.

8 The recovery of Hen Harrier numbers following the cessation of persecution in contrast to overall decline

We can gain some idea of the effect of the removal of raptor persecution when we consider how rapidly Buzzards became abundant following the replacement of poisoning by Larsen trapping (a use of legal cage traps with decoy crows) as the main method of killing crows after an anti-poisoning campaign by SOAFD and the successful prosecution of keepers. Buzzards are now a common sight in most parts of Scotland, and may ultimately reach the sort of abundance that is familiar to anyone who has travelled abroad in Europe. The Scottish Raptor Study Groups have mainly concentrated on the scarcer birds of prey and have not monitored Buzzards systematically over large areas. There are, however, good records of increases of the much scarcer Hen Harrier subsequent to the cessation of persecution.

On an estate in south west Scotland, Hen Harriers were monitored from 1984 onwards but suffered complete breeding failure. In 1988, the RSPB, following representations from the South Strathclyde Raptor Study

Group, wrote to the owner regarding persecution and a meeting was held. The situation immediately improved for harriers until the estate owner died in 1992 and shooting on the estate came under new management, whereupon relations between keepers and RSPB and the Raptor Study Group significantly deteriorated. Between 1984 and 1988 there were one to 3 female harriers present each year and only 4 out of 11 nests were successful, with recorded persecution incidents including a shot female found dead on the nest and a dead female which had been poisoned with alphachlorolose. From 1989 onwards numbers improved to peak at 9 females (5 successful nests) in 1992. In 1993 no nests produced young, one did so in 1994 and none since then. Numbers of females attempting to breed on the estate initially remained the same but had fallen to only 4 by 1996 (Table 8.1, moor A).

On another estate in south west Scotland, also following representation from the RSPB, persecution apparently ceased in 1990. At one moor (B) prior to 1990 there were no more than 5 females and overall breeding success was low (one successful nest from 11 attempts). After 1990 success improved immediately (4 out of 7 attempts in 1990-92) and numbers of females increased to 11 in 1994 and 14 in 1996, most of which (85%) produced young.

At another moor (C) on this estate, the fortunes of harriers also improved after 1990. Before 1990 no more than 3 females were present in any one year and only 4 out of 7 nests produced young. After 1990, numbers increased to 10 females in 1994, 6 of which produced young. In 1994 there was some persecution on nearby ground with the destruction of several nests together with the

adult females. Harrier numbers overall fell in 1995 to 5 females which bred successfully in that year, but poorly the year after (2 out of 5 nests were successful in 1996).

In each of these case histories, Hen Harrier breeding success and/or numbers markedly increased after persecution ceased. Such increase was at odds with trends elsewhere on managed grouse moors where harriers were formerly present. For example, there has been a decline in part of the Outer Isles, in the Ladder Hills and the Cabrach/Fiddich/Glass area (Grampian) and in Kincardineshire (Table 8.1). In the latter county there were at least 15 nests found in 1974 when there was relatively little persecution (Picozzi 1978) but as that study ceased and persecution increased in the surrounding area, there were only 3 nests in 1988/9 (Bibby & Etheridge 1993). A thorough search of all moorland in 1995 and 1996 failed to turn up even a single nest.

Discussion and conclusions

The present document lists only some of the persecution incidents from the records of members of the Scottish Raptor Study Groups. The main purpose of the paper is to relate instances from study areas where the impact of persecution can be assessed. We have shown for 3 Peregrine study areas that persecution is by no means rare. The impact of robbing by egg collectors and others appears to have waned, whereas killing of full grown birds and the destruction of nest contents by game preservers seems to have been maintained or even increased in the 1990s.

It seemed that in south east Scotland about half the Peregrine breeding sites on grouse moor suffered persecution with an estimated 52% loss of productivity. In north east Scotland up to 74% of Peregrine productivity was lost on 2 estates where persecution was commonest. The equivalent figure for

Table 8.1. The increase in number of Hen Harriers on 3 moors following cessation of persecution in contrast to declines elsewhere.

Area	Females and/or nests	(years)
Southwest moor A*	1-3 (1984-88)	9 (1992) 4 (1996)
moor B**	5 (pre 1990)	11 (1994) 14 (1996)
moor C***	3 (pre 1990)	10 (1994) 5 (1995/96)
Outer Isles	3-4 (1988/89)	0 (1995/96)
Ladder Hills ***	10 (1993)	4 (1996)
Cabrach/Fiddich/Glass	11 (1994)	4 (1993) 0 (1996)
Kincardineshire	15+ (1974)	3 (1988/89) 0 (1995/96)

* Persecution ceased in 1989, but recommenced in 1993

** Persecution ceased in 1990

*** Most persecution ceased about 1990

Peregrines on keepered ground in central Scotland was 42%. In any one region only a proportion of the Peregrine population was vulnerable so overall losses were less, though not trivial; 27% of production in the south east, 24% in the north east and 18% in central Scotland. The impact on the overall population is difficult to estimate because the killing of adult Peregrines not only reduces production but drains the pool of potential recruits, preventing population increase and perhaps, at present, causing population declines. The proportion of occupied sites has declined in at least some habitats in all 3 areas.

The fortunes of the Golden Eagle population are even more affected by the loss of full grown birds because eagles take so long to mature and start breeding. In the 3 areas examined, the loss of productivity due to egg collectors was small (an estimated value of 12% in west Tayside) compared with the unquantifiable losses due to the failure of adult pairs to establish successful breeding on some ranges. This affected 9 (42%) of ranges in west Tayside, 3 (14%) of ranges in north east Scotland and 3 (16%) of ranges in south Argyll. These are minimal estimates because gaps in the existing Golden Eagle distribution, where there is suitable habitat but no record of pairs, suggest that the breeding population might be much larger were it to be allowed to build up. At present, persecution on some ranges is continuously removing the potential recruits that might otherwise settle and breed in new areas.

Intensive studies of Hen Harriers (Etheridge *et al* 1997) has shown that this 'sump' effect is real, and is sufficient explanation for the speed with which numbers increased following the cessation of persecution in our examples. A further example of a potential persecution 'sump' for raptor populations is the killing of birds at communal roosts (Appendix 2).

Anyone who travels widely abroad soon becomes accustomed to the ubiquity of large birds of prey in many countries but, until persecution ceases in Britain, we are unlikely to become accustomed to it here.

Acknowledgements

The information used to compile this report was collected by members of the Scottish Raptor Study Groups and is in itself a tribute to the skill, hard work and dedication of these voluntary fieldworkers. We also thank the RSPB for its cooperation in providing ancillary details of certain persecution incidents. Much of the fieldwork was done under licences to disturb Schedule 1 species of birds issued by Scottish Natural Heritage. We are grateful to the many landowners, their tenants, agents and employees for freely giving access to the ground under their jurisdiction and for information and helpful advice.

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Appendix I. Examples of persecution of Golden Eagles in Tayside

There have been a number of high profile cases of Golden Eagle persecution in Tayside and adjoining areas in recent years. Bearing in mind the small chance of detecting such incidents, these examples probably represent the tip of the iceberg.

Shooting

1. On 21 April 1988 an adult female Golden Eagle was found dead concealed among rocks near its nest a few miles east of Ben Lomond. An X-ray showed that it had been shot with a shotgun at very close range. The nest was later found to contain 2 cold eggs. The police interviewed the local game keeper who had been threatening to 'get the eagle.'

2. On 7 October 1989 a group of 4 hill walkers was approaching the summit of Glas Maol, Glenshee, when they found the corpse of a recently dead Golden Eagle. The bird was retrieved by RSPB investigators and found to be an adult male which had died due to being

struck by a single shotgun pellet which had lodged in its windpipe.

Despite a police investigation no culprit was ever identified and no court proceedings were ever initiated. This bird had died on a National Nature Reserve. The only shotgun activity for many miles in any direction is vermin control connected to grouse shooting and grouse shooting itself.

In April of the previous year the adult male in the same home range had been found poisoned on its nest (see below). In all probability the shot male was the replacement for the poisoned male.

3. On 31 May 1994 a young Golden Eagle was found dead close to the reservoir in upper Glen Lednock. This bird had also been shot. The ring it was carrying confirmed that it had fledged from an Argyllshire nest in the previous summer, a good example of the fate awaiting birds moving into Tayside from the apparently impoverished but revealingly more productive deer forest and sheep walk territories to the west.

A police investigation was again initiated but no culprit was found.

4. On 30 May 1995 a RSPB contract worker carrying out an agreed visit to an estate in Glen Clova discovered the body of an eagle. On X-ray this bird was found to contain over 30 pieces of shot. A post mortem revealed that the bird had almost certainly been shot on the ground, perhaps after an initial injury.

An immediate police investigation followed leading to several members of the public giving information about previously unreported persecution incidents in the area. No one was ever charged over the shot eagle.

The reaction of certain landowners was to attempt to suggest that the bird had been either a tame one, or that it had been "planted" to discredit some unnamed person. There was no evidence to back up either of these claims.

Poison

Poisoning still appears to be endemic in Tayside with SOAEFD, RSPB and Tayside Police aware of dozens of confirmed incidents of deliberate wildlife poisoning which have occurred in or close to Golden Eagle home ranges in the last 2 decades. The most commonly recorded victims are Buzzards, which share a liking for carrion with eagles. Golden Eagles, however, are not usually present in such accessible areas as the more ubiquitous Buzzard so the chances of finding a poisoned eagle are reduced.

1. On 1 April 1982 a contract fieldworker found one of a pair of breeding eagles poisoned by alphachloralose within a mile of its built up nest. This was at a remote location at the extreme west of Tayside at the junction

of 3 estates. All estates denied any knowledge but a local shepherd/estate worker admitted to the finder of the dead bird that he used the chemical against crows. This remains the only recorded instance of persecution or poisoning anywhere near the location but it may be significant that this was the last known nesting in this home range.

2. On 14 April 1988 a Tayside Raptor Study Group member, carrying out a routine check on Golden Eagles in Caenlochan National Nature Reserve, found an adult male lying dead on its nest. After a difficult climb, he retrieved the bird which was sent for analysis. It was found to have been poisoned with alphachloralose. A field search by RSPB staff 2 days later turned up a dead hare laced with alphachloralose on a grouse shooting estate neighbouring Caenlochan. Again, all was reported to the police who interviewed the landowner and game keeper of this estate but no charges were brought.

3. In early June 1989 an adult female eagle was retrieved dead from its nest near Drumochter a few kilometres outside the Tayside area. Also in the nest were its 2 dead chicks. Post mortem chemical analysis confirmed that the bird had been poisoned with alphachloralose. This was reported to the police and publicised.

The reaction of the landowner was to try to have the NCC withdraw the Schedule 1 disturbance licence of the RSPB contract worker who had retrieved the bird after watching the nest from a neighbouring estate by telescope. The landowner claimed that the licence was invalidated because access permission had not been granted, but how do you disturb a dead eagle and 2 dead chicks?

Trapping

As with poison, the use of baited traps, usually gin traps, to kill eagles has a long history, with many references to this practice in the literature from the early 19th century onwards. Also in common with poisoning, the practice has not died out as some may claim.

1. Following a report from a hill walker on 13 May 1986, 2 RSPB investigators located a baited gin trap at a moorland pool (a 'drowning set') in an eagle's territory at Glen Tarf, near Glen Tilt. The illegal trap had caught a harmless and legally protected Black-headed Gull, no doubt unintentionally, the traditional targets of this trapping method being Fox, Wildcat and Eagle. The illegal trap was reported to the police. When approached by the RSPB, the estate's representative said 'it must have been an older keeper showing a young one the old methods.'
2. On 12 May 1991 an article in *The Observer* carried a picture story on a baited gin trap found set above Glen Tilt. On being interviewed the landowner's comment was to the effect that the incident was regrettable but understandable. The police were again informed but no charges were brought.
3. On 1 June 1991 a walker from Brighton, again in Glen Tarf, off Glen Tilt, found a live Golden Eagle dragging a gin trap behind it through the heather. On his return to Pitlochry he tried to report the matter but failed to leave site details or a forwarding address with the SSPCA before disappearing. Over 2 months later he wrote to RSPB HQ in England to ask if anything had been done! An immediate field investigation was carried out by Tayside Police and the RSPB but a search of Glen Tarf failed to find the presumably by now long dead bird. Again the estate was investigated

by the police and again no charges were brought for lack of evidence. The estate asked for more 'cooperation between the RSPB and the keepers.'

4. On 20 January 1996 a landowner on a small estate which was actively running down its game management, phoned the RSPB to say that a dead eagle had been found in one of its crow cage traps. The bird had been ringed as a nestling in 1995, in a nest that had been subject to an intensive nest watch. The site had been previously plagued by egg collectors and a massive effort by some 100 local volunteers had resulted in this chick fledging, the first successful nesting at this site in 9 years.

This bird's death by starvation, due to the neglect of a legal trap, caused great concern. Crow cages could be officially monitored to prevent such incidents but they remain unregulated. A police investigation found no evidence of deliberate wrongdoing.

5. Finally, in July 1982 a recently fledged juvenile eagle was found in Glen Tilt with a badly broken wing and the main primary feathers missing from the other wing. It is difficult to imagine how this damage might have occurred naturally and human interference was suspected. Considerable force is necessary to extract these feathers and the broken wing was consistent with a foot having been braced on it to give leverage to pull feathers from the other wing.

Concluding remarks

This list of incidents for Tayside could be repeated for other parts of Scotland, and incidents are listed and published as a matter of course by the RSPB. The main point to be

made is that such occurrences are still frequent. No knowledgeable person doubts that illegal persecution of raptors continues, or that it is mainly associated with game preservation. It is, however, difficult to prove in court which individual is responsible in any one case.

Appendix 2. Persecution at a Buzzard and Raven communal roost in Tayside

Some raptors and Ravens gather to roost communally, and, under such circumstances, are particularly vulnerable to persecution. Persecution can kill many birds in a short time and these birds are drawn to the roost from a very wide area; thus the activities of one persecutor can affect a substantial part of the overall population of the species in question. It is thought that Red Kites and White-tailed Eagles were exterminated in Scotland more easily than some other predatory birds because, although they are wide ranging, they often congregate to roost or exploit local food abundance, where they become vulnerable to persecution. It is therefore of some concern that persecution at communal roosts still occurs; it is suspected at some Hen Harrier roosts and is documented here for a Buzzard and Raven roost.

The roost accommodated up to 12 Buzzards and 70 Ravens at any one time and was occupied from at least 1988. On 23 December

1990, shots were heard from the roost wood and regular inspection of the site from then onwards in January 1991 discovered a concealed dead Buzzard and 4 dead Ravens lying in the open. The roost was only occupied intermittently for the next 4 years, perhaps because of the persistent shooting taking place there, but numbers built up in 1995 when intensive shooting started again; a Buzzard injured by shot was found in October 1995 and another dead one in October 1996.

The overall impact of such shooting is impossible to quantify. The small glen where the roost is situated is very good Buzzard habitat and could support several breeding pairs but none have been found there.

Appendix 3. Scientific names

Red Kite *Milvus milvus*; White-tailed Eagle *Haliaeetus albicilla*; Marsh Harrier *Circus aeruginosus*; Hen Harrier *Circus cyaneus*; Goshawk *Accipiter gentilis*; Sparrowhawk *Accipiter nisus*; Buzzard *Buteo buteo*; Golden Eagle *Aquila chrysaetos*; Osprey *Pandion haliaetus*; Peregrine *Falco peregrinus*; Red Grouse *Lagopus lagopus*; Ptarmigan *Lagopus mutus*; Black-headed Gull *Larus ridibundus*; Raven *Corvus corax*; Mountain Hare *Lepus timidus*; Fox *Vulpes vulpes*; Wildcat *Felis silvestris*.

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Publication of this paper has been accelerated as the information is of direct value to the current debate on raptors. We thank the George Lodge Fund for funding an extra Scottish Birds which will be published in March 1998.

Movements of Fulmars from the Firth of Forth

JOHN C DAVIES

Recoveries of Fulmars ringed as chicks in the Firth of Forth were concentrated on the shores of the Firth of Forth, on the East Coast and the Low Countries of the North Sea. Other birds were recovered in the English Channel, the Celtic and Irish Seas and the North Atlantic. One third of the birds were recovered in their first year. Immature birds appear to return to British waters in their fifth and sixth years.

Introduction

Fulmars *Fulmarus glacialis* first bred in the Firth of Forth on the cliffs at Tantallon in the 1930s. They now breed at many other sites including the Isle of May (first bred 1930) and Inchkeith (1948), (Harris *et al* 1987). The Fulmars on Eynhallow, Orkney have been the subject of a long term population study (Dunnet 1991) and recoveries of Fulmars ringed in Britain up to 1975 have been analysed by Macdonald (1977).

Most of the Fulmars ringed in the Firth of Forth have been ringed on Inchkeith by the Lothian Ringing Group and its predecessor, the Edinburgh RG. Fulmars have also been ringed on the Isle of May by the Isle of May Bird Observatory and at Tantallon by individual ringers. This paper presents the results of this ringing and updates a previous report by Poxton (1981).

Method of analysis

This paper is based on 109 recoveries of birds ringed as chicks during the first fortnight

of August reported up to the end of 1995. All but 8 of the recoveries refer to dead birds. The birds are assumed to have fledged by 1 September each year, although some will not have fledged as early as this, and the year of recovery is from 1 September to 31 August of the following year. The 4 seasons, autumn, winter, spring and summer refer to the months September to November, December to February, March to May and June to August respectively. Since the Fulmar is a pelagic bird, except when breeding, the place of recovery has been allocated to sea areas rather than countries or regions. East Coast refers to the east coasts of Scotland and England; the Low Countries are the North Sea coasts of France, Belgium, the Netherlands and Germany; Scandinavia is the North Sea coasts of Denmark and Norway and the Skagerrak. The NW Approaches are the Malin Sea, the Minches and the Sea of the Hebrides (Hardisty, 1990). North Atlantic includes the Faroes and Newfoundland, Canada.

Results

The temporal and spatial distributions of

recoveries are shown in Tables 1 and 2 and are mapped in Figure 1. Nearly a third (31%) of all recoveries were from the Firth of Forth and over a third (35%) of the birds were recovered in their first year, mostly within 2 months of fledging. Other recoveries in the first year came from the East Coast, the shores of North Sea and the North Atlantic. The number of recoveries reduced considerably in the second, third and fourth

years, again with recoveries from the shores of the North Sea and North Atlantic. In the fifth and sixth years recoveries increased with birds from the English Channel, the Celtic and Irish Seas and the NW Approaches as well as the North Sea and North Atlantic. The majority of birds were recovered in spring and summer. Few were recovered in autumn or winter with the exception of the autumn of the first year.

Figure 1a Recoveries of Firth of Forth Fulmars Years one to 4.

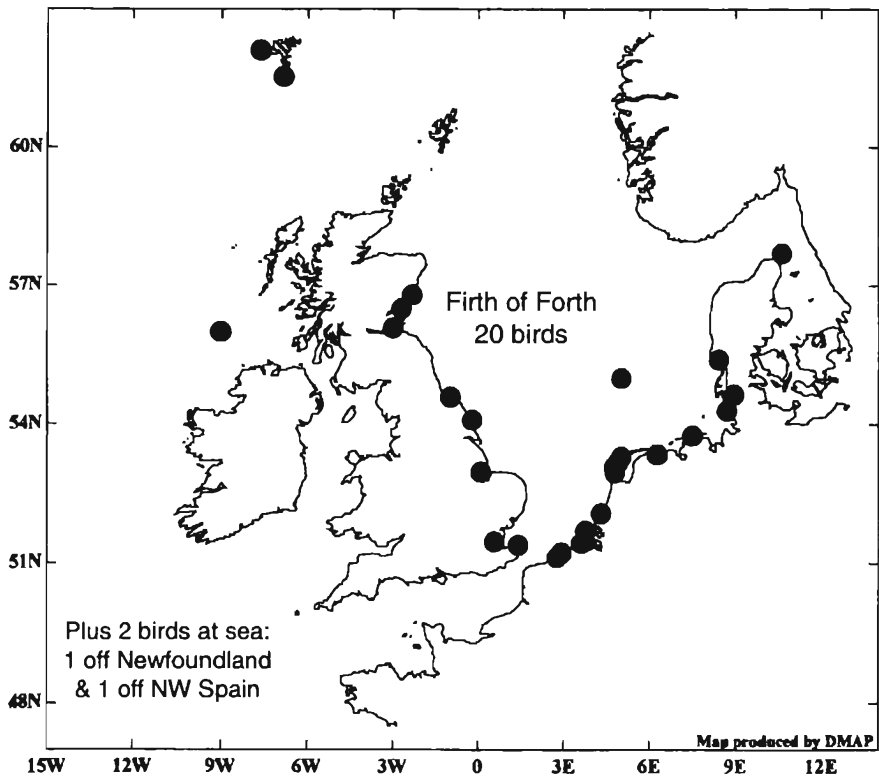
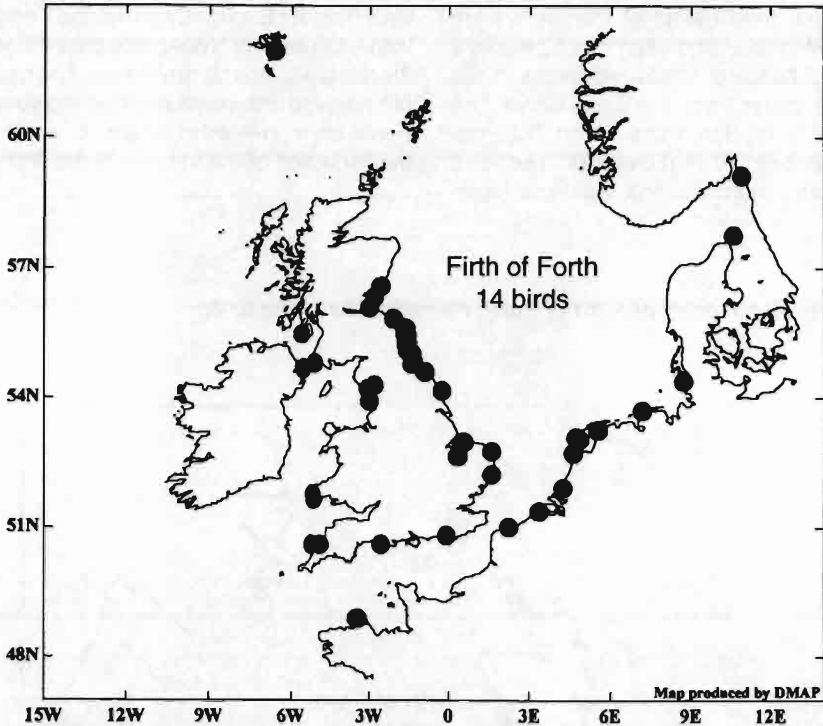


Figure 1b Recoveries of Firth of Forth Fulmars Year 5 onwards.



The finding details of recoveries were divided into 4 main categories shown in Table 3. Almost two thirds (65%) of the birds recovered were simply found dead on the shore. Sick and injured birds (11 %) included birds which subsequently died or were taken into care with unknown results. Oiled birds (8%) could have been involved in an oiling incident or become contaminated after dying. Fulmars suffer insignificant losses from chronic oil pollution except maybe in the southern North Sea (Stone *et al* 1995). Included in the caught or shot category were 8 birds (out of 17) caught and released again by ringers at other colonies; 2 local movements (Tantallon to

Inchkeith and Inchkeith to Inchmickery); one to the Farn Islands; 3 to Hunstanton, Norfolk; one to Ile de Rouzic, Brittany, France; and one to the Copeland Islands Northern Ireland. The median age of these birds was 11 (range 6 to 20 years).

There were also 11 recoveries of birds ringed as adults in the Firth of Forth. They were recovered between one and 14 years after ringing (median 4 years). Four of the recoveries were within the Firth of Forth, 5 within the North Sea, one in the Faeroes and one in the Barent's Sea. There were 5

Table 1 Year and area of recovery of Firth of Forth Fulmars.

Area of Recovery	YEAR OF RECOVERY															Total	Percent
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th		
Firth of Forth	20				2	1	1	2	2	3	1			2		34	31%
East Coast	5		2		2	5	1	3	3	1			2		1	26	24%
Low Countries	11	1	1	1	2	2	1	1	1			1		1		23	21%
Scandinavia		2		1				1		1						5	5%
English Channel					1		2	1								4	4%
Celtic Sea						1	2		1							4	4%
Irish Sea						2	1		1			1				5	5%
NW Approaches						1										1	1%
North Atlantic	2	1	1	1		1										6	6%
Total	38	4	4	3	7	13	8	8	8	5	1	3	2	3	1	108	100%
Percentage	35%	4%	4%	3%	6%	12%	7%	7%	7%	5%	1%	3%	2%	3%	1%	100%	

Footnote. One recovery not included: 20th year, East Coast

Table 2 Season of recovery of Firth of Forth Fulmars.

Season of recovery	YEAR OF RECOVERY															Total	Percent
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th		
Autumn	31	1	1			1		2	1			1		1		39	36%
Winter	2			1	1	1								1		6	6%
Spring	2	2	3	2	1	4	2	3	5	2	1	1		1		29	27%
Summer	3	1			5	7	6	3	2	3		1	2		1	34	31%
Total	38	4	4	3	7	13	8	8	8	5	1	3	2	3	1	108	100%
Percentage	35%	4%	4%	3%	6%	12%	7%	7%	7%	5%	1%	3%	2%	3%	1%	100%	

Footnote. One recovery not included: 20th year, summer.

recoveries or controls of birds which had been ringed as chicks outwith the Firth of Forth. Three birds ringed on Shetland, Fair Isle and Orkney were found dead in the Firth of Forth one, 5 and 16 years after ringing respectively. Two birds ringed on Fair Isle and at Tarbet Ness, Moray Firth were controlled on the Isle of May after 13 years and at Tantallon after 14 years.

Table 3 Finding details of recoveries of Firth of Forth Fulmars.

Finding Details	Number	Percentage
Dead	71	65%
Sick/Injured	12	11%
Oiled	9	8%
Caught/Shot	17	16%
Total	109	100%

Discussion

Post fledging recoveries are high in the Firth of Forth because its shores are well populated and accessible and dead birds are easily found and reported. Macdonald (1977) found that, soon after fledging, Fulmars disperse from British waters to the waters of the North Atlantic, Norwegian Sea and European Arctic. This study shows Fulmars from the Firth of Forth disperse south east into the North Sea as well as to the North Atlantic in their first year. Whether they enter the North Atlantic south through the English Channel and Celtic Sea or north by Orkney and Shetland is not known. However, in the first few years, there are no recoveries of Firth of Forth Fulmars from the English Channel and Celtic Sea as there are in later years. Tasker *et al* (1985)

found higher Fulmar densities off the east coast of Britain in September and October than in other months and also noted south eastward movements of birds at that time.

Macdonald (1977) showed a contraction in the distribution of Fulmars in the North Atlantic in their fourth year coinciding with the return of pre breeding birds to land. Fulmars from the Firth of Forth appear to return to British seas in their fifth and sixth years. Breeding pairs occupy nest sites for several years prior to first breeding at around 10 years for males and 12 for females (Dunnet 1991). Twenty eight Fulmars ringed on Inchkeith (10 ringed as chicks and 18 as adults) have been retrapped or recovered dead on the island in later years. The number of years between ringing and retrapping or recovery varied between 3 and 19 years (median 14 years for chicks and 2 and 18 years (median 7 years) for adults.

Acknowledgements

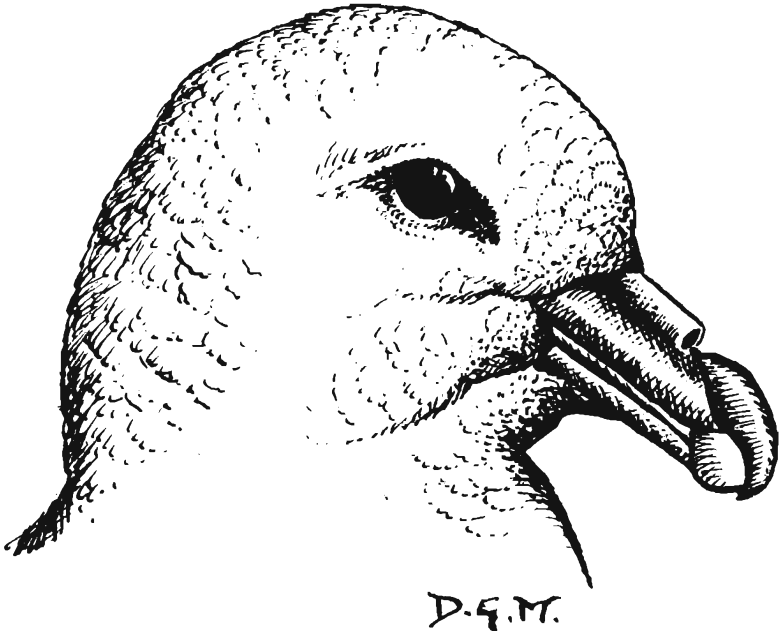
I am very grateful to Martin Moss and past and present members of the Edinburgh and Lothian Ringing Groups for their efforts ringing Fulmars over the years. Ian Darling kindly gave permission to use the Isle of May Bird Observatory Fulmar recoveries. The British Trust for Ornithology Ringing Scheme is supported by the BTO, the Joint Nature Conservation Committee (on behalf of, among others, Scottish Natural Heritage) and the ringers themselves. Ringing costs for seabirds are currently subsidised by the JNCCs Seabird Monitoring Programme. The Scottish Ornithologists' Club has supported seabird monitoring on the Firth of Forth islands for many years through its Endowment Fund Grants.

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Fulmar

David Mitchell

A winter survey of sawbill ducks and Cormorants on the River Deveron, north east Scotland.

P J COSGROVE

During January 1996 a winter survey of sawbill ducks and Cormorants was carried out on the main stem of the River Deveron, in north east Scotland. A total of 91 Goosanders were counted representing approximately one bird per 1km of river. Nearly half of the birds were adult males and the rest females or yearlings. Goosanders were most abundant in the lower to middle reaches of the river. No Red-breasted Mergansers were detected on the river. There were 15 Cormorants on the river representing approximately one bird per 6km of river, although birds were only recorded in the lower to middle sections of the river. The figure of 91 Goosanders shows that the River Deveron is a nationally important wintering site, holding at least 1% of the estimated population in Great Britain. However the national population has been estimated in the absence of comprehensive river surveys and so the national figures need to be reassessed to take account of all Goosander habitats. Both Goosanders and Cormorants have been culled under licence in relatively high numbers on the Deveron in recent years. The impact of culling on the bird and fish populations are considered and the necessity of culling is questioned.

Introduction

The aims of this study were to census the winter population of sawbill ducks (Goosander *Mergus merganser* and Red-breasted Merganser *Mergus serrator*) and Cormorants *Phalacrocorax carbo* on the main stem of the River Deveron, from the sea at Banff to the source near Cabrach; compare the counts with other relevant data; assess the likely impact of culling on populations of the respective species, and make recommendations for future censuses of local sawbill and Cormorant populations.

Methods

The winter census of piscivorous birds was carried out by means of a transect count along the whole length (87km) of the River Deveron. The count was carried out in mid January, over 4 days (21.01.96 - 24.01.96) during a period of similarly mild weather conditions, to minimise the possible effects of weather related movements of birds along the river. Goosanders, for example, are prone to cold weather movements (Marquiss, *pers comm*) and therefore selecting consecutive days with similar weather conditions is of considerable importance in avoiding repeat

counts of birds. Counts were usually in the morning but sometimes continued into the afternoon because of short day length. Consultations with local fishermen suggested that human disturbance was not a problem on most stretches of the river outside the fishing season. The towns of Banff, Turriff and Huntly however may have had disturbance during the day; therefore these stretches were surveyed in the first 2 hours of daylight to avoid missing birds which may have been disturbed by human activities along the river. The whole river was walked from Banff to Cabrach, scanning thoroughly at every bend to avoid flushing birds ahead of the fieldworker. The survey was carried out by 2 teams of 2. Observers covered a stretch of river by walking upstream to a predetermined spot where the other observer left a car and began his/her walk. Where possible observers moved around birds so as not to flush them. The location of each bird was recorded from grid references on 1:50,000 maps. Goosanders were recorded and categorised into one of 3 cohorts: paired birds, unpaired adult males and unpaired adult females/unsexed juveniles ('redheads') according to plumage characteristics. Paired birds were defined as males closely escorting females.

Population estimates

Goosander and Cormorant distribution was plotted with respect to river elevation; the whole river was subdivided into 10km sections starting from the mouth. The mean elevation was estimated metres above sea level (masl) from 1:50,000 Ordnance Survey maps. The terms referring population estimates to sections of river are loosely defined as: 'lower' Banff to Turriff; 'middle' Turriff to Huntly and 'upper' Huntly to Cabrach.

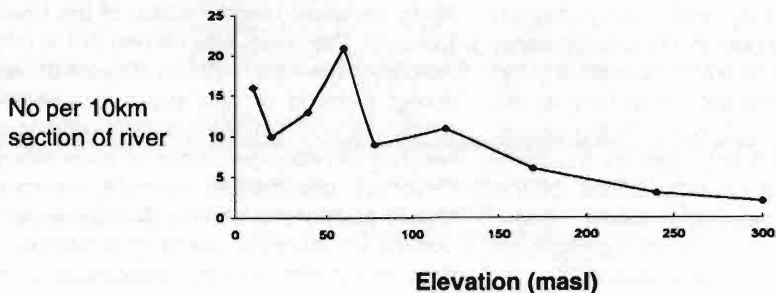
Results

Goosander

Population estimate

Ninety one Goosanders were counted on the main stem of the River Deveron over the 4 day count, giving a density of approximately one bird per 1km of river. During the January count Goosanders were scarce on the upper part of the river and most abundant on the lower part of the river (Figure 1). There were comparatively high densities of individuals in the lower-middle reaches, until 120 masl.

Figure 1 *Goosander densities in relation to elevation on the River Deveron, in January 1996.*



where there was a steady decline up to Cabrach, near to the source of the river (300 masl). The highest density of birds per 10km section was 21 at 30-40km inland, 60 masl around Inverkeithy and Marnoch Bridge. The lowest density of birds per 10km section was 3 at 70-80km inland, 240 masl around Haugh of Glass and Mains of Lesmurdie. There were only 16 birds recorded in the whole of the upper river from Huntly to Cabrach.

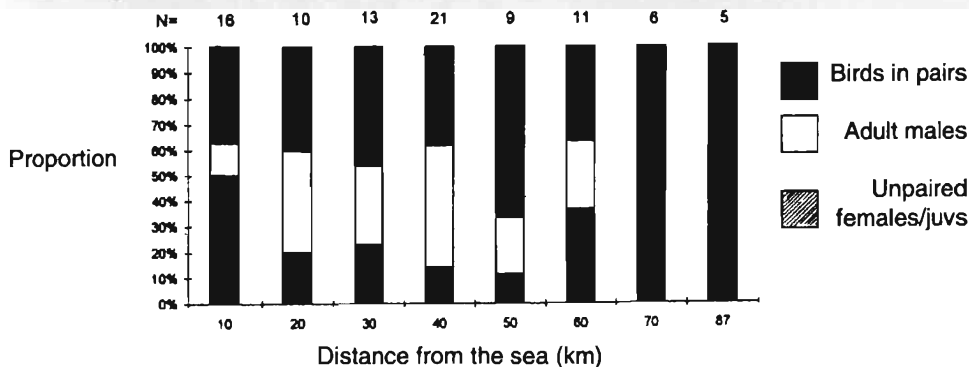
Patterns of abundance in the age/sex composition of the population

Nearly half (43) of the 91 Goosanders were adult males and the rest were redheads. Of these birds 36 individuals were in 18 pairs, 30 were single or group redheads and 25 were single or group adult males. The proportions of these 3 categories of Goosanders along sections of the River Deveron are illustrated in Figure 2. The proportion of birds in pairs remained high (30-50%) in most of the lower and middle sections of river. Only in the uppermost reaches of the river were pairs not

recorded. The proportion of unpaired adult males remained similar to the proportion of birds in pairs (20-50%) in all but the lowest and upper sections of river. None were recorded in the upper 17km of the river. Redheads were proportionately lower than the other 2 categories in most of the lower and middle sections of the river. However from 60km inland, 120 masl, this increased steadily until the final sections when most of the birds were redheads. In the last 2 sections (17km) of river, Goosanders were very scarce (11 birds) and it should be noted that the changes in composition over these sections are based on small sample sizes.

Goosanders were recorded in small groups throughout the river. Most of the groups tended to be pairs of birds with other individuals in attendance. The highest number recorded in any one location on the river was 7, 2 pairs and 3 additional redheads on one wide, deep pool. There appeared to be no particular bias in the composition of these groups with both adult males and redhead only groups as well as mixed groups being recorded.

Figure 2 *The proportions of 3 categories of Goosanders seen on the River Deveron in January 1996.*



Red-breasted Merganser

There were no Red-breasted Mergansers detected on the River Deveron.

Cormorant

Population estimates and patterns of abundance

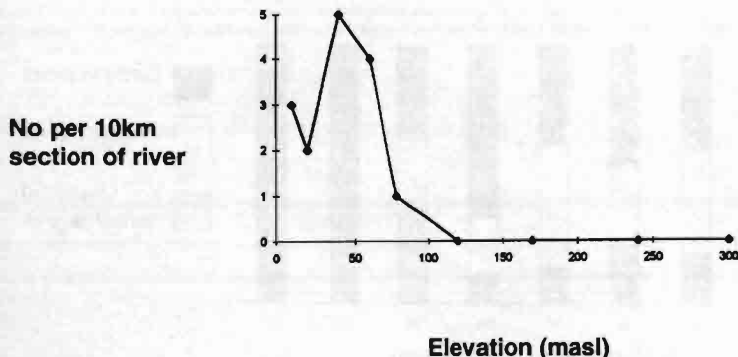
The total count for the 4 days was 15 birds on the river or sitting on tree branches over the river (Figure 3), giving a density of approximately one bird per 6km of river. No Cormorants were detected after Rothiemay, in the middle to upper river stretches. The last bird was seen in 43 km inland, 60 masl, between Marnoch Bridge and Rothiemay. One other Cormorant was found shot dead in a lower river section.

Discussion

Goosander

There have been very few estimates of whole river populations of Goosanders in Britain, most estimates have been made on sections of rivers, such as those counts carried out on parts of the Tweed and Eden in the Borders. Estimates of wintering populations of Goosanders have been compromised by a lack of systematic counts on rivers (Owen *et al* 1986, Marquiss and Duncan 1994). The most comprehensively studied river has probably been the Dee in Grampian. It is perhaps appropriate, therefore, that comparisons are made with this river, although it is acknowledged that the 2 rivers differ in their character with the Dee being a more predominantly upland river than the Deveron. In 1988, the River Dee winter population was estimated from counts in December (Marquiss and Duncan 1994). That study found 62

Figure 3 *Cormorant densities in relation to elevation on the River Deveron in January 1996.*



Goosanders on the main stem of the river; 20 adult males, at least 8 young males, and the rest females and unsexed young birds. Most birds were on the lower sections of the river, with only 4 birds being recorded in the upper reaches. These results are similar to those found in this study, where most of the birds were on the lower to middle stretches of the River Deveron. Marquiss and Duncan (1994) attributed this to the species' food requirements. Goosanders' main prey items are largely unavailable during the daytime in the very cold upper reaches of the river in winter because many of the fish are apparently buried in the substrate. The birds are consequently found lower down the river on the deeper water where many fish are still available. This was the case in the present study; most birds were found in areas that reflected their needs for food, such as long deep straights, wide sweeping bends and deep pools.

There were some differences in the patterns of abundance of the age/sex composition of the populations between the 2 studies. A greater proportion of birds on the Deveron were in pairs, particularly in the lower reaches, than were found on the Dee where most of the birds were unpaired. This could have been because the Deveron counts were approximately one month later in the season than on the Dee and closer to the breeding season, when more paired birds might have been expected. There were also some apparent differences in the composition of the populations in the upper reaches of the 2 rivers, but these could be explained by the very small sample sizes and any conclusions should therefore be treated with caution.

Systematic counts of birds on the River Deveron appear not to have taken place before, so previous population estimates are

not available, but the shooting bags figures from SOAEFD may give some very crude minimum estimates (Table 1). These figures are, however, difficult to interpret because shooting effort was not standardised or even measured. Goosander bag sizes from between 1992-1994 suggest that numbers were probably in excess of 50 birds. Initially the limit was set for 150 Goosander, almost 2% of the national population (Waters and Cranswick 1993). The bag limit has since been reduced to 50 but this is still set at approximately half of the January population estimate. Licences are issued to assist in scaring birds to alleviate perceived high predation pressure. A minimum number of birds can be shot to prevent serious damage (Munro, in Hansard, 1991), but licences are issued as a supplement to effective scaring, exclusion and fisheries management policies and not to achieve an overall reduction in the Goosander population (MAFF 1995). One of the consequences of this is that the practice of widespread culling has not been properly investigated (Wynde, RSPB, *pers comm*). Therefore, any assessment of the long term effects of shooting 40-50 Goosanders per year is purely speculative because of a lack of data.

Goosander numbers in Britain have increased over the last 3 decades, although numbers on the most important site in national terms (the Inner Moray Firth) have declined recently and numbers in the north east of Scotland have not increased (Waters and Cranswick 1993). The figure of 91 Goosanders shows that the River Deveron is a nationally important wintering site, holding at least 1% of the estimated population in Great Britain (Waters and Cranswick 1993). However, the national population has been estimated without comprehensive river surveys, so the national figures and levels qualifying for national and

international significance need to be reassessed following national surveys of all Goosander habitats. It is clearly an important wintering site for this species but no data are available to suggest how important the site is in spring for passage as well as breeding birds. It is not known, for example, how many of the winter birds remain to breed. Work from the River Dee suggests that some birds may well remain to breed.

Table 1 Numbers of reported sawbill ducks and Cormorants shot under licence on the River Deveron.

(Data courtesy of the Scottish Office Agriculture, Environment and Fisheries Department SOAEFD)

Year	Season	Species	Bag Limit	No shot
1992	Spring	C	100	4
		G	150	52
		R	50	Nil
	Autumn	C	40	38
1993	Spring	G	50	41
		R	20	Nil
	Autumn	C	40	38
1994	Spring	G	50	17
		C	40	4
		G	40	24
1995	No spring licence application	C	30	18
		G	50	8

Key: C = Cormorant, G = Goosander and R = Red-breasted Merganser

Assessments of the impact of culling on Goosander (and Cormorant) populations cannot be made without further investigations into their biology. Only a little is known about

the biology of Goosanders on the Deveron. Marquiss and Carss (1995) found in an analysis of stomach contents of birds shot on the Deveron in the spring that approximately 80% of the food items were Salmon and Trout parr. They did not, however, analyse the contents of guts collected in the winter.

The numbers of Goosander found from one count may well be of little value. On 2 rivers where Marquiss and Duncan varied sawbills, they found bird abundance varied with river habitat, between seasons and between years (Marquiss and Duncan 1993, 1994). It is therefore strongly recommended that future work be carried out on a number of aspects of Goosander biology on the Deveron. Most importantly, monitoring should be carried out on both the spring and winter populations. It is only through increased monitoring of birds that the effects of the killing on the bird populations could be determined, through carefully designed controlled experiments manipulating the levels of culling over a number of seasons. There would also need to be an adequate number of replicates and monitoring of other factors likely to impact on Salmon stocks.

From both the ornithologist's and the fisherman's point of view, the critical question is whether or not the Goosander population is likely to cause serious damage to the fishery. If it does, the 1996 revision of the Wildlife and Countryside Act demands that all alternative measures to killing must have been tried and found to be ineffective, before considering whether or not culling the birds is likely to alleviate this level of damage. If, as the present evidence suggests, they do not cause serious damage to fisheries (eg Marquiss and Carss 1994), then SOAEFD do not need to issue licences because the question of culling is unnecessary.

Red-breasted Merganser

There were no Red-breasted Mergansers found on the Deveron in the course of this study, nor were there any returns of birds killed in any of the years where licences were issued. However, historically some birds were recorded at the mouth of the river in the 1940's and once a group of 4 were seen at the Alvah gorge (A Watson *pers comm*). It is surprising therefore, that SOAEFD issued licences to kill up to 50 Red-breasted Mergansers on a river on which they were apparently absent.

Cormorant

The count of 15 Cormorants on the whole river is low compared to the numbers shot annually under licence (Table 1). In some years up to 40 birds have been shot. The data on when these birds were shot are unavailable, and as a consequence, it is difficult to assess whether the population of birds was formerly high and has since declined. The Cormorant population in Great Britain as a whole is high and increasing (Waters and Cranswick 1993), but there has been a substantial decline in breeding numbers between the 2 breeding Atlases in some areas, especially in northern Scotland (Gibbons *et al* 1993). It is possible that shot birds have been replaced by new birds from surrounding areas and that the cumulative effect of the birds removal has been rapid re-colonisation of suitable feeding areas on the Deveron.

The distribution of Cormorants inland tends to reflect their choice of feeding areas (Carss and Marquiss 1991, Marquiss and Carss 1994). The birds tend to respond to increases in food availability quickly and colonise suitable areas. The recent rapid increase in small

ponds and lochs (*pers obs*) stocked artificially with Trout and other species on and around the Deveron catchment may have provided new concentrated feeding sites formerly absent for Cormorants. Any potential predation problems are likely to be exacerbated by the increasing number of new stocked fisheries, particularly in the upper reaches of the Deveron where Cormorants were not recorded on the river. There is no evidence that the Cormorants shot under licence on the Deveron were actually foraging in the river. Unpublished information from other areas in Britain, suggests that many of the Cormorants that were killed under licence were shot flying above waters, rather than shot when actually foraging in them (Wynde, RSPB *pers comm*). Several Cormorants were seen above the middle to upper reaches of the Deveron flying quite high upstream. None of these birds were later recorded on the river and it is unclear where their final destination was.

It is difficult to assess what impacts culling is having on the Cormorant population. There is no information on turn over rates of birds or actual foraging rates on the river. However, the removal of up to 40 birds annually from a population with such a low number of individuals in the winter gives cause for concern. Further monitoring of Cormorants should take place (similar to that described for Goosander) on the Deveron to determine the impacts of the cull on both the Cormorant population and the fishery. It would also be useful to have more meaningful shooting bag returns, illustrating the dates when and where birds were shot and whether the birds were on the river or flying over. Only when more information is available can informed decisions be made about fisheries management and bird numbers.

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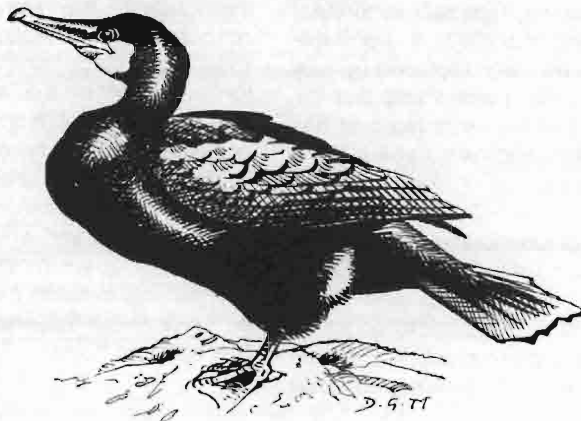
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Cormorant

David Mitchell

Declines in Turnstones and Purple Sandpipers wintering in south east Scotland

H E M DOTT

Winter counts of shorebirds carried out in south east Scotland on predominantly rocky coasts in East Lothian and Berwickshire have revealed an alarming decline in numbers of Turnstones and Purple Sandpipers since the late 1980s.

Introduction, study area and methods

The coast of south east Scotland from Gullane Point in East Lothian eastwards is exposed and mainly rocky, with some cliffs and many small pockets of sand or stones and a few beaches. In Berwickshire it is still more exposed, steep and rocky, with some major cliffs and fewer beaches of sand or boulders. There is about 60km of coastline from Gullane Point to the border with England.

The status of birds using exposed open coasts in Britain is less well known than that for those using estuaries, which have been monitored regularly through national schemes for more than 20 years. However, for the open coast of south east Scotland a number of counts of shorebirds have been made, and those for Turnstones *Arenaria interpres* and Purple Sandpipers *Calidris maritima* are presented here.

This 60 km stretch of coast was first counted in winter 1973-74 by Summers *et al* (1975), and East Lothian sections were counted in winters in 1976-77, 1977-78, 1979 and 1984 (da Prato & da Prato 1979, 1985).

In January 1995 counts of all shorebirds were made along the entire coast again, omitting only the estuary of the River Tyne as before. This was done by a team of local counters as part of the national WeBS Non-Estuarine Waterfowl Survey Pilot Count 1994-95, organised by BTO, WWT, RSPB and JNCC. Repeat counts on the same stretch of coast were made in January 1996 and February 1997, mainly by the same counters using the same methods. The 3 counts were made by all the team members working concurrently during the same low tides on 8 January 1995, 14 January 1996 and 2 February 1997, except for a small section of the Berwickshire coast done on 7 January 1995 and 13 January 1996, so that the likelihood of double counting or of missing birds was minimised.

In all years low tide counts were carried out within 3 hours before or after low water. Counters were particularly looking out for "difficult" species such as Purple Sandpiper. Full details of the methods are given in Summers *et al* (1975) and in the WeBS Pilot Count 1994-95 instructions. da Prato and da Prato (1979) made comparisons of low and high tide counts made on this coast during 3 winters, and found higher counts were consistently obtained during low tide.

Table 1 Numbers of Turnstones and Purple Sandpipers counted on non estuarine coasts in south east Scotland.

	1973-74 Nov-Feb	1976-77 Dec-Jan	1977-78 Dec-Jan	1979 Jan	1984 Dec	1995 Jan	1996 Jan	1997 Feb
Turnstone								
East Lothian	1,299	1,515	1,633	1,259	1,351	489	411	259
Berwickshire	229	-	-	-	-	33	41	61
Purple Sandpiper								
East Lothian	688	642	659	746	522	63	81	83
Berwickshire	39	-	-	-	-	10	0	17
		Mean 1970s & 1980s (East Lothian only)		Mean 1990's (East Lothian only)		Percentage change		
Turnstone		1,411		386		-73%		
Purple Sandpiper		651		76		-88%		

Results

The most recent counts reveal that the number of Turnstones and Purple Sandpipers have declined very considerably since 1984. Table 1 shows all counts obtained for Turnstones and Purple Sandpipers for the 60 km of coast. For both species the counts are remarkably similar through the 1970s and in 1984, but are dramatically lower in the 1990s. At face value these counts indicate a drop of 73% for Turnstones and 88% for Purple Sandpipers.

Purple Sandpipers have been counted more frequently, mainly by the reserve warden, at Gullane Point-Hummell Rocks, part of Aberlady Bay Local Nature Reserve, at the western end of the open coast, and these counts are shown in Table 2. They suggest a less drastic drop than the Table 1 figures but do also show a decline, particularly from the late 1980s onwards. Annual WeBS counts for the neighbouring Firth of Forth estuary

show no clear trend for Turnstones and include too few data for Purple Sandpipers to be meaningful.

Discussion

Turnstones and Purple Sandpipers are known to be strongly site faithful to relatively restricted sections of coast in winter, both within one winter and from one winter to another, and they are unlikely to move due to cold weather as their food is relatively unaffected by frost (Metcalf & Furness 1985, Summers *et al* 1992, Burton & Evan 1997), although some individual Purple Sandpipers may perform diurnal movements of up to 8 km, at least in April (Summers 1995). This suggests that the results shown in Tables 1 and 2 indicate a real decline in the numbers of Turnstones and Purple Sandpipers wintering in this part of south east Scotland.

The scale and the possible causes of this

Table 2 Maximum numbers of Purple Sandpipers counted at Gullane Point-Hummell Rocks, East Lothian, November-March, 1978-87.

Year	Maximum Count	Year	Maximum Count
1978-79	70	1987-88	21
1979-80	63	1988-89	20
1980-81	111	1989-90	18
1981-82	100	1990-91	23
1982-83	75	1991-92	18
1983-84	75	1992-93	17
1984-85	45	1993-94	20
1985-86	21	1994-95	14
1986-87	80		

decline would have to be examined in the wider context of whatever population these birds may be from. The annual WeBS shorebird counts for the UK (annual *Wildfowl and Wader Counts*) also show some recent declines for both species, but this scheme has been based largely on estuarine shore counts and thus does not adequately monitor total UK numbers. Of all shorebirds in the UK in winter, Purple Sandpipers and Turnstones have the largest proportions occurring on non estuarine shores (Cayford & Waters 1996). These authors, in an analysis of 40 non estuarine UK shore sites, found an *increase* in Turnstones and Purple Sandpipers between 1984/85 and 1991/92. However Browne *et al* (1996) using data from over 500 UK non estuarine sites found *decreases* between 1984/85 and 1994/95 of 44% for Turnstones and 53% for Purple Sandpipers. There is clearly cause for concern and need further investigation if decreases of this order are genuine. The data given here for south-east Scotland are of particular interest due to there having been comparable counts for the same coastline during the 1970s, 80s and 90s.

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Turnstone in winter plumage

David Mitchell

Habitat use by Snow Buntings in Scotland from spring to autumn

ADAM WATSON

Adult Snow Buntings fed their young on invertebrates obtained beside snow, and on snow, flushes, and grassland. Adults and independent young often ate grass seeds at reseeded patches on a ski area, and picnic scraps, but scraps were seldom fed to dependent young. Snow patches delayed insect emergence, leading to plentiful food on thawing soil outside the receding snow edge throughout the summer. All habitats used had interlocking boulders, giving shelter to fledglings and cover from predators. Most moulting birds in late August and September were at bouldery hollows, cliffs and summit cairns. Birds in spring, snowfalls before nesting, and October used a far larger area than breeders. This needs recognition for species protection.

Introduction

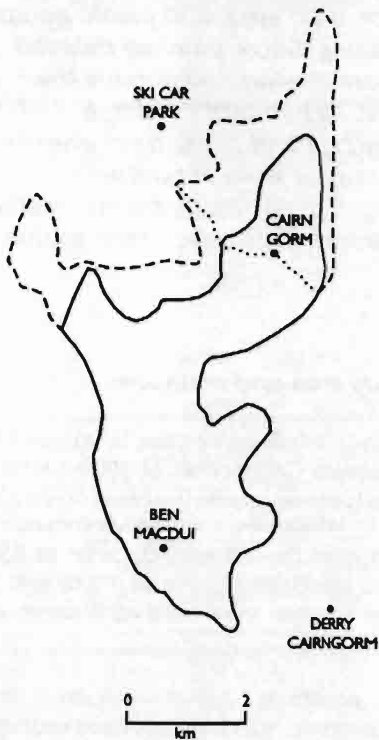
Snow Buntings *Plectrophenax nivalis* in Scotland nest at low density on a southern edge of their mainly arctic breeding range (Perrins 1994). There is much interest in such marginal populations and in understanding their habitats better. I observed on the same area as Nethersole-Thompson (1966), Smith & Marquiss (1994, study of marked birds in 1988-93), and Watson (1996, breeding in 1970-87). I lacked marked birds but they were unnecessary for this particular study. I had a long run of observations from 1943 to 1997, including spring and autumn, seasons for which few data have been published hitherto. Summer winds drop insects on snow (Thomley 1896), where cold traps them as food for insect feeders (Mani 1962). I wanted to test whether birds favoured snow patches or made equal use of habitats of equal area.

Study area and methods

Smith (1994) described the 16km² area A in the central Cairngorms, at 1050-1310m on Cairn Gorm plateau 100km west of Aberdeen (Fig 1). When snow covered A before nesting, birds used the 5.5 km² B, down to 850m. Arctic alpine land starts at 760m and has many summer snow patches (Watson *et al* 1994).

Bias occurs in studies of habitat use if observers do not visit some habitats, but my walks were designed to cover all parts of A in approximate proportion, for studies of human use and snow patches (Watson 1991; Watson *et al* 1994). A bird is easier to see in some spots, eg on snow than off it, so I used data only after undisturbed flying birds landed. Statistically independent data were assured by randomly taking an observation for a bird in each category (adult cock, adult hen etc), in

Figure 1 Area A used in nesting and fledgling periods (solid line), and alpine land on area B (out to dashed line) used when fresh snow covered A in late March-early June snowfalls before nesting, and in October irrespective of snow. Lines are drawn round outermost sightings in 1943-97. Dotted line shows northern boundary of Sites of Special Scientific Interest.



each period (incubation, nestling etc), each year. I expanded sample size where birds were obviously different ie adults foraging near nests that lay far apart, and dependent fledglings far apart and at very different stages of development).

I did not use surveys of plant communities, as these were designed for a different purpose and observations on the birds indicated their lack of value. Instead, the habitat's physical structure in terms of boulders, snow patches, and small flushes which were not mapped in the plant surveys appeared paramount. I therefore made a simple classification based on knowledge of the birds. I traced habitats from aerial photographs and made ground checks. Most habitats varied in extent each summer as the winter snowpack melted, and between summers following snowy and mild winters, so I compared usage of these habitats only when nearly all snow had gone.

If birds use one habitat much, use of others must be low. Hence I give a probability for only one habitat in each stage of the annual cycle. I treated 2 or more birds seen together as one sighting.

Results

Song posts and nest sites

Most cocks sang on high boulders and a few on cliffs, cairns, boulder shelters, survey pillars, snow fences, pylons, and huts. One sang from a ledge, overhung above and out of sight from the west where he had no neighbours, but overlooking a corrie which held a cock.

Of 47 nests, 44 lay in holes in interlocking boulders and 3 in cliff cracks. None was reused for a second clutch in the same year. Most were within 30m of boulder fields, and all within 100m. Six were on slopes facing west, 3 south, 7 north, and 31 east. Many boulder fields faced west, but most snow patches faced east (Watson *et al* 1994), like nest sites. All nest sites were within 200m of flushes, and within 200m of snow patches as

noted at the start of July (Watson *et al* 1994).

Adults before nesting

In late March and April I saw many birds on area A in mild snow free weather, mostly in flocks but a few paired or single. Some may have been migrants, but a few single cocks sang in spots used for breeding in previous years. When snow covered A completely, I saw birds on B, eg a cock in winter plumage singing on 27 March at 950 m, >1 km from the nearest known nest site. Until mid April a few frequented ski ar parks and buildings at 620-670m, outside B. A tape-recorder there at 0520 on 13 April 1975 revealed much song during a snowfall (A Archer-Lock *in litt*). All birds seen in May were paired or single, except for small flocks on days of fresh snow in early May.

Before nesting began, I saw no birds on A during many ski trips on days in May and early June when fresh snow covered all vegetation and soil there. Birds seen outside A were on land where snow cover was incomplete due to wind exposed terrain or lower altitude, mainly on B but also on Derry Cairngorm (Fig 1). Some on B ate picnic scraps at a cafe at 1090m, at summit cairns, and along footpaths and vehicle tracks much used by people (Table 1). Others foraged on reseeded patches, where ground bared by machines or trampling had been treated with grass seed and fertilizer to reduce soil erosion. They ate ungerminated seeds from new reseeded, as well as seeds produced by grass from earlier reseeded

In May and June before nesting, most days were mild, with many snow free patches of vegetation and bare soil, and thawed upper soil horizons on most ground. Birds fed on scraps, reseeded patches and other habitats.

On warm days I saw some eating insects on snow. They often took crane-fly larvae (*Tipula* spp) on thawing bare soil beside snow. In such conditions, many larvae came to the surface to escape drowning. The upper soil horizons had become waterlogged, due to thaw water being unable to percolate downwards because of frozen lower horizons.

Foraging of adults with nestlings and fledglings

Food taken by cocks to hens on eggs, and by both sexes to nestlings and fledglings was mainly crane-flies, but also other flies, beetles, and moths. In a mass influx of aphids I never saw adults get insects so easily (Watson & Stroyan 1984). Foraging adults often ate insects and grass seeds. Many ate cheese, bread, and cake, but seconds later gathered insects for their young. I saw no adult feed picnic scraps to young, except in 1996 and 1997 on Cairn Gorm with nestlings >8 days old and fledglings. I saw no dependent young find and eat scraps for themselves.

Fledglings scattered within 100m on the day of nest departure, each in a hole in boulders, and came to the entrance to be fed. Later they came into the open, but ran or flew to boulders when disturbed, and sheltered under them in rain, sleet and snow. Up to 5 days out, they often gave a food cheep even when no parent was present, but after a week they did this only when a parent was seen or heard nearby. Each fledgling churred when about to be fed, and up to 10-12 days when finding food for itself. At 15 days, fledglings occasionally gave the food cheep from boulder tops, but I saw none fed after this age. Most young foraging in the first week were at edges of boulder patches, but in the second week they went also to other habitats.

Table 1 Percentage of sightings of foraging birds on different habitats in 1966-97.

	n	Picnic scraps [^]	Bouldery grassland & heath	Snow	Flush	Reseeded patch	Boulder -field edge*	Smooth grassland & heath	Moss on soil	Moss on rock	Beside snow	Grit patch
Adults - snowfall-	32	44 ¹	25	0	0	31	0	0	0	0	0	0
- before nesting#	29	24 ²	17	14	14	10	0	0	0	0	14	7
- with nest eggs	51	14	24	10	16	2	2	2	10	6	16 ³	0
- feeding nestlings	52	4	23	15	19	0	2	2	6	10	19 ⁴	0
- feeding fledglings	68	3	21	10	24	0	1	0	3	9	29 ⁵	0
- eating, with young@21	14		19	5	19	5	5	0	5	10	19 ⁶	0
Fledglings foraging												
- week 1	34	0	3	0	0	0	94 ⁷	0	0	0	0	3
- week 2	22	0	23	0	9	0	36 ⁸	0	14	9	0	9
Flocks adults & fledglings	28	7	29	0	14	0	7	0	0	7	36	0
Adults & independent young July and Aug.27	15		19	22 ¹⁰	26	7	0	0	0	4	7	0
September	30	13	27	0	33 ¹¹	7	7	0	0	0	16	0
October	48	10	40	0	17	33 ¹²	0	0	0	0	0	0

- May-June before nesting, fresh snowfall; #May-June before nesting, no fresh snowfall; ^At summit cairns, huts, paths, and lochan rim beside a path; *Includes a few at boulder bivouacs; @Adults which had young, but here were eating for themselves.

Picnic scraps on several habitat types - snow edge, boulder-field edge, and reseeded patch - each comprised, in area occupied, <<1% of the study area. Snow comprised <3% of the area when use of this habitat type was tested. The biggest proportion in each row was tested, except in rows 3, 4, 10 and 12 where this was impossible because of too variable snow cover, and hence too variable areas of the most-used habitat types. Each superscript numeral refers to analysis by cumulative Poisson probabilities of obtaining the observed value or a more extreme one, $P < 0.00001$. Comparison of 7 vs 8 is by Fisher exact test, $P < 0.001$.

Parents gathered invertebrates on snow, flushes and other habitats (Table 1). Nearly all habitats used had many boulders. Smooth ground with few or no boulders and with continuous vegetation covered 41% of A when it was snow free, and >30% of it on 1 July each year, when much of A was under snow. However, I saw no bird with a nest or fledglings on smooth ground, and none foraging on it except at edges within 10m of a boulder patch. The most marked absences were on big tracts of grassland (eg in the centre of basins at Coire Raibeirt and at Cairn Lochan's Feith Buidhe, where the nearest boulder patches were >200m away).

However there can be too many boulders where they formed the entire surface, with no ground vegetation. Boulder fields occupied 41% of A in snow free conditions, and >50% of snow free land on 1 July, but I saw no birds with nests or fledglings foraging there except near the edge. Most adults with nests and fledglings foraged on intermediate ground with many boulders (18% of A when snow free).

Adults foraged much on snow patches (Table 1). For example, in 90 minutes a cock with fledglings that could fly up to 30m after him made 18 trips on to snow, 4 to beside snow, 3 to a flush, and one to a boulder-field edge. However, during the nesting and fledgling periods I saw none foraging in the middle of snowfields >50m from boulders.

Snow free land had a brief insect peak. Snowbeds delayed its start and prolonged its duration. Land beside snow was frozen or waterlogged, but in a few days dried and warmed, leading to crane-fly emergence. More snow had melted by then, so emergence lasted for weeks if the snow lasted. Foragers exploited this. Ground beside snow was much used by adults eating for themselves, cocks

feeding brooding hens, cocks and hens feeding nestlings and fledglings, and fledglings feeding themselves. For example, on 8 August 1979 a hen and 2 fledglings 3-4 days out of the nest were beside a snowbed. She spent all of a 30-minute watch gathering food in a band 0.5-2 m out from the snow, mostly crane-flies on moist soil. The chicks often followed her for up to 100m, which saved her time, but found food for themselves when temporarily on their own.

A day or two after nest departure, parents and young occasionally stayed within 200m of the nest, but often moved to a new place up to 1km away, where crane-flies were relatively abundant. Even though nest sites lay near snow patches, frequently the snow there had gone by the time of nest departure, whereas the new places were beside big snow patches or in hollows that had held snow within a week. Interesting exceptions were in 1996 and 1997 on Cairn Gorm summit dome; adults took several broods up to 500m to bouldery grassland far from snow but near spots with picnic scraps which they ate and often fed to young. Parents gathered most food near the young, but sometimes afar, eg a cock flew 600m thrice in succession for crane-flies, and a pair gathered insects beside snow and together flew >1km to day-old fledglings. M Marquiss (*pers comm*) watched a cock gather a beakful of insects and fly >1.5km, but the stage of breeding was unknown.

Adults and dependent young in a flock

Once chicks were getting most food for themselves, they followed parents, and adults stopped making foraging trips out of sight of the young. In 1977, a year of late first nests and no seconds (Watson 1996), 3 families flocked together. On 29 July, 2 cocks and 3 hens had broods 9, 10 and 15 days out of the

nest, in a loose flock though each hen and brood formed a unit. They fed in a 4-ha area and then in only 0.1 ha of bouldery grass, before flying in gloomy light at 2030 into a boulder field to rest. On 31 July the hens and young were in a 1-ha area about 300m away, again in a loose flock but acting as 3 units, and hens still fed both the later broods.

Adults and independent young in late July and August

All sightings in this period were on A, mainly on flushes in bouldery hollows. Some flushes issued temporarily from snow, but most were permanent, including rock-controlled ones, some of which were on low wet corries not seen to be used for nesting. A few sightings were of single adult cocks eating scraps at summit cairns, and insects and seeds. Adults and independent young, singly and in groups, foraged on snow more than breeders. On 23 and 26 August 1978 I saw 2 cocks, 3 hens and 5 juveniles from 2 broods run up steep snow in line abreast c1m apart, eating insects, and on reaching the top of the 60m wide snowfield fly down to start again, and repeat the sequence often. I watched independent young eating moss capsules and grass seeds as well as insects.

September

Though I saw some moulting adults at the end of August, the main annual moult occurred in September, as judged by the appearance of the plumage (Watson 1957). All sightings were on A. Reluctant to fly, most birds flushed within 5m, sometimes almost at my feet, and flew <15m to vanish among boulders, but sometimes an adult passed overhead, flying well.

Most were single (Table 2). In most cases, singletons were in bouldery hollows 1-3m

wide, with a small flush. I saw none in flushes >5m from boulders, except for birds in flocks. About a fifth of sightings were in flushes below clifftops, and a few beside snow. Birds fed mainly on insects and seeds. Some singletons and small groups frequented summit cairns and tors visited by many walkers, eating mainly scraps with some insects. This habit already occurred in 1946 with a cock at Ben Macdui cairn, and in 1956 a cock and hen on Cairn Lochan.

October

After the moult, many were flying when first seen or heard. As in September, singletons were reluctant to fly, but they skulk in winter too, so skulking is inverse to group size, irrespective of moulting. However, they tended to flush at greater range than in September, and flew further (>20 m and usually >50 m). Most birds were in flocks, with singletons less frequent than in September (Table 2). I saw none on smooth grassland or heath. As well as using A, birds used B much.

The main foods were seeds of grass, sedge, rush and other herbs, with moss capsules. Occasionally birds ate insects, eg flies emerging on thawing new snow. Some ate picnic scraps at cairns, tors, footpaths, and the cafe on B. Ungerminated seeds of reseeded grass abounded after reseeded, eg all of a cumulative total of 64 birds seen on Cairn Gorm in October 1996 were on patches reseeded in late July 1996, and birds were seen to eat ungerminated seeds exclusively.

Discussion

Adult presence and absence on the main habitat types

Most breeding adults were on intermediate land with boulder patches near poorly drained

Table 2 Percentages of sightings of different group sizes in autumn 1966-97.

Number in group	September	October
1	47	10
2	13	6
3	10	6
4	7	8
5	3	15
6	3	13
7	3	10
8	3	6
9	3	2
10	0	2
11	3	2
12	3	4
16	0	2
17	0	2
20	0	2
21	0	2
28	0	2
30	0	2
33	0	2
n	30	48

An analysis comparing proportions of singletons and all other group sizes combined, in September vs October, gave $\chi^2 = 11$ (Yates correction), $df = 1$, $P < 0.001$.

or freely drained plant communities or snowbeds, and at boulder field edges beside such land. None was seen on continuous grassland or heath with few or no boulders or cliffs, or on Three-leaved Rush *Juncus trifidus* with grit patches and scattered boulders. In Baffin Island, Watson (1957, 1963) found up to a cock per ha in wet or dry spots where boulder cavities offered nest-sites, but few or none where boulders were smooth, or isolated

(ie with cavities, but lacking nearby boulders as cover). Most boulders among Three-leaved Rush on A were tabular and embedded in soil, and so lacked holes, but interlocking boulders provided many holes.

Foraging on and near snow patches, and insect abundance

Many adults foraged on snow patches while breeding and shortly after. This supports ideas on snow as an important insect trap for insect-eaters (Mani 1962; Swan 1963; Nethersole-Thompson 1966; Pattie & Verbeek 1966; Watson 1966). Hendricks (1987) did not find this for insectivorous birds, but Antor (1995) did for high-alpine ones.

In some years I saw no foraging buntings on snow patches during the nesting and fledgling periods. As judged by visual impressions, craneflies abounded in 1969, 1971, 1972, 1973, 1975, 1977, 1979 and 1981 but not in 1968, 1970, 1974, 1976, 1978, 1996 and 1997 (I did not note this before 1968 and in 1982-95). In the first set of years I saw no foraging on snow patches in June and early July, when birds foraged mostly on grassland and flushes with abundant craneflies, but did see foraging on snow in late July and August, when visual impressions indicated few craneflies on the grassland and flushes used earlier. By contrast, in June and early July in the second set of years I saw more birds foraging on snow than on any other habitat except beside snow, which was favoured in every year.

A sole adult foraging on snow may be at more risk from predation, and so may feed there only if insects are scarce off the snow and there are no other accessible foods such as picnic scraps. I saw no dependent fledglings on snow, and no adults or others on snow in September during the moult. Avoidance of

predation might explain this. However, I saw very few insects on snow in September, and the area of snow left then was minute.

I observed far more foraging beside snow than on it. The role of frozen soil in delaying insect emergence and providing bird food for a longer period is not well recognised and deserves study.

Craneflies were fewer in late July and August than earlier, even in peak years. Often the only ones seen in late summer were on patches where foraging Snow Buntings and other passerines had concentrated. Adults feeding picnic scraps to nestlings and fledglings (as noted above) were seen only in late July and early August 1996 and 1997 on Cairn Gorm, a period and area with few craneflies as judged by visual impressions.

Movements during the breeding season

Above, I noted long flights by foraging adults, and movements with fledglings to new sites far from nests. Such movements might increase predation and may indicate poorer habitat. In a high density area in Baffin Island (Watson 1957, 1963), I saw no such movements till young were independent

The birds' land use and protection measures

Moulting birds were reluctant to fly and may be vulnerable to predators. R. Smith (in Gibbons *et al*/1993) noted that adults become very unobtrusive during the moult in August and September, and 'a major loss of adults appears to occur at this vulnerable time'. Reseeded patches on the ski area and picnic scraps provide food near boulder cover then, and people there may keep predators away.

I had too few data from before the 1960 ski

development to test for differences since. My impression was that birds used B more since 1960, associated with reseeded patches, the cafe, and more scraps due to more people. Nevertheless, in May and early June snowfalls before nesting, I saw birds on B and on Derry Cairngorm in many pre development years in 1943-59. Hence their use of these areas was not due to development, even though the frequency of such use currently may be.

Sites for protection should include all breeding grounds (area A), but also B, which birds use in autumn and in snowfalls before nesting. Existing and proposed Sites of Special Scientific Interest omit land north east of Cairn Gorm and the ski area's upper parts north-west of Cairn Gorm, which form some of A and much of B. All of A and B should be considered for inclusion.

One of the rarer regular breeders in the UK, the Snow Bunting did not nest in other EEC countries when the Birds Directive was announced in 1979 (79/409/EEC). Yet it is not in the Directive's Annex I, though the far more abundant Peregrine *Falco peregrinus*, Capercaillie *Tetrao urogallus*, Golden Plover *Pluvialis apricaria*, Short-eared Owl *Asio flammeus* and others are. A proposed Cairngorms Special Protection Area for Annex I birds omits more of A and B than the SSSIs. The Snow Bunting should be considered for Annex I and the SPA amended accordingly.

Acknowledgements

I thank Miss J Watson for drawing the map, and Drs M Marquiss, R D Smith and D B A Thompson for comments.

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Revised manuscript accepted December 1996



Male Snow Bunting

Alex Tewnion

SHORT NOTES

Red-backed Shrike breeding records in Scotland

With reference to previous successful breeding records of Red-backed Shrikes in Scotland (*Scottish Birds* 18:118-119; 190), a pair of Red-backed Shrikes also bred successfully in Grampian in 1981, producing 4 young of which 3 survived.

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The note describing a successful breeding attempt in Perthshire in 1994 clearly did not summarise all previous breeding records. We do not intend to publish more such records unless they are part of a comprehensive review.

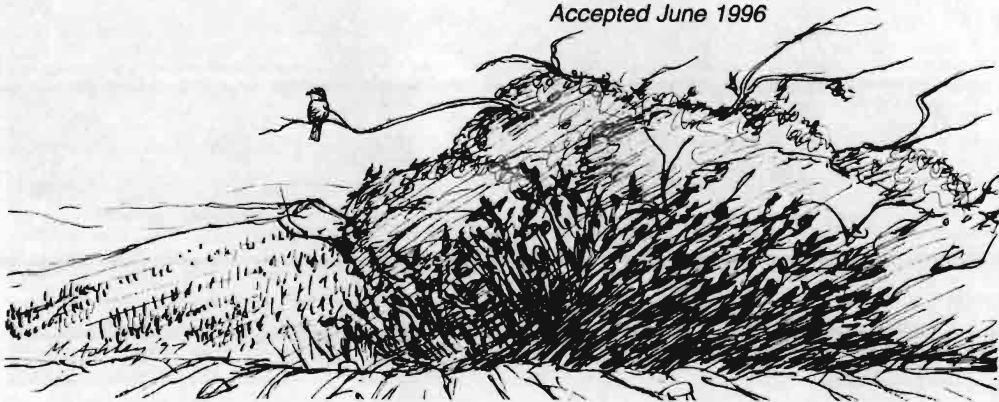
Accepted June 1996

Red-backed Shrike - summer records in Scotland

An adult male was at Glen Doll, Angus, during the summers of 1989 and presumably the same bird, in the same area, during 1990. It was seen by several observers, but no females nor any form of display, or territorial behaviour was noted. During the summers of 1988 and 1989, both sexes were regularly noted near Braemar. They appeared to be paired and to be defending territory in a fragmented Hawthorn hedge. No nest nor fledglings were seen by me. In 1981 an adult male lived at Muir of Dinnet from 17 May till last seen on 3 July. This was a year, when Wryneck *Jynx torquilla* was singing throughout June elsewhere in Deeside suggesting a Scandinavian origin. On 3 June 1994 an adult female was at Milton, north of Blairgowrie but could well have been a displaced migrant. Remains of a male were found at a Sparrowhawk plucking post near Lochmaben, Dumfriesshire on 19 June 1969. It may well have been a migrant too.

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Accepted June 1996



Red-backed Shrike

Mike Ashley

Ground nesting Treecreeper in Deeside

On 26 May 1996 I found an unusual Treecreeper *Certhia familiaris* nest at Dinnet Nature Reserve, Deeside. The nest was located in grass and Ling, *Calluna vulgaris*, at the base of a 15m Scots Pine *Pinus sylvestris*. The tree was in a mixed stand of Scots Pine and Birch *Betula* spp. The ground vegetation was approximately 0.15m tall and concealed a small grass lined cup placed almost directly on the ground. There were 2 live, naked young, one dead, naked young and one

unhatched egg. By the 30th one of the young had died and, by 1 June 1996, the remaining chick was ready to fledge. On the 5th the chick had gone, presumably having fledged successfully. The nest contained the 2 dead chicks and the egg. The only previous record of ground nesting I have found refers to a nest in Derbyshire in May 1969. That nest too was at the base of a Scots Pine, though the ground vegetation was 0.3m high Bracken *Pteridium aquilinum* (Frost 1969, *British Birds* 62:446). The stand of trees in which the Dinnet nest was located was quite young, and probably lacking suitable nesting crevices, hence the unusual choice of nest site.

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Accepted August 1996

Numbers of Snow Buntings on arable land in north east Scotland

Wintering Snow Buntings *Plectrophenax nivalis* in north east Scotland have been recorded mostly on hills and coastal dunes, but with some flocks in fields, mostly in Buchan and Clatt (S T Buckland, M V Bell & N Picozzi, 1990, *The Birds of North-East Scotland*). This understates their occasional high numbers and wide distribution in fields.

RR noted birds in 1984, 1986 and 1994-96 near Newburgh, and AW in 1988-96 in the course of studying Corn Buntings *Miliaria calandra* from Portsoy to Arbroath. Effort and locations searched were the same each year.

1983-84. January-February, big flocks in coastal fields in prolonged snow.

1985-86. January flocks of 600 at Collieston and 2,000 in uncut coats at Rashierieve.

1988-89. One at Towie in November, and 120 at Kinellar in December-January. In January, 225 at Inverurie, 108 at Corse, 84 at Crudie and 50, 80, 120 and 200 at 4 farms near Portsoy. At a fifth Portsoy farm 300 in January-20 February, 250 on 24 February, 30 on 26 February, 10 on 11 March, and none on 26 March. At Whitehills 1,100 in January, 700-800 till 26 February and none on 11 March.

1989-90. Two in 8cm of snow at Kennethmont in January.

1990-91. In January, 50 at Boyndie.

1991-92. In February, 8 in 6cm of snow at Badenscoth, and one in 5cm at Inverurie. In November-March, 100 in uncut oats at Gannochy moor near Edzell, not seen after the oats were burnt in early March, and none in 1988-91 when the field was rough pasture.

1992-93. In November, 2 at Garvock and one near Buckie. In November-January at Gannochy, 100 in uncut oats. One in 4cm of snow at Barras in February.

1993-94. In December, 70 in 4cm of snow at Crawton; deep snow further inland. In November-February, 15 in uncut oats on Gannochy moor.

1994-95. None seen. Wild geese devastated uncut Gannochy oats in October and Red Deer at the rest of the standing oats by 31 October.

1995-96. None seen. Red deer devastated uncut Gannochy oats in October.

Numbers seen in the winters of 1988-96, excluding repeated observations of the same flock, were 2,388, 2, 50, 109, 104, 85, 0 and 0, a big variation. Of the total of 2,739, 25% were 15-50km from the sea, 21% at 3-9km and 54% within 1km. Most were in north Banffshire and central or north Aberdeenshire,

few in Kincardineshire, and none on study areas on and near the Angus coast. A few in 1989-94 were in fields with thin snow when higher land had deep snow; these birds vanished with the thaw.

To assess foraging we used cases where flying flocks were first seen to alight, to avoid bias due to birds being more easily seen on some fields such as short grass than on others such as stubble. Totals included some flocks observed more than once. Out of 8,286 cases, 49% were on wheat stubble, 26% on barley stubble, 13% and 4% on recently ploughed wheat and barley stubble, 4% on pasture, 3% in standing oats, 1% on a football pitch, 30 birds in rough grass by a farm road, and 2 each in uncut wheat, weedy set aside, and rough grass with herbs. As more stubble fields became ploughed, some foraged on newly or recently ploughed stubble in late February and early March, where grain was conspicuous on the dark earth. Birds husked oats and barley, but not wheat, which lacked husks. A few ate flies and other insects.

Snow Buntings disturbed by a raptor or person flew to low electricity wires, and sometimes to telephone wires and fences. They often flew to wires to loaf, and a flock was seen twice in a 10m Beech *Fagus sylvatica* tree, loafing on branch tips. One flock of 300 weighed down electricity wires. Obvious cocks in flocks varied from 0% to 10%, averaging 5.1% out of 1,848 in different flocks checked.

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Accepted September 1996

Capercaillie and Black Grouse south of Banff in the 1940s

A map in Catt *et al* (1994, *Abundance and Distribution of Capercaillie in Scotland, 1992-94*, Institute of Terrestrial Ecology, Banchory) showed, incorrectly, that Capercaillie *Tetrao urogallus* had 'never been present' between Banff and Fyvie. Though their references list Pennie (1950, *Scottish Naturalist* 62:65-87), they did not use his good account for the area. Here I add my sightings of Capercaillie and Black Grouse *Tetrao tetrix* made in 1943-48, and information from others. All woods had mature/old Scots Pine *Pinus sylvestris* with some Birch *Betula sp* and Rowan *Sorbus aucuparia*.

Capercaillie

1. Forglen, 250 ha. Each year I saw a cock and hen in 4 ha of heather and blaeberry with self sown Norway Spruce *Pinus abies* and Birch. They bred in big tracts of self sown Birch and Pine with Blaeberry *Vaccinium myrtillus* and Heather *Calluna vulgaris*, and in planted pine, Norway Spruce and Larch *Larix decidua*. Up to 25 were seen in a winter pack; not seen after clear-felling and planting.
2. Delgaty, 160 ha. Capercaillie bred in old pine with Birch, Heather and Blaeberry, and in mature planted pine, with up to 20 in a winter pack. I saw a hen eat Beech leaves in May. Birds not seen after clear felling and Forestry Commission (FC) planting.
3. Lescraigie. A hen was seen in May in 30 ha of pine and Norway Spruce, later clear felled.
4. Lendrum, 55 ha. One to two seen each spring in Heather with pine and Norway Spruce.
5. Den of Woodhead, Balquhollie, 20 ha. One to 2 seen each spring in scattered pine and Norway Spruce with grass, Blaeberry and nearby Beeches.
6. Brownside, Mountblairy, 95 ha. This was cut by 1943, but the gamekeeper said it held many Capercaillie before cutting; not seen after FC planting.
7. Montcoffer, 120 ha. Capercaillie bred in old pine with Heather and Blaeberry, and nearby Beeches. Up to 16 were seen in a winter pack; not seen after clear felling and planting.
8. Den of Rothie. Pennie gave useful information on breeding numbers here, calling it 'Den Wood', and estimated that there were 500 acres of suitable habitat. Mr Main, Fyvie Castle gamekeeper, told me in March 1949 that 'they shoot 8-9 every year and usually see 20-30 in a day's drive. Occasional wanderers move into other wood on Fyvie (Cranna, Brownhill, Cockhill and Fyvie Castle). I haven't noticed any difference in numbers over the years' (he had been there for 37 years).
9. Hatton Castle. The owner Lt Col Duff told me in March 1949 that he shot a Capercaillie at Hatton about 1934, and 'at one time I saw them fairly often and there were a nest or 2 at the east end of the Den of Balquhollie, but those trees are now cut down. I saw one hen in the Wood of Colp 2 years ago, but I think any Caper at Hatton now are merely visitors'. Den of Balquhollie is near Lescraigie (3 above). It had semi open patches with some Heather and Blaeberry. The Wood of Colp was of old planted pine and Norway Spruce, with grass below.

Black Grouse

1. Forglen. Black Grouse bred each year. Up to 6 were seen in a winter pack; not seen after felling.
2. Delgaty. Birds bred each year with up to 12 in a winter pack; not seen after felling.
3. Waggle Hill, 175 ha of sedgy and rushy Heather. Breeding occurred each year with up to 10 in a winter pack; not seen after FC planted nearly all of it.
4. Greenness Hill, 30 ha of sedgy and rushy Heather. One to 2 hens bred each year, only 1 km from nearest part of Waggle Hill; not seen after FC planted all of it.
5. Fyvie Castle and Den of Rothie. The laird (Forbes-Leith) told me there used to be 'quite a number', in both these places, the last in

1912 as planted woods thickened. Gamekeeper Mr Main confirmed this in 1949, adding that they had bred annually and he shot the last one in 1912. They were regularly on Minnonie and other Ythan braes to Gight Castle and east of it. Later the FC planted conifers densely on big parts of the braes.

6. Hatton Castle. Lt Col Duff told me in 1949 that they nested annually in the middle and north ends of the Den of Balquhally.

Delgaty, Montcoffer and parts of Hatton and Den of Rothie resembled Caledonian pinewood and much of Forglen was developing into natural boreal woodland. Their destruction was tragic. Felling, burning and dense planting of mostly exotic conifers eliminated heath, save in narrow rides. This ended thriving stocks of both species, decades before recent concerns over their decline and years before Foxes *Vulpes vulpes* colonised the area in the late 1950s.

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Accepted September 1996



Black Grouse

Brent Hurley

Reed Warblers breeding in south west Scotland

In Scotland the Reed Warbler *Acrocephalus scirpaceus* occurs regularly in spring and autumn with only one breeding record in Shetland in 1973 (Thom V M 1986. *Birds in Scotland*). In England and Wales the overall breeding population is estimated between 40,000-80,000 pairs (BTO/JNCC: *Britain's Birds in 1990-91*).

On 17 September 1992, members of the North Solway Ringing Group were mist netting in a Galloway reedbed when a juvenile Reed Warbler was trapped and ringed (Table 1). It could not be ascertained whether the bird was locally bred or was a migrant. This was the first Reed Warbler caught by the Group.

On 3 visits to the reedbed during August 1994, 6 adult birds, 3 being female with well formed brood patches, were caught. Two of the adult birds had been ringed at the site in 1993 (Table 2). Three juvenile birds, all strong fliers, were also trapped and marked. Singing males had been heard in the reedbed every month between May and August.

During July and August 1995, 18 Reed Warblers were caught at the site. Eight were juveniles with either remiges or rectrices still growing with large parts of the body still bare. Also trapped were 9 adults; 4 females, 5 males, with 3 of the birds having been ringed at the site in previous years. One of these birds had been ringed as a recently fledged juvenile on 5 September 1993. An adult bird was also seen in attendance with 2 newly fledged young.

Table 1 Annual totals of Reed Warblers caught in a Galloway reed bed 1992-96.

	1992	1993	1994	1995	1996
Juveniles	1	2	3	9	20
Adult (new)	-	4	4	6	3
Adult (retrap)	-	-	2	3	6
Totals	1	6	9	18	29

In 1993 visits were made to the same reedbed on several occasions when at least 2 singing males were holding territory. By the end of the summer mist netting had produced 4 adult birds, one of which was a female with a well developed brood patch. On 5 September, 2 juvenile birds were caught. The birds, recently fledged, had traces of down, weak and loose body feathers with bare skin under the wings still quite discernible and they were barely able to fly.

During 1996, while only 5 males were caught, it is believed that 7 singing males were in the reedbed. Juvenile fledging was up on previous years with 20 birds trapped (Table 1).

This would appear to be a notable range extension of the species into mainland Scotland. The nearest known breeding Reed Warblers are in Cumbria where 2, possibly 3 pairs, bred in 1993 (*Birds in Cumbria: County Natural History Report 1993*). In *The Atlas of*

Table 2 *Reed Warblers returning to reed bed in subsequent years.*

Ringing year and No. of birds ringed		Year of retrap				
		1992	1993	1994	1995	1996
1992	1	-	-	-	-	-
1993	6	-	-	2	2	1
1994	7	-	-	-	1	3
1995	15	-	-	-	-	2
1996	23	-	-	-	-	-

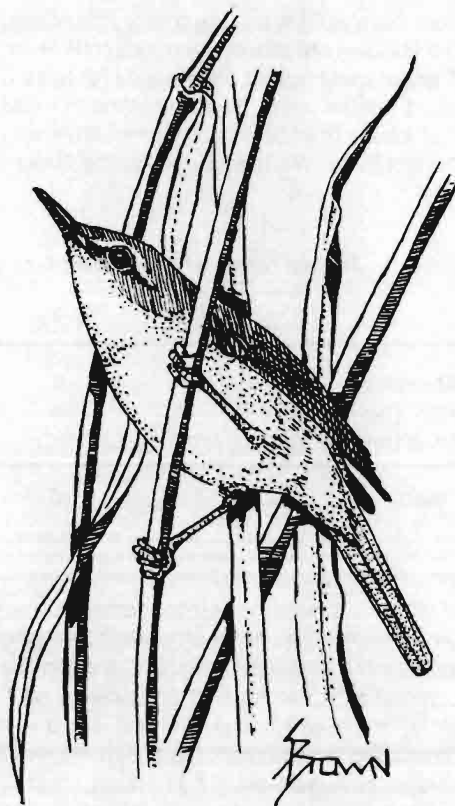
Breeding Birds in Britain and Ireland (Sharrock 1976) there were no breeding dots for Cumbria between 1968-72 while *The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991* (Gibbons, Reid and Chapman 1993), gives 7 full dots. This obvious range expansion northwards can also be seen on the east coast of England, in North Yorkshire and Durham, where in the same 20 year period between the *Atlases* 4 dots compared to one dot is shown.

During the summer of 1996 a second breeding site in south west Scotland was found at Caerlaverock National Nature Reserve.

Acknowledgement

I am grateful to Dr Malcolm Ogilvie for helpful comments on an earlier draft.

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Accepted October 1996

Reed Warbler

Steven Brown

Inland nesting by Razorbills

Razorbills *Alca torda* breed solitarily or colonially in rocky coastal areas, on mainland cliffs and offshore islands. The breeding site is usually in a boulder scree or on a small ledge or niche, on a rocky cliff face. Less commonly, birds nest in earthy burrows or on the nests of Kittiwakes *Rissa tridactyla*. As the chick leaves the nest site when only partly grown and still unable to fly, most colonies tend to be directly above the sea. Although there are published records of breeding sites up to 300 m inland in Greenland (Salomonsen 1950, *Grønlands Vogel*), to our knowledge similar cases have not previously been described in Britain.

During the last few decades, the numbers of several species of cliff nesting seabird, including Razorbills, have increased substantially on the Isle of May in the Firth of Forth, a trend which is in line with many other colonies around the North Sea (Lloyd *et al*, 1991, *Status of Seabirds in Britain and Ireland*). A notable feature of the increase on the Isle of May has been that several species have 'spilled over' from the seacliffs to breed up to 100 m inland on low cliffs and steep vegetated slopes. The main area of overspill has been around a manmade freshwater loch, which is about 20m above sea level and separated from the sea by a dam, a 50 m slope of eroded



The loch on the Isle of May. The main group of nesting Razorbills on the south side was in the Kittiwake colony in the top left corner of the photograph.

Mike Harris

soil and loose rock and a boulder beach (see photograph). By the early 1990s, the slopes and low cliffs either side of this loch had been colonised by Kittiwakes, Fulmars *Fulmarus glacialis* and Puffins *Fratercula arctica* but Razorbills had never been recorded in the area, although large numbers were breeding on the cliffs at the seaward end of the loch. Annual counts of a monitoring plot on the seacliffs just north west of the loch showed that the number of Razorbills present increased by 6–7% per annum between 1983 and 1995. It was also apparent that, each year, birds were progressively colonising the cliffs above the boulder beach and the eroded slope, and were moving towards the dam.

In 1994, Razorbills were occasionally seen flying over the loch and we assumed that these birds were taking a short-cut to the east side of the island. However, in June 1995, birds were observed standing on, and among, Kittiwake nests on both sides of the loch. One pair of Razorbills on the north side definitely had an egg on 15 June, but it is not known if they fledged a chick (Harding & Thompson, 1996, *Studies of breeding birds on the Isle of May in 1995*, SNH Report). On the south side of the loch, a pair with a recently-hatched chick was recorded on the late date of 14 July. The chick was still present on 25 July, but

again, the breeding outcome was unknown. In 1996, a pair bred at the same site on the north side of the loch and their chick left on 23 July. Up to 12 individuals were recorded on the south side; four or five pairs laid, and at least three of these reared a chick to leaving age.

Although Razorbills appeared to have no difficulty rearing chicks at these inland sites, they faced a potential problem at fledging. Under normal circumstances, the chick jumps from the nest-site at dusk, and glides, or plummets, to the sea, accompanied by its male parent. All being well, the adult and young meet up on the water and immediately swim out to sea together. It is impossible for Razorbill chicks from the lochside to reach the sea directly and it is almost inevitable that they will land on the loch. On the morning of 20 July 1996, there was an adult and a chick on the loch, but within an hour both had disappeared. To have reached the sea, the chick would have had to climb around the dam, and walk about 50 m through several Herring Gull *Larus argentatus* territories, a fairly perilous procedure.

It will be interesting to see whether further colonisation of this inland habitat occurs and if there is any evidence of successful fledging.

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Accepted December 1996

Hooded Warbler on St Kilda

At midday on 10 September 1992 J Vaughan and myself were at the army base at Village Bay on Hirta, JV saw a bird that 'looked like a large *phyllosc* but with black on its head' fly past him and disappear over the sea wall on to the beach. Together we almost immediately relocated the bird. The heavy rain and strong gusts of wind made viewing condition difficult. My first impressions were of an almost wagtail like passerine, basically olive green above and yellow below but with black on its crown, extending back to the nape and around the sides of its head to behind the ear coverts and with a black gorget. The legs were bright pink and robust.

The bird frequently cocked up or flicked its tail. It was very lively and would not permit a closer approach than 10m. The flight was fast and low, on shortish wings which served to exaggerate the length of the tail. We continued to watch it for some 4-5 minutes making mental notes as the poor weather made writing impossible. We adjourned to the Factor's House to check reference books. Identification was straight forward. The large size, robust features and general colouration combined to eliminate all but 2 species: Hooded and Wilson's Warblers. The latter was immediately eliminated due to our bird's distinctive head

pattern. We went out again and, after a short search, relocated the bird in the same area. The diagnostic presence of white patches on the 3 outer feathers of the upper tail was eventually confirmed, though this feature was only apparent when the bird flicked open its tail or hovered. The bird was watched for a further 2-3 minutes before we agreed not to push it around any further in the appalling weather.

The bird was seen briefly later in the afternoon by JV, perched on a wire outside the army base. That night, continuous heavy rainfall was severe enough to cause flooding in the Village Bay area. The bird was never seen again.

A series of fairly active Atlantic depressions had crossed the area during the preceding few days and a depression was centred over sea area Hebrides at the time of the discovery. A vigorous westerly jetstream had apparently become established at upper altitudes several days before (I Robinson, Benbecula Met Office) which would have assisted trans Atlantic vagrancy.

There has been one other occurrence of this species in Britain and Europe, a female from 20-23 September 1970 on St Agnes in the Scilly Isles.

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A full description is in the files of the British Birds Rarities Committee. This is the first Scottish record. Although it has been customary for such records to be published in Scottish Birds that practice originated when Scottish Birds was the SOC's only publication. In future such records will be published in the Scottish Bird Report.

Scavenging Merlins

I read with interest the note (Thomas 1992, *Scottish Birds* 16:219-220) on a Merlin *Falco columbarius* feeding on Rabbit carrion in Tayside. Scavenging by Merlins has rarely been seen or reported. During intensive observations of Merlins between 1965-96, I have only recorded one apparent attempt at scavenging by wintering Merlins in over 800 observations.

On 25 August 1977 at 1650hrs, in a sandy bay on the coast over a kilometre from a Merlin's roost in Galloway, a female or juvenile Merlin was watched standing on and apparently pecking at a juvenile Greater Black-backed Gull *Larus marina*. The Merlin was soon displaced by a Carrion Crow *Corvus corone*. It landed a short distance away. Ten minutes later the Merlin chased a passing flock of Ringed Plovers *Charadrius hiaticula* enough to indicate that it was healthy and

uninjured. The Merlin flew on out of sight. On inspecting the dead gull, the feathers were found to be intact and the skin unbroken. I cannot say whether the Merlin was attempting to feed on the gull or using the carcass as a hunting perch, pecking at it inquisitively.

Apart from the reference given in Thomas's note I know of 2 others on scavenging by Merlins. Warkentin (1986 *Canadian Journal of Zoology* 64:262-264) recorded a radio tagged Merlin released 51 days after being found injured that was killed by a vehicle when feeding on a feral pigeon *Columba livia* killed on a road. Warkentin & Oliphant (1988, *Wilson Bulletin* 100:137-139) recorded a radio tagged female Merlin apparently scavenging a feral pigeon frozen to a roof top. Although other species of raptors like Peregrine *Falco peregrinus* and Sparrowhawk *Accipiter nisus* have been illegally killed in Britain while scavenging at poisoned baits, Merlins have not (D Dick *in litt*).

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Accepted December 1996

Buzzard robbing juvenile Peregrine of prey

Peregrine *Falco peregrinus* occasionally steal from other raptors (Ratcliffe 1993, *The Peregrine Falcon*, London) but records of Buzzards *Buteo buteo* stealing from Peregrines are generally lacking in Britain. On 3 September 1995 a juvenile Peregrine was standing on a dead, adult Black-headed

Gull *Larus ridibundus* in a shallow muddy pool on flooded pasture near Stranraer, Galloway. As the falcon tried to lift its prey out of the mud it began to call as a Buzzard landed on a fence post 10-15m away. The falcon managed to free the carcass and, as it landed, it was immediately displaced by the Buzzard. The Peregrine flew up calling and swooped on the Buzzard 3 times, before landing 2-3m away. The Buzzard pecked at the carcass and once approached the

Peregrine on foot in a threatening posture. Nine minutes later the Buzzard flew back to the fence post while the Peregrine flew to the carcass and fed on the gull for the next 25 minutes.

The Buzzard only made a half hearted attempt to eat the gull but was possibly intimidated by

the presence of the Peregrine. In North America, Peregrines usually yield their prey to *Buteos* (Beebe 1960, *Condor* 62:145-189) In this case the Peregrine regained possession of its prey without too much effort, from, I suspect, an inexperienced, juvenile Buzzard. Three Buzzards had been seen together on previous occasions in the same field, possibly juveniles from the same brood.

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Interaction between Sparrowhawk and Jackdaw near Newtonmore, Highland

On 14 January, 1995 I was alerted to a disturbance by the agitated calling of a large number of corvids, close to my house, near Newtonmore, Highland. I saw a female Sparrowhawk *Accipiter nisus* and, as I later discovered, an adult Jackdaw *Corvus monedula* fighting on the ground. It was obvious that the confrontation may have turned into a lengthy one and I started the timer on my wristwatch. The ground was sloping and during the first few minutes of struggle, both birds tumbled a couple of metres downhill. The Sparrowhawk had one talon locked into the breast of its prey but the Jackdaw was resisting fiercely, flapping its wings, jumping up to 30cm into the air and stabbing with gaped beak as they tumbled. The Sparrowhawk arrested its fall with its free talon by grasping at the bank; the other remained locked firmly into the flailing Jackdaw. The mixed corvid flock of about 40 Jackdaws and Rooks *Corvus frugilegus*

continued to call from the surrounding trees. Several individuals swooped to branches just a few metres above the Sparrowhawk but none alighted on the ground or attempted to make physical contact.

During the next tumble down the slope, the Sparrowhawk locked its other talon into the Jackdaw. The birds came to rest on a small level area, the hawk on its back, with the Jackdaw held by extended legs. Both birds rested for between 2 and 3 minutes. Following another short tumble, the Sparrowhawk gained the upper position using its outstretched wings to balance and mantle its prey. Only at this stage did it seem to assess its surroundings, glancing around at the corvid flock, which caused them to increase the intensity of their calling.

The struggle continued for 9 minutes and the Jackdaw made repeated attempts to escape. After 11 minutes the Jackdaw's resistance had lessened and the corvid flock dispersed. One or 2 individuals settled in isolated trees about 200m away.

After 23 minutes, the Sparrowhawk attempted to pluck the Jackdaw which responded by weakly flapping its wings. After 29 minutes the Sparrowhawk plucked at feathers and began to rear at the Jackdaw's flesh and no more movement was seen from the prey.

from a single Rook which flew back to a tree above the Sparrowhawk and called intermittently. The Sparrowhawk left the area after 3 hours 20 minutes and was not seen to return, though the carcass disappeared within 16 hours.

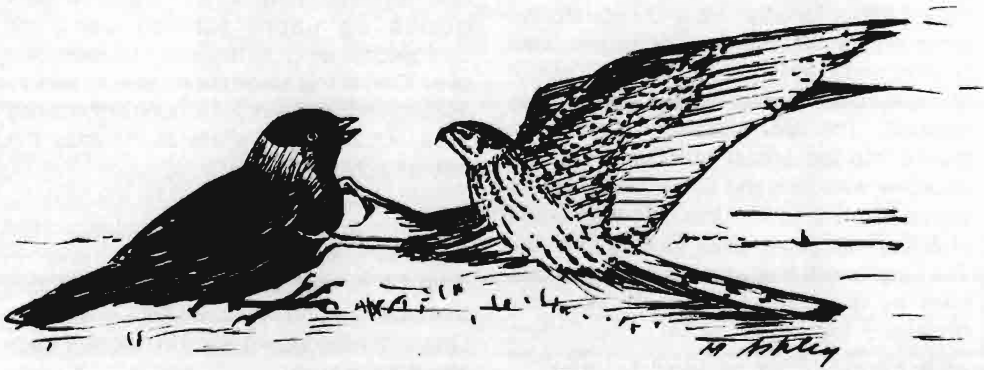
Between the 39th and 43rd minute of the observation, the Sparrowhawk made 3 unsuccessful attempts to move the carcass. After resting for 7 minutes it resumed feeding for the next 2 hours 15 minutes. As it fed, the corvid flock reappeared landing in nearby trees, flying around and calling excitedly. After a minutes or so, they dispersed once again as quickly as they had arrived. Again, 2 individuals settled in isolated trees, in sight of the Sparrowhawk. Three hours and five minutes after first taking the Jackdaw to ground, the Sparrowhawk moved approximately 1m from the carcass and preened. The movement elicited a response

Jackdaws have been recorded before as Sparrowhawk prey items (Newton, *The Sparrowhawk*, Poyser 1986) as has the fact that large prey may not be killed immediately, but may die later during plucking and eating (Cramp & Simmons *Birds of the Western Palearctic*, Vol 2, October, 1980). This observation highlights the potential hazards to a predator which has preyed on a relatively large and social species. The rewards must be set against the energy required to subdue the prey and the risk of potential injury.

I thank Steve Redpath for his thoughts on this observation.

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Revised manuscript accepted January 1997



Sparrowhawk attacking a Jackdaw

Mike Ashley

Mobbing of Waxwing by Chaffinches and Blue Tits

The short note in *Scottish Birds* 18:250 coincided with a very similar experience we noted on 10 December 1996 on a gloomy, damp morning about 0900hrs, when from our bedroom window we saw a single Waxwing, *Bombycilla garrulus*, eating the berries of a Rowan *Sorbus vilmorinii*. We noted that the other birds in the same tree comprising Blue

Tits *Parus caeruleus*, Chaffinches *Fringilla coelebs*, and Greenfinches *Carduelis chloris* were acting in a very agitated manner. Our fears that this was due to a predator in the form of a domestic cat proved groundless. It seems possible that it is the solitary Waxwing, rather than a flock, which arouses the hostility of other birds. On 18 December 1996 16 Waxwings held sway over the berries of the Rowan both in the tree and on the ground. We were not aware of any antagonistic behaviour from other birds.

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Accepted January 1997

Waxwings feeding on Cowberries

British birdwatchers tend to associate Waxwings with urban parks and gardens, where they are most often seen feeding on the berries of small trees or tall shrubs notably Hawthorn *Crataegus* Rowan *Sorbus* and *Cotoneaster*. On 28 January 1996, I saw 8 Waxwings *Bombycilla garrulus* feeding on the ground on the berries of Cowberry *Vaccinium vitis-idaea* on heather moorland a few miles north of Blair Atholl at 360 metres above sea level.

Joan Howie has told me that she used to see Waxwings feeding on Cowberry in Strathspey when she lived there.

Birds of the Western Palearctic (vol V pp494-496) records Waxwings feeding on berries of *Vaccinium* though the records are mainly from breeding areas.

This behaviour may be under recorded in Britain since birdwatchers are most likely to see Waxwings in or near towns.

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Revised manuscript accepted January 1997

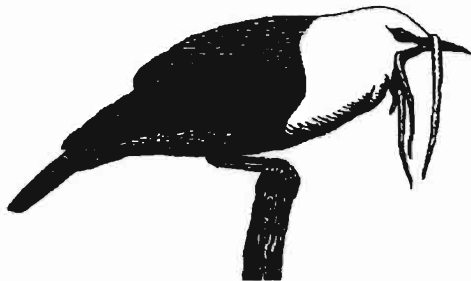
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Tables, maps and diagrams should be designed to fit either a single column or the full page width. Tables should be self explanatory and headings should be kept as simple as possible, with footnotes used to provide extra details where necessary. Each table should be on a separate sheet. Maps and diagrams should be in Indian ink and be camera ready, but drawn so as to permit reduction to half their original size.



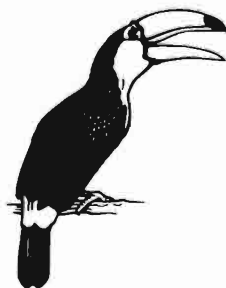
NEOTROPICAL BIRD CLUB

Neotropical bird club launched

A club has been launched to promote the study and conservation of the birds of the Neotropics (South America, Central America and the Caribbean). It is currently seeking founder members to help reach the launch budget of £2000, which is required to get the club running and to publish the two first issues of its intended journal 'Continga'. Founder members will be asked to pay a minimum of £25, and will be formally acknowledged in the first issue of 'Continga'. 'Continga' will provide a colourful and much needed forum for exchange of information on the avifauna of this extremely rich and diverse area, and will contain papers and features on the birds and their conservation as well as news of recent observations and discoveries (at present, new species are still being discovered at the rate of more than two a year). It is hoped that in due course the club will be able to provide direct funding and support for practical conservation programmes.

*For further details and membership forms,
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Contents

Main papers

The illegal persecution of raptors in Scotland A report from the Scottish Raptor Study Groups.	65
Movements of Fulmars from the Firth of Forth. <i>John C Davies</i>	86
A winter survey of sawbill ducks and Cormorants on the River Deveron, north east Scotland. <i>P J Cosgrove</i>	93
Declines in Turnstones and Purple Sandpipers wintering in south east Scotland. <i>H E M Dott</i>	101
Habitat use by Snow Buntings in Scotland from spring to autumn. <i>Adam Watson</i>	105

Short notes

Red-backed Shrike breeding records in Scotland. <i>R C Dickson</i>	114
Red-backed Shrike - summer records in Scotland. <i>John Young</i>	114
Ground nesting Treecreeper in Deeside. <i>Simon Gillings</i>	115
Numbers of Snow Buntings on arable land in north east Scotland. <i>A Watson & R Rae</i>	115
Capercaillie and Black Grouse south of Banff in the 1940s. <i>Adam Watson</i>	117
Reed Warblers breeding in south west Scotland. <i>Ken Bruce</i>	119
Inland nesting by Razorbills. <i>M P Harris & S Wanless</i>	121
Hooded Warbler on St Kilda. <i>T J Dix</i>	123
Scavenging Merlins. <i>R C Dickson</i>	124
Buzzard robbing juvenile Peregrine of prey. <i>R C Dickson</i>	124
Interaction between Sparrowhawk and Jackdaw near Newtonmore, Highland. <i>P R Moore</i>	125
Mobbing of Waxwing by Chaffinches and Blue Tits. <i>S & M E Shimeld</i>	127
Waxwings feeding on Cowberries. <i>Ron Youngman</i>	127

Advice to contributors	128
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