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Seabirds on Colonsay and Oronsay
Changes in breeding wader numbers on Scottish farmed land
The Atlantic Puffin population of the Shiant Islands

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Seabirds on Colonsay and Oronsay, Inner Hebrides

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Breeding season populations of seabirds were counted on Colonsay and Oronsay, during 1999 and 2000. Results of the counts are presented along with comparisons with previous counts made in 1969 and in 1985–86. The islands hold the largest colonies of Northern Fulmar, Black-legged Kittiwake, Common Guillemot and Razorbill in Argyll. Populations of Northen Fulmar, Lesser Black-backed Gull, Great Black-backed Gull, Common Guillemot and Razorbill have risen since the mid 1980s. Populations of other species have remained largely unchanged since then, except for that of Black-headed Gull which has declined significantly.

Introduction

The periodic survey of seabirds throughout Britain and Ireland allows regular reappraisal of their status and also allows the identification of sites of national and regional conservation importance. In this paper we report on the recent Seabird 2000 survey (Mitchell, 1999) on the islands of Colonsay and Oronsay, Argyll and Bute, and by making comparisons with previous surveys highlight their importance as a seabird station in the Inner Hebrides.

Methods

In June 1999, all the seabirds (except terns) were counted on Colonsay to the north of Kiloran Bay, the east coast of Colonsay, the whole of Oronsay and that part of Colonsay south of Port Mhor. These counts were land based, although a small boat was used to reach the offshore islets of Oronsay. In 2000 all seabirds between Port Mhor and Kiloran Bay were also counted between 4 and 15 June. This section was largely counted from the land, using the wave platform below the cliffs at low tide for access to some of the cliff sections otherwise invisible from above. In addition, some small sections, which were not visible from land, were counted from a small boat on 15 June 2000. Also in 2000 a count of all the terns on the islands was carried out from land between 4 and 18 June, with a small boat being used to reach offshore islands. Additional pre breeding counts of Black Guillemots were made on Colonsay in April 2001. All counts adopted the methodology of the Seabird 2000 Survey (www.jncc.gov.uk/seabird2000) which are based on those in Walsh *et al* (1995).

The previous assessments of seabird populations on these islands were made during mid to late May; in 1969 during Operation Seafarer by J A Fowler (NCC) and by John and Pamela Clarke in 1985 and 1986 (Clarke & Clarke, 1986 & 1987). In this paper, where possible, comparisons are made with these surveys.

Different count techniques were used for various species groups. For most species counts were made of apparently occupied nests (AON). In the case of Northern Fulmar a similar unit - apparently occupied site (AOS) was used. To allow comparison with the other counts, those of gulls made in 1985 and 1986 have been expressed as estimates of apparently occupied nests (est AON) by dividing the original counts (which were of individuals) by 2. This method was not used for Black-legged Kittiwakes, which were counted as AONs in 1985 and 1986 (Clarke & Clarke, 1986, 1987).

The counts for gulls and terns during Seabird 2000 and in 1985 and 1986 were made from vantage points (the method used in Operation Seafarer is not known).

Auks were counted as individuals (ind). To allow comparison with later counts, the Operation Seafarer count of Black Guillemot, which was originally of breeding pairs, has been expressed as estimated individuals (est ind) by multiplying the number of pairs by 2.

For the present survey the Colonsay coast was divided into 60 sections, and Oronsay into 17; these data have been amalgamated into 4 areas of Colonsay and for Oronsay as a whole (Figure 1). The inland areas of both islands were also surveyed, although no breeding colonies of seabirds were found.

It should be noted there is a slight difference in the count boundary between East and North Colonsay for data for Seabird 2000, which used Balnahard Bay as a boundary, while Clarke & Clarke (1986 & 1987) used the eastern end of Eilean Dubh. This difference has only a marginal effect on counts for the various areas for Northern Fulmar and Black Guillemot.

Results and Discussion

Northern Fulmar *Fulmarus glacialis*

In total 1323 AOS were found on Colonsay during Seabird 2000. None were found on Oronsay or East Colonsay. Fulmars increased over 37% from the 1986 count. This increase however masks a changing trend in the population on Colonsay. The population at 3 sites which are monitored annually peaked during the mid 1990s and have in recent years declined (Jardine, 1998). The increase in numbers between the counts in 1985 and 1986 is not fully understood, but may have been a consequence of more birds frequenting the cliffs during the poor weather conditions experienced during the 1986 count, or may have been a result of many Fulmars prospecting intermittently.

	Seabird 2000 (AOS)	**Clarke & Clarke 1986 (AOS)**	**Clarke & Clarke 1985 (AOS)**	**Operation Seafarer 1969 (AOS)**
North Colonsay	248	101	89	35
West Colonsay	1039	855	583	218
SW Colonsay	36	10	10	0
E Colonsay	0	2	0	0
Total	1323	968	682	253

European Shag *Phalacrocorax aristotelis*

During Seabird 2000, 170 AON were found on Colonsay and one on Oronsay - the first recorded breeding. There has been little change in the Shag population on Colonsay since the mid 1980s (ie +4% on 1985, and +42% on 1986). The reduction from 165 AON in 1985 to 120 AON in 1986 followed the seabird wreck in the Firth of Lorne in July 1985 (Craik, 1986).

	Seabird 2000 (AON)	Clarke & Clarke 1986 (AON)	Clarke & Clarke 1985 (AON)	Operation Seafarer 1969 (AON)
North Colonsay	15	2	4	1
West Colonsay	155	118	161	108
Oronsay	1	0	0	0
Total	171	120	165	109

Black-headed Gull *Larus ridibundus*

There has been a major decline in the breeding population (-93%) of Black-headed Gulls on the islands with only 5 AON found during Seabird 2000. The former colony near Ardskenish farmhouse is now extinct, following a period of 5 years of complete breeding failure (pers obs) due, it is thought, to predation by Otters *Lutra lutra* and feral cats.

	Seabird 2000 (AON)	Clarke & Clarke 1986 (est AON)	Clarke & Clarke 1985 (est AON)	Operation Seafarer 1969 (AON)
North Colonsay	0	0	N/a	1
West Colonsay	0	0	N/a	0
SW Colonsay	3	33	N/a	35
East Colonsay	0	0	N/a	0
Oronsay	2	38	N/a	4
Total	5	71	36	40

Mew Gull *Larus canus*

There has apparently been a slight fall (-17%) in the total number of breeding Mew Gulls on Colonsay and Oronsay since 1986, although differences in census methods used for the 2 surveys makes direct comparison difficult. There have also been significant changes in the distribution of this species, with reductions on Oronsay, West and East Colonsay, but increases in South West and North Colonsay. These changes to slightly less accessible parts of the island reflect the ephemeral nature of colonies of this species which can move in response to predation or disturbance from other species and humans.

	Seabird 2000 (AON)	Clarke & Clarke 1986 (est AON)	Clarke & Clarke 1985 (est AON)	Operation Seafarer 1969 (AON)
North Colonsay	20	10	4	1
West Colonsay	1	5	8	0
SW Colonsay	24	9	10	5
East Colonsay	16	20	10	0
Oronsay	20	54	14	22
Total	81	98	46	28

Lesser Black-backed Gull *Larus fuscus*

There has been a very large increase (+451%) in Lesser Black-backed Gulls. This has been through the increase in the existing colony on Oronsay, and through the establishment of a new colony at Pigs Paradise (West Colonsay), where previously only one or 2 pairs were found.

	Seabird 2000 (AON)	Clarke & Clarke 1986 (est AON)	Clarke & Clarke 1985 (est AON)	Operation Seafarer 1969 (AON)
North Colonsay	18	29	13	1
West Colonsay	40	0	1	2
Oronsay	168	12	17	0
Total	226	41	31	3

Herring Gull *Larus argentatus*

There has apparently been little change in the population of Herring Gulls since the increases reported by Clarke & Clarke (1986,1987) in the mid 1980s. Nor has there been any great change in the distribution within the islands, although trends in individual colonies are masked, eg on Oronsay there has been a shift from nesting in the south west to the north east.

	Seabird 2000 (AON)	Clarke & Clarke 1986 (est AON)	Clarke & Clarke 1985 (est AON)	Operation Seafarer 1969 (AON)
North Colonsay	369	390	409	84
West Colonsay	392	325	320	155
SW Colonsay	28	24	0	36
East Colonsay	14	10	3	2
Oronsay	318	411	368	67
Total	1121	1160	1100	344

Great Black-backed Gull *Larus marinus*

There has been an apparent increase of 23% in the breeding population of Great Black-backed Gulls on the islands since 1986, largely on Colonsay, where breeding has now been found on the east coast. The increase on Oronsay between 1985 and 1986 may reflect different levels of human persecution, which was known to occur, in each of these years.

	Seabird 2000 (AON)	Clarke & Clarke 1986 (est AON)	Clarke & Clarke 1985 (est AON)	Operation Seafarer 1969 (AON)
North Colonsay	11	5	5	3
West Colonsay	10	10	10	4
SW Colonsay	11	6	0	3
East Colonsay	2	0	0	1
Oronsay	42	41	28	6
Total	76	62	43	17

Black-legged Kittiwake *Rissa tridactyla*
There has been a modest increase in the Black-legged Kittiwake population on Colonsay since the mid 1980s. The increase is 4% on the population of 1985 and 13% on the population of 1986, following the drop between these years which coincided with the Loch Linnhe seabird wreck in July 1985 (Craik, 1986). Black-legged Kittiwakes remain confined to colonies between Kiloran Bay and Port Mhor.

	Seabird 2000 (AON)	Clarke & Clarke 1986 (est AON)	Clarke & Clarke 1985 (est AON)	Operation Seafarer 1969 (AON)
West Colonsay	6485	5713	6212	2136
Total	6485	5713	6212	2136

Terns *Sterna* spp
Details of the breeding populations of terns found in Seabird 2000 are presented below. Species comparisons with the previous surveys are difficult as Clarke & Clarke (op cit) did not record terns. Records are available for the total number of birds but do not distinguish between Common and Arctic terns though they allow comparison with the current total number of birds recorded. Variation between years is not unusual for this group and this is reflected in the reported counts given below. It is encouraging, however, to note that populations have risen from the lows recorded in the early 1990s.

Year	Number of Common and Arctic Terns (ind)	Source
1969	130	Operation Seafarer 1969
1984	450-500	Clarke & Clarke (pers obs)
1987	748	Clarke & Clarke (pers obs)
1991	c550	Clarke & Clarke (pers obs)
1992	c200	Clarke & Clarke (pers obs)
1993	c270	Clarke & Clarke (pers obs)
2000	614	Seabird 2000

Common Tern *Sterna hirundo*

A total of 31 AON were recorded. The colony at Port Olmsa (East Colonsay) which had 5 pairs in 1992 appears to be in decline; only one pair was found.

	Seabird 2000 (AON)	**Operation Seafarer 1969 (AON)**
East Colonsay	1	0
Oronsay	30	7
Total	31	7

Arctic Tern *Sterna paradisaea*

In total 201 AON of Arctic Terns were found in June 2000; a large proportion of these were on offshore islets and future surveys of these islands should use a small boat to ensure that full coverage is achieved. It is believed that the low count in Operation Seafarer for this and a number of other species which use offshore islets may have been a result of incomplete coverage.

	Seabird 2000 (AON)	**Operation Seafarer 1969 (AON)**
North Colonsay	11	12
SW Colonsay	85*	15
Oronsay	105	31
Total	201	58

* also 150 non breeding individuals present

Little Tern *Sterna albifrons*

Two AONs and a single bird were found in SW Colonsay during Seabird 2000; there are no previous breeding records of this species on Colonsay or Oronsay.

Common Guillemot *Uria aalge*

There has been a large increase (+93%) in the number of Common Guillemots since the mid 1980s. This is not surprising as the annual survival of adult Common Guillemots from Colonsay is known to be very high at 97% (Harris *et al*, 2000). Some of this increase, however, may also reflect slight differences in counting technique and timing as Clarke & Clarke (1986, 1987) counted only birds they felt were on breeding ledges in mid May. The Seabird 2000 count was based on all birds using the cliffs in June, other than those only loosely associated with the colony (ie on intertidal rocks). The very much lower count recorded in Operation Seafarer may also in part be due to the early date of the count in late May.

	Seabird 2000 (ind)	Clarke & Clarke 1986 (ind)	Clarke & Clarke 1985 (ind)	Operation Seafarer 1969 (ind)
North Colonsay	75	40	30	0
West Colonsay	26394	13567	13430	1595
Total	26469	13617	13460	1595

Razorbill *Alca torda*

The level of increase in Razorbills (+90%) since the 1980s is very similar to that of Common Guillemots. Unlike Common Guillemots which showed similar increases in North and West Colonsay, the increases in Razorbill have not been uniform; those of North Colonsay (+227%) exceed those in West Colonsay (+87%) suggesting that colonisation is still proceeding to the north of Kiloran Bay.

	Seabird 2000 (ind)	Clarke & Clarke 1986 (ind)	Clarke & Clarke 1985 (ind)	Operation Seafarer 1969 (ind)
North Colonsay	108	33	62	0
West Colonsay	2631	1407	1719	304
Total	2739	1440	1781	304

Black Guillemot *Cepphus grylle*

The number of Black Guillemots recorded has decreased (-66%) since the dawn count made in 1987. It is likely that this reduction reflects a change in counting methods as Seabird 2000 was unable to count all areas at dawn during April (West and North Colonsay were only partially counted). The figures presented for Seabird 2000 should be regarded as minimum estimates of the current population.

	Seabird 2000 (ind)	Clarke & Clarke 1987 (ind)	Clarke & Clarke 1986 (ind)	Operation Seafarer 1969 (est ind)
North Colonsay	49	183	27	4
West Colonsay	21	167	26	10
SW Colonsay	33	21	0	6
East Colonsay	7	15	27	2
Oronsay	24	13	21	0
Total	134	399	101	22

Atlantic Puffin *Fratercula arctica*

While Atlantic Puffins have been seen offshore from Colonsay in most years, previous surveys have not found them breeding. Seabird 2000 found a single bird ashore at Pigs Paradise in June 2000, but breeding was not confirmed.

Other species

There are breeding season records of Manx Shearwater *Puffinus puffinus*, European Storm Petrel *Hydrobates pelagicus*, Great Cormorant *Phalacrocorax carbo*, and Great Skua *Catharacta skua* on Colonsay and Oronsay although breeding has not been proven. The records of Manx Shearwater and Great Skua are of flying birds that are believed to have come from other colonies in western Scotland. Those of Great Cormorant are of single feeding and loafing birds. The majority of these are immatures; the few adults recorded are thought to have come from the nearby colony on Mull. European Storm Petrels have been mist netted on Colonsay using tape lures during the breeding season; there is no evidence to suggest they were breeding birds.

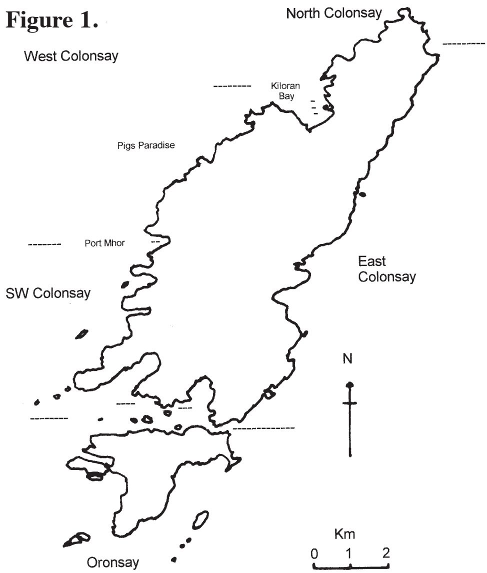
Operation Seafarer recorded 2 Arctic Skuas *Stercorarius parasiticus* on the ground on Oronsay, although breeding was not proven. This species is still regularly seen from the islands and as breeding has never been found the birds are presumed to be from neighbouring colonies on Jura or Coll.

Table 1 ***Comparison of major seabird colonies in Argyll.***
Data are from Seabird 2000 counts in 1999 - 2001 (Daw, 2000; I Mitchell pers comm)

Species	Unit	Colonsay & Oronsay (total)	Colonsay (North & West)*	Treshnish	Tiree (Ceann a Mhara)	Sanda
Fulmar	AOS	1323	1287	1078	1382	500
Manx Shearwater	AOB			1283		200
Storm Petrel	AOB			1700		200
Cormorant	AON					21
Shag	AON	171	170	601	160	516
Great Skua				1		
Black-headed Gull	AON	5				
Common Gull	AON	81	21	8		44
Lesser BB Gull	AON	226	58	40	55	66
Herring Gull	AON	1121	761	225	192	821
Great BB Gull	AON	76	21	342	6	54
Kittiwake	AON	6485	6485	786	899	9
Common Tern	AON	31		6		
Arctic Tern	AON	201	11	143		
Little Tern	AON	2				
Guillemot	Ind	26469	26469	9566	1974	2174
Razorbill	Ind	2739	2739	1232	394	2944
Black Guillemot	Ind	134	70	217	16	442
Puffin	Ind	1	1	1232		354

* Colonsay (North and West) are included in the Colonsay and Oronsay Total.

Figure 1.



Discussion

The Seabird 2000 survey has shown that there have been substantial increases in the populations of several seabirds on Colonsay and Oronsay, while others have remained similar to those recorded in the 1980s. Only one species, Black-headed Gull, has declined significantly.

There are 4 seabird colonies in Argyll which hold a wide guild of seabird species (Table 1). The results of Seabird 2000 confirm Colonsay and Oronsay as of primary importance within the region. The area of north and west Colonsay is identified as an Important Bird Area principally for Corncrake *Crex crex* and Red - billed Chough *Pyrrhocorax pyrrhocorax* and is protected as a Site of Special Scientific Interest. The area has been designated as a Special Protection Area (SPA) under the EU Birds Directive with specific reference to Chough, although the assemblage of cliff-nesting seabirds is considered of only incidental interest. The results of Seabird 2000 suggest that this view may require revision.

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Changes in breeding wader numbers on Scottish farmed land during the 1990s

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A repeat survey of 'farmed land' in Scotland comprising c400 one km squares, together with 52 sites covering 70 km² previously identified as key wader breeding sites, was undertaken between 1997 and 2000. Each of these sites had originally been surveyed in 1992 or 1993. Revised Scottish 'farmed land' population estimates of 91,000 pairs of Eurasian Oystercatcher, 87,000 Northern Lapwing, 33,000 Common Snipe, 46,000 Eurasian Curlew and 13,000 Common Redshank were calculated. There were no significant overall changes in wader numbers between 1992-93 and 1997-2000. The ability to detect significant trends was poor due to a combination of a short time period between surveys and considerable variation in wader trends both between sites and between regions. These results are compared with findings from other monitoring schemes and factors explaining variations discussed.

Introduction

Five species of breeding waders, Eurasian Oystercatcher *Haematopus ostralegus*, Northern Lapwing *Vanellus vanellus*, Common Snipe *Gallinago gallinago*, Eurasian Curlew *Numenius arquata* and Common Redshank *Tringa totanus*, are commonly associated with farmland habitats in the United Kingdom. The populations of these species on 'farmed land' in Scotland were previously assessed in 1992 (O'Brien 1996). Considerable numbers of waders, in particular Eurasian Oystercatcher and Eurasian Curlew both of which exceeded previous UK population estimates, were found to be thinly distributed across much of farmland on mainland Scotland with higher densities of all species on the Northern and Western Isles.

Recent surveys in the UK and in Europe have indicated considerable declines in numbers of some breeding waders giving cause for concern over wader populations on farmland (eg Wilson *et al* 2001, Hagemeijer and Blair 1997, Gibbons *et al* 1993, Marchant *et al* 1990). For example,

- the number of occupied 10 km squares in Britain had declined by 9% for Northern Lapwing, 19% for Common Snipe, 3% for Eurasian Curlew and 12% for Common Redshank between 1968-72 and 1988-91 (Gibbons *et al* 1993).

- Northern Lapwing populations declined by 49% between 1987 and 1998 across England and Wales (Wilson *et al* 2001).

- Northern Lapwing and Eurasian Curlew declined significantly by c60% in Northern Ireland between 1987 and 1999 (Henderson *et al* 2002).

- Eurasian Oystercatcher populations, by contrast, have increased both in numbers and distribution in the UK (an increase of 11% in the number of occupied 10 km squares between 1968-71 and 1988-91) and Western Europe (Gibbons *et al* 1993, Hagemeijer and Blair 1997).

Little quantitative information is available on the changes in wader populations in Scotland. A comparison of breeding densities on Scottish farmland in 1983 and 1992 suggested that Northern Lapwing populations had remained stable, but that Common Redshank and Eurasian Oystercatcher populations may have increased (Galbraith *et al* 1984, O'Brien 1996). These comparisons were based, however, on different survey areas using different monitoring techniques and with differing criteria as to what constituted 'farmed land'.

The main aims of this study were to estimate the population size and the change in numbers of breeding waders on 'farmed land' in Scotland between 1992-93 (O'Brien 1996) and the present study.

Methods

The present project was a repeat of a survey previously undertaken in 1992-93 (O'Brien, 1996). Scotland was split into 5 regions - Scottish mainland (including the Inner Hebrides), Orkney, Shetland, the southern isles of the Outer Hebrides (hereafter referred to as 'the Uists'), and the northern Isles of the Outer Hebrides. Scottish 'farmed land' was defined as land within the classes 1 to 5.3 of the Macauley Land Capability for Agriculture system (Soil Survey of Scotland, 1982). Any 1 km square that comprised predominantly 'farmed land' (75% of the square on Scottish mainland, 50% of the square on Orkney, Shetland and the Outer Hebrides) was included in the survey. In addition, 186 of 232 sites considered important for lowland breeding waders in mainland Scotland (referred to subsequently as 'identified wader sites') were surveyed in 1992. Accordingly, the random sites selected in Scottish mainland comprised a sample of the Scottish mainland excluding the identified wader sites; 224 of the random squares on mainland Scotland and 52 of the 'identified wader sites' were resurveyed in 1997. Twelve random squares were not surveyed in 1997 due to a combination of poor weather early in the survey period and access permission being refused by landowners. The random sites on Orkney (65 squares compared with 67 in 1993) and Shetland (60 squares compared with 61 in 1993) were resurveyed in 1998 while the 50 random squares in the Southern Isles of the Outer Hebrides were surveyed in 2000. None of the remaining identified wader sites or the sites on the Northern Isles of the Outer Hebrides were included in the resurvey.

The same standard field by field method for surveying breeding waders was used as in 1992-93 (O'Brien 1996, Bibby *et al* 1992, Gilbert & Gibbons 1999). All surveyors were provided with 3 copies of a map of the survey area together with 3 sets of recording forms. Each map was marked with the site boundary, within which all fields were numbered. Surveyors were asked to visit sites on 3 evenly spaced occasions, visit 1 between 18 April and 8 May, visit 2 between 9 May and 29 May and visit 3 between 30 May and 19 June.

Surveyors were asked to walk through, and get to within 100 metres of any point in each field, and to look 200-400 metres ahead, scanning with binoculars to note the distribution of all waders. All registrations were mapped, although only birds considered to be breeding within the survey area were counted.

Calibration relating the number of waders recorded on a site to the estimated number of pairs on a site was undertaken in the same manner as in 1992. These are as follows:

Eurasian Oystercatcher: the maximum number of pairs (where 'pairs' relates to the number of paired birds, displaying birds or single birds attached to a particular site) recorded on any one of the 3 visits (Smith, 1983).

Northern Lapwing: the maximum number of individuals recorded on a site (where individuals excludes all obviously nonbreeding flocks of birds) on any visit in April and May (ie the first 2 visits in this survey) divided by 2 (Barrett and Barrett, 1984).

Common Snipe: the maximum number of drumming plus chipping birds recorded on any one of the 3 visits. This is the figure used to compare changes in the numbers of Common Snipe within a region. This is related to the number of pairs of Common Snipe by multiplying the number of drumming plus chipping birds by 1.74 (Green 1985).

'Eurasian Curlew method 1': as with Eurasian Oystercatcher, the maximum number of pairs recorded on any one of the 3 visits (Smith, 1983).

'Eurasian Curlew method 2': the average number of individuals recorded on a site between mid April and mid June, multiplied by 0.71 with 0.1 added for each of the sites where Eurasian Curlew were recorded (Grant *et al* 2000).

Common Redshank: the average number of individuals recorded on site between mid April and 20 May (ie the first 2 visits) (Cadbury *et al* 1987).

Two estimates of current Eurasian Curlew populations were made; one, based on the original 1992/93 method allowed comparisons with the first survey, and one based on methods recently proposed by Grant *et al* (2000).

The wader populations of the Uists were estimated by a single visit during late May/early June in 2000. For each of the 50 randomly selected 1 km squares on the Uists the date of visit in 1993 most closely approximating the visit in 2000 was used for comparison. The change in wader numbers between the 1993 and the 2000 surveys was then used to estimate the change in the wader population on the Uists since 1993. One problem with the 2000 survey was that it was undertaken during daytime and not at dawn or dusk. This contrasts with the 1993 survey, and means that any declines in wader numbers, in particular Common Snipe, may be due to lower detectability associated with the time of day of survey (Green 1985, Reed *et al* 1985).

No surveys were made on Lewis/Harris so wader population changes here are unknown. The Lewis/Harris 1993 estimates are used for subsequent Scottish population estimates. Similarly, only a small sample of the 'identified wader sites' originally surveyed were revisited in 1997. Wader densities on many of the 'identified wader sites' proved not to be significantly higher than on random sites in 1992 (O'Brien and Bainbridge 2002). Those that were resurveyed in 1997 were sites that contained higher densities of breeding waders in 1992 than those that were not surveyed in 1997. Extrapolating the changes recorded on the identified wader sites to those not surveyed is not valid. Accordingly we have decided to use the numbers recorded on identified wader sites in 1992 as population estimates where there was no repeat survey in 1997. It should be noted that both the Lewis/Harris sites and the non resurveyed identified wader sites represent a small fraction of the total wader populations of Scotland, and so are unlikely to significantly affect the change in wader numbers recorded in the present study.

Analysis of data

The change in wader numbers was estimated using the following formula.

$$\text{Change} = (\text{No}_{yr2} - \text{No}_{yr1})/\text{No}_{yr1}$$

where No_{yr1} and No_{yr2} are the total number of waders for the given region in year one and year 2 respectively. These have been presented as percentages. A bootstrap method was used to estimate whether there was a significant change in numbers between the 2 surveys (see Appendix). In the bootstrap method sites were sampled, with replacement, until the set selected contained the same number of sites as had been surveyed. This was repeated 999 times and the sets ranked by the change in number of waders estimated. Note that this means that the 95% confidence intervals around the population estimate from the first years survey may overlap with the estimate from the second years survey but the percentage change may remain significant.

Results

Population estimates

The number of waders, the maximum number in a square, the number of squares with birds, the mean density and the estimated population sizes have been calculated for each of the survey areas (Table 1). Of the 2 Eurasian Curlew estimates presented 'Eurasian Curlew method 2' is the one that is likely to be closer to the true figure (Grant *et al* 2000).

The proportion of squares occupied on Scottish mainland indicated that Eurasian Oystercatcher and Eurasian Curlew were the most widespread of the wader species, each occurring in 59% of the squares surveyed (Table 1). Northern Lapwings occurred in 42% of squares and, although overall density was similar to Eurasian Oystercatchers, Northern Lapwings were recorded at higher densities than Eurasian Oystercatchers on those sites that were occupied. Common Snipe (20% of squares) and Common Redshank (10% of squares) were rather less widely distributed within Scottish farmed land.

The data from Table 1 have been combined to produce an overall estimate of wader numbers on farmed land in Scotland (Table 2). This indicated that Eurasian Oystercatcher and Northern Lapwing were the most common, and Common Redshank the least common of the 5 species of breeding wader on farmed land in Scotland.

Changes in wader numbers since 1992-93

A comparison of the changes in the number of breeding waders in sites surveyed in both 1992-93 and 1997-98 (2000 in the Uists) indicated considerable variation between the regions (Table 3). All 5 species declined significantly in Shetland between 1993 and 1998. By contrast, 4 of the 5 species (not Northern Lapwing) increased significantly in Orkney during the same period. On the Uists the Eurasian Oystercatcher population increased significantly, while the Common Snipe population declined significantly between 1993 and 2000, although the latter was likely to be due to the change in time of day of survey between 1993 and 2000. There were no significant changes in wader numbers on the random sites on mainland Scotland.

The data from Table 3 have been combined to produce an overall estimate of the change in wader numbers on farmed land in Scotland between 1992-93 and 1997-98-2000 (Table 4). There are no significant changes in any of the 5 species of breeding wader - although the 18% decline in Common Snipe and the 10% increase in Eurasian Oystercatcher and Eurasian Curlew estimates are very nearly significant. The confidence intervals around these estimates are, however, rather high indicating that the ability to detect national trends is rather poor. This is despite the fact that sample sizes are large (indicated by the fact that significant trends can be identified within the island groups). The data

Table 1 *The number of breeding waders recorded in each of the survey areas within Scotland in 1997-98-2000. The population estimate is calculated by multiplying the mean density by the area of 'farmed land' within each region (shown in parentheses).*

Random sites on Scottish mainland	**Eurasian Oystercatcher**	**Northern Lapwing**	**Common Snipe**	**Eurasian Curlew (method 1)**	**Eurasian Curlew (method 2)**	**Common Redshank**
Calibrated no pairs	466	459.5	139.2	340	254.6	35.5
Maximum no in a square	16	28.5	9	9	11	6
Occupied squares (max=224)	132	94	45	132	132	22
Mean density (pairs km^{-2})	2.08	2.05	0.62	1.52	1.14	0.16
Estimate (area=34,177 km^2)	71,100	70,109	21,239	51,876	38,839	5,416
Lower confidence limit	56,793	51,212	13,643	44,037	32,773	2,621
Upper confidence limit	83,743	84,252	30.104	60,785	47,202	7,798
Key sites on Scottish mainland						
Calibrated no pairs	429	972.5	586.4	457	333.1	425
Maximum density (pair km^{-2})	35.0	49.0	52.4	32.9	24.3	20.7
Mean density (pairs km^{-2})	6.11	13.85	8.35	6.51	4.75	6.05
Orkney						
Calibrated no pairs	1321	588.5	544.6	687	527.6	251
Maximum no in a square	55	67	34.8	27	26.583	26
Occupied squares (max=65)	65	62	52	65	65	51
Mean density (pairs km^{-2})	20.32	9.05	8.38	10.57	8.12	3.86
Estimate (area=626km^2)	12,722	5,668	5,245	6,616	5,082	2,417
Lower confidence limit	11,497	4,434	4,164	5,874	4,425	1,830
Upper confidence limit	13,939	7,321	6,538	7,367	5,829	3,086
Shetland						
Calibrated no pairs	320	200	250.6	191	134.0	125.5
Maximum no in a square	22	21.5	17.4	8	5.993	12.5
Occupied squares (max=60)	59	55	47	58	58	45
Mean density (pairs km^{-2})	5.33	3.33	4.18	3.18	2.23	2.09
Estimate (area=398km^2)	2,123	1,327	1,662	1,267	889	832
Lower confidence limit	1,762	1,099	1,338	1,121	741	647
Upper confidence limit	2,545	1,600	2,025	1,419	1008	1,049
Uists						
Calibrated no pairs	745	1048	346	0	0	681
Mean density (pairs km^{-2})	14.90	20.96	6.9	0	0	13.62
Estimate (area=240km^2)	3,576	5,030	1,661	0	0	3,269
Lower confidence limit	3,093	4,230	1,247	0	0	2,696
Upper confidence limit	4,067	5,891	2,091	0	0	3,961

Table 2 ***Total population estimate for breeding waders on 'farmed land' in Scotland, 1997-98-2000.***

	Eurasian Oystercatcher	Northern Lapwing	Common Snipe	Eurasian Curlew (method 1)	Eurasian Curlew (method 2)	Common Redshank
Scottish Mainland Random	71,100	70,109	21,239	51,876	38,839	5,416
Surveyed key sites	429	973	586	457	333	425
Other key sites estimate	1,084	2343	1096	665	484	723
Uists	3,576	5,030	1,661	0	0	3,269
Lewis/Harris	68	1204	1488	0	0	349
Orkney	12,722	5,668	5,245	6,616	5,082	2,417
Shetland	2,123	1,327	1,662	1,267	889	832
Overall estimate	91,102	86,654	32,977	60,881	45,627	13,431
Lower confidence limit	76,822	67,774	25,439	53,114	39,432	10,442
Upper confidence limit	103,839	101,032	39,394	69,909	54,268	16,086

Note that the figures incorporated for the estimated key sites and Lewis/Harris assume that there has been no change in wader numbers on these sites since 1992/93.

indicate clearly that trends in wader numbers vary considerably between island groups (Orkney v Shetland) and also that there is little consistency in trends in the dataset within Scottish mainland (indicated by the high confidence intervals within the Scottish mainland subset).

Discussion

Population estimates

Population estimates for breeding waders on 'farmed land' in Scotland have been presented. The estimate for breeding Eurasian Oystercatcher is an increase compared with 1992-93 and confirms that the range given in Stone *et al* (1997) (33,000 to 43,000 pairs in GB) is a considerable underestimate. This estimate means that the Eurasian Oystercatcher population breeding in Scotland is similar in size to that in the Netherlands and higher than any other country in Europe (Hagemeijer and Blair 1997). The Scottish 'farmed land' Northern Lapwing population now represents over half the UK total, with total numbers exceeded only by the Netherlands, Belarus, Germany and Sweden in Europe (Hagemeijer and Blair 1997). The new estimate of Eurasian Curlew numbers on Scottish 'farmed land' (45,600 pairs) again suggests that the figures given in Stone *et al* (1997) (33,000 to 38,000 pairs in GB) considerably underestimate the actual British Eurasian Curlew population which is likely to be closer to that indicated by Grant (1997). The Scottish 'farmed land' estimate for Eurasian Curlew is only exceeded within Europe by the population estimate for Finland (Hagemeijer and Blair 1997).

Estimated Common Snipe (33,000 pairs) and Common Redshank (13,400 pairs) populations each indicate that Scottish 'farmed land' holds a substantial proportion (54% and 40% respec-

Table 3 ***Changes in the number of breeding waders on each of the survey areas within 'farmed land' in Scotland between 1993 and 1998-99. All % changes marked in bold are significant at the 95% confidence intervals, the actual 95% confidence limits are shown in the Lower cl and Upper cl columns.***

Random sites (from 224 squares)	**No in 1992**	**No in 1997**	**% Change**	**Lower cl**	**Upper cl**
Eurasian Oystercatcher	428	466	8.88	-4.0	23.0
Northern Lapwing	503	460	-8.65	-28.1	12.9
Common Snipe	98	80	-18.37	-42.4	19.5
Eurasian Curlew	307	340	10.75	-3.1	26.7
Common Redshank	30	36	20.34	-33.3	123.3
Key sites					
Eurasian Oystercatcher	438	429	-1.94		
Northern Lapwing	1205	973	-19.29		
Common Snipe	343	337	-1.75		
Eurasian Curlew	429	457	6.65		
Common Redshank	518	425	-17.87		
Orkney (from 65 squares)					
Eurasian Oystercatcher	1027	1,321	**28.63**	18.1	40.9
Northern Lapwing	548	589	7.49	-10.7	25.3
Common Snipe	189	313	**65.61**	29.1	116.1
Eurasian Curlew	526	687	**30.61**	16.6	46.5
Common Redshank	175	251	**43.14**	5.3	90.0
Shetland (from 60 squares)					
Eurasian Oystercatcher	504	320	**-36.51**	-47.7	-23.2
Northern Lapwing	299	200	**-33.00**	-45.4	-15.9
Common Snipe	400	144	**-64.00**	-70.6	-56.0
Eurasian Curlew	310	191	**-38.39**	-47.3	-27.8
Common Redshank	165	126	**-23.94**	-44.0	-2.0
Uists (from 50 squares)					
Eurasian Oystercatcher	490	643	**31.22**	16.0	46.6
Northern Lapwing	1513	1,407	-7.01	-23.0	8.3
Common Snipe	231	117	**-49.35**	-64.8	-27.8
Eurasian Curlew	0	0		0.0	0.0
Common Redshank	841	953	13.32	-6.8	36.0

tively) of the UK's population of these species (Stone *et al* 1997). For 4 of the species of breeding wader a substantial proportion (>70%) of the total Scottish 'farmed land' population occurs on the Scottish mainland. In contrast, Common Redshank numbers on the Northern and Western Isles represent over half the total Scottish population.

Comparison with other estimates of breeding wader populations in Scotland

A previous paper (O'Brien 1996) compared wader densities, and population estimates, with those derived from Galbraith *et al* (1984). This suggested that Northern Lapwing estimates were similar, but that Common Redshank and Eurasian Oystercatcher estimates were 2 and 3 times higher, respectively, in 1992 than in 1983. The reasons for this apparent increase in numbers is unclear, but is just as likely to be due to differences in survey technique and interpretation associated with each survey as to actual increases in wader numbers. Galbraith *et al* (1984) did not estimate populations of Common Snipe or Eurasian Curlew, accepting that a significant proportion of the birds occurred on what they defined as uplands.

A survey of Northern Lapwings in Scotland was undertaken in 1998 (Wilson and Browne 1999). They estimated a Scottish Northern Lapwing population of around 65,000 pairs - some 75% of the estimate derived from the current survey. As their survey was based on a single visit around the end of April, the figure corresponds well with the findings from the present survey where the proportion of Northern Lapwings recorded on the first visit also represented around 75% of the total Northern Lapwing population estimate. There are 2 alternative explanations for this discrepancy. The first is that a single visit is insufficient and likely to underestimate Northern Lapwing numbers compared to the 3 visit method used in this survey. If this is the case then the estimate from the current study will be more accurate. The second is that a single visit is sufficient and that movements of birds between visits makes a 3 visit method likely to overestimate numbers. Other studies suggest that there is little movement of birds between sites on grassland habitats (Thompson *et al* 1994), but that movement may be more common where habitat rapidly becomes unsuitable during the breeding season (eg arable) or where densities are low relative to the area of suitable habitat (Mead *et al* 1968, O'Brien 2001).

Trends in breeding waders on 'farmed land' in Scotland in the 1990s

The present study had low ability to detect changes in national populations of waders breeding in Scotland during the 1990s because of considerable heterogeneity between the regions surveyed. For example, all 5 species declined significantly (from a 24% decline in Common Redshank to a 64% decline in Common Snipe numbers) on Shetland between 1993 and 1998. These were offset by a significant increase in numbers of 4 of the 5 species on Orkney where only Northern Lapwing did not increase significantly. On the Uists, Eurasian Oystercatcher numbers increased significantly between 1993 and 2000, while Common Snipe numbers declined significantly. However, the latter change is likely to be an artefact of differences between 1993 and 2000 in the time of day when surveys took place.

Comparison of results with the Breeding Bird Survey

The BTO/NCC/RSPB Breeding Bird Survey (BBS) monitors all bird species recorded on a random sample of sites in the UK on an annual basis since 1994 (Baillie *et al* 2001). For 3 of the species - Eurasian Oystercatcher, Eurasian Curlew and Common Redshank -the 95% confidence intervals around the 2 estimates of change do not overlap (Tables 4 & 5 - all BBS squares). This would suggest that the 2 surveys have been sampled from different populations, although both purport to be estimates of changes of breeding wader numbers in Scotland in the 1990s. Differences between the surveys are:

- The present survey compares changes in wader numbers between 1992-93 and 1997-98-2000, although for 4 of the 5 species (not Common Redshank) 70-80% of the birds were recorded in 1992 and 1997 on the Scottish mainland. The BBS survey monitors wader numbers on an annual basis between 1994 and 1999. It is possible that wader populations increased between 1992 and 1994, then subsequently declined.

- The present survey covers only the 'farmed land' whilst BBS squares are randomly selected from all available squares in Scotland. A reanalysis of population changes on the subset of BBS squares on 'farmed land' in Scotland between 1994 and 1999 still showed significant Northern Lapwing declines, although the trends for Eurasian Curlew and Eurasian Oystercatchers were rendered nonsignificant (Table 5, David Noble *pers comm*.) Too few occupied squares meant that trend data for Common Snipe and Common Redshank on 'farmed land' was not reliable.

- The present survey estimates the number of breeding pairs while the BBS counts individual birds However, if the number of waders within an individual BBS transect section exceeds 10 then that has been judged to indicate a flock of non breeding birds and so is not included in the BBS estimate (Field and Gregory 1999). It is possible that an increasing population of breeding waders within individual transect sections could result in increasing numbers of these sections not being counted. There is no evidence that this has happened in the current BBS dataset.

- The timing and number of visits is different between the 2 surveys. The present survey aims to visit the site on 3 occasions, in late April, mid May and early June. The BBS visits on 2 occasions with the first visit sometimes as late as mid May. It is possible that early nesting waders, Lapwing in particular, are missed as they may already have failed and moved out prior to the first visit. This may underestimate the number of breeding Lapwing on a site in some years. There is, however, no evidence from the BBS data that mean date of first visit to the squares has become later. Also the total number of Lapwing recorded on the first visit to sites in the current survey was very similar to the number recorded on the second visit (220 of the random sites in mainland Scotland were visited on 3 occasions at the appropriate time of year. For all breeding waders more birds were recorded on the second visit than on the first). As the finishing date for the second visit in the present survey was later than the finishing date for the first visit on the BBS it would suggest that variation in Lapwing numbers within dates of the first visit should not be sufficient to skew the data significantly.

The conclusion of Wilson and Browne (1999) that "Scotland does not appear to have suffered from the widespread loss of breeding waders on lowland farms that has been encountered in England and Wales" is supported by the present study but not by BBS data. Conversely, their further conclusion that "... there is now good evidence of a decline in Northern Lapwing numbers in Scotland during the 1990s" is supported by the BBS data but not be the results

Table 4 ***Overall changes in the numbers of breeding waders in Scotland between 1992-93 and 1997-98-2000. The lower and upper cls represent the 95% confidence limits around the percent change, as derived from the bootstrap statistic.***

	No. 1992/93	No. 1997/98	% Change	Lower cl	Upper cl
Eurasian Oystercatcher	82,851	91,102	9.96	-1.07	20.40
Northern Lapwing	94,160	86,653	-7.97	-24.80	5.03
Common Snipe	40,265	32,977	-18.10	-34.81	0.71
Eurasian Curlew	55,056	60,881	10.58	-1.08	23.74
Common Redshank	11,755	13,432	14.27	-10.91	40.74

Table 5 ***Population changes for all breeding waders in Scotland as recorded by the Breeding Bird Survey between 1994 and 1999*** **(*Baillie* et al *2001*).**

	All BBS squares in Scotland			BBS squares on 'farmed land' on Scottish mainland		
	Sample	%	Change	Sample	%	Change
Eurasian Oystercatcher	118	**-22**	**(-33 to - 9)**	83	-8	(-24 to +10)
Northern Lapwing	87	**-34**	**(-46 to -20)**	64	**-35**	**(-49 to -17)**
Common Snipe	55	39	(0 to +95)	20	**+20**	**(+16 to +275)**
Eurasian Curlew	125	**-18**	**(-31 to - 4)**	81	-15	(-32 to + 5)
Common Redshank	21	**-61**	**(-75 to -39)**	9	**-74**	**(-84 to -57)**

Note that the changes on farmed land were calculated by David Noble at BTO and have not previously been published. The percentage changes are shown with 95% confidence intervals in brackets. Figures in bold are significant at the 5% level.

from this study, although this study hints at a decline in Northern Lapwings (-8%). It is of considerable concern that short term breeding wader population trends suggested by this study and the BBS differ so markedly. The explanation may simply be that wader population trends within Scotland are heterogenous across habitat and geographical regions. This is implied by the wide confidence intervals around the change estimates and demonstrated by the contrasting trends between Orkney and Shetland in this study, and strong trend differences within the Uists as revealed in another recent study (Jackson *et al* in press).

Appendix

Sites were randomly selected, with replication, from the dataset in such a way that some sites could be selected on more than one occasion, while others would not be selected. This was repeated until a pseudo dataset, comprising the same number of sites as the original dataset, was selected. Note that, in contrast to other change methods such as Baillie *et al* 2001, this approach allows sampling of sites where a given wader species was not recorded. The pseudo estimates for wader numbers in each of the 2 years of survey were then summed, the change statistic calculated and stored. This process was repeated 999 times, sorted by change, and the measure for change at the 25th and 975th estimate used as the lower and upper confidence intervals respectively. This process was repeated separately for each of the regions where sites were randomly sampled. This analysis estimates the change in number of breeding waders within each of the regions. An overall estimate of change in wader numbers for Scottish farmland needs to be weighted by the proportion of the wader population that occurs in each of these regions. Accordingly wader population estimates for a region, and the confidence intervals around these estimates, were calculated using the following formula.

$Popn^{Ryr} = Count^{act} + (count^{est}/No.Squares)^{*}$
$(Area^{est} - Area^{obs})$

Where:

$Popn^{Ryr}$ is the population estimate for a region and a given year

$Count^{act}$ is the number of waders recorded on all the surveyed squares in the year

$Count^{est}$ is the number of waders estimated by bootstrapping

$Area^{obs}$ is the area (number of 1km squares) surveyed

$Area^{est}$ is the area from which the 1km squares were sampled.

For the population estimate $Count^{act}$ and $count^{est}$ are the same - the number of waders recorded on the squares in the year. The confidence intervals are estimated by substituting $count^{est}$ with the figure derived from bootstrapping. Population estimates are obtained for each of the regions and each of the years and for each of the 999 bootstrapped estimates. The bootstrapped estimates for each year are summed across the regions for each of the 999 estimates, ensuring that the bootstrapped estimates have not been sorted beforehand. The key sites survey is a complete survey and so is added to each of the 999 estimates. These provide 999 estimates of total wader populations for each of the two survey periods. The change statistic was calculated for each of these estimates and sorted by change, taking the 25th and 975th estimate as the 95% confidence limits as before.

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The Atlantic Puffin population of the Shiant Islands, 2000

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The Atlantic Puffin population of the Shiant Islands, one of the very largest in the United Kingdom, was estimated to be about 65,200 pairs in 2000. Although this total is below the 76,900 pairs recorded in 1970 during Operation Seafarer, the most accessible colonies have not altered in numbers in the 30 year period, and we do not believe the total population has declined. We describe the location of a new permanent transect which will permit future monitoring of the population.

Introduction

One of Britain's largest Atlantic Puffin *Fratercula arctica* colonies, probably the largest after St Kilda, is that on the Shiant Islands in the Minch (Lloyd *et al* 1991). In the course of Operation Seafarer the colony was censussed in 1970 when the population was estimated at 77,000 pairs. A repeat census in 1971 suggested 20% fewer pairs (Brooke 1972). There was at least a prima facie case that these numbers were considerably less than the number occupying the islands in the late nineteenth century. Coupled with evidence of decline from other major colonies (e g St Kilda: Flegg 1972), a geographically extensive study of Scottish Puffins was established under the leadership of Dr M P Harris. Broadly, this study ran from the mid 1970s to the mid 1980s and discovered that, while some colonies might have declined in the past, the decline was not continuing. Other colonies (eg Isle of May) were actually increasing (Harris 1984). Although the Shiants colony was not studied in great detail during this project, the number of burrows in monitoring transects was counted annually, and found to fluctuate, but not to show any marked trend (Harris 1984).

This paper brings the Shiants situation up to date. It repeats the censuses of 1970/71 using the same methodology and same observer, compares the counts so obtained with those arising from other methods, and revisits the monitoring transects. Since these transects had become very difficult to find on the ground, we established a new marked transect which, we hope, will be easy to find and to count for several decades.

Methods

In the course of the nationwide seabird census, Seabird 2000, we visited the Shiants from 17-24 June 2000.

Colony census methods

The census unit was the apparently occupied burrow, recognized by features such as disturbed grass, fresh excavation, droppings, hatched eggshells or dropped fish (Harris 1984). To estimate the number of apparently occupied burrows in the Atlantic Puffin colonies, A-L, mapped by Brooke (1972), we repeated his census methodology. In brief these methods were:

(i) Make several transects walking up the fall line of the colony, counting the number of burrows one pace either side of the transect. Estimate the colony's width from several paced horizontal transects. To ensure uniformity of pace size, the transects and width estimates should be done by the same person, MdeLB in this case.

(ii) Over a timed period, count simultaneously the number of Puffins departing from burrows in the colony to be censussed and also from burrows in a colony already counted by Method (i). The ratio of departing Puffins allows a straightforward estimate of the number of burrows in the unknown colony. The method is impractical for colonies larger than about 5000 burrows.

(iii) Simultaneously count the number of Puffins standing in the unknown colony and in a colony already counted by Method (i). The ratio of standing Puffins allows a straightforward estimate of the number of burrows in the unknown colony. This method is most useful for boulder scree colonies.

(iv) Make a guess based on the extent of the colony, the burrow density, and the number of Puffins active there.

As an independent alternative to the above methods, we also used the following methods in 2000.

(A) In colonies A and G, we counted the number of apparently occupied burrows in 20 randomly situated 5 x 5 m quadrats, and assessed the area of the colony via detailed tape measure/compass mapping of the perimeter.

(B) Over half an hour, we simultaneously counted the number of Puffins arriving with fish at burrows in the Colony C and also at burrows in Colony A already counted by Methods (i) and (A). The ratio of arriving Puffins arriving at the 2 colonies allows a straightforward estimate of the number of burrows in the Colony C. This method is simply a variation on Method (ii) above.

(C) In Colony C, on very steep slope requiring a rope for safe access, we counted the number of burrows in a single transect of 1.52 m width along the fall line in the centre of the colony. We also measured the colony's width at the cliff top.

Permanent transects

Having refound the permanent transects monitored by Harris (1984) in colony G on Garbh Eilean, we counted the number of apparently occupied and unoccupied burrows therein. In practise these transects, comprising 3 x 3 m quadrats, occupied a single strip 144 x 6m down the centre of colony G, plus 3 horizontal 3m strips of length 66, 44, and 86 m intersecting the single vertical strip at right angles. In each case, these horizontal lengths include the 6 m overlap with the vertical transect. The 3 horizontal transects were situated approximately one quarter, midway and three quarters down the colony, and they spanned the entire width of the colony.

Our newly established permanent transect depends only on one permanent FENO marker, situated centrally at the top of colony G (Fig. 1). Its GPS determined position is 57º54'08"N 6º21'37"W and its altitude 63m. From this marker, the transect line runs due north (magnetic) until the bottom of the colony is reached. The vertical counted transect is 50 3 x 3 m quadrats stretching to the bottom of the colony. The western edge of each quadrat touches the vertical line. The horizontal transect is perpendicular to this transect line. It is 15 3 x 3 m quadrats long. It intersects the vertical transect such that Quadrat 27 on the vertical transect (counted from the top) is the same as Quadrat 10 on the horizontal transect (counted from the east).

In all the above surveys, any burrows whose entrance was crossed by the quadrat boundary were scored as a half burrow.

Results

The results of the colony by colony census are given in Table 1. The overall pattern of Atlantic Puffin distribution was clearly broadly similar in 1970 and 2000. Two marginal colonies on Eilean Mhuire (D and E) had disappeared. The large colonies that were most difficult to count, C on a steep slope on Eilean Mhuire and F and H among boulders on Garbh Eilean yielded somewhat smaller estimates in 2000 than 30 years earlier. On the other hand, the most tractable colonies, A and G (i) which are both on large easily reached grassy slopes on Eilean Mhuire and Garbh Eilean respectively, showed modest increases. However, given the large standard errors, these increases were not significant. But we are encouraged to believe in the accuracy of these estimates by the correspondence between the simple Method (i) and the more thorough Method A.

The permanent transect data also suggested an increase in Colony G (i). In 2000, the number of burrows counted in the Harris transects was 871 occupied and 238.5 unoccupied, equivalent to densities of 0.623 and 0.171 burrows/m^2 respectively. This number of occupied burrows is higher than in 1973-1983 (see Discussion).

The mean number of burrows in the 64 quadrats of the newly established transect was 8.17 + s.e. 0.49 occupied and 2.38 + 0.18 unoccupied/quadrat. Thus the total number of burrows was 519 occupied and 152 unoccupied, equivalent to densities of 0.901 and 0.264 burrows/m^2 respectively. The lower overall density in the Harris transects is probably mostly explicable by the fact that their horizontal arms extended laterally further than the new transect, into areas barely occupied by Puffins.

Discussion

The number of occupied burrows counted annually from 1973 to 1983 in the Harris transects was notably stable, ranging from about 450-650 but usually about 550 (Harris 1984: Fig 12). The number of unoccupied burrows was about 400 in most years (D Steventon, in litt.). Our 2000 counts revealed a substantial increase to 871 occupied burrows while the number of unoccupied burrows fell to 239. Even allowing for differences between observers in the assignation of burrows to the occupied and unoccupied categories, it seems numbers of burrows and more particularly of occupied burrows have increased in the transects. This is entirely compatible with an increase of approximately 11% in the overall size of Colony G (i) between 1970 and 2000 (Table 1).

Other Atlantic Puffin colonies of the Shiants had either increased or decreased. The likely error in such one off counts is substantial and therefore we suspect that the apparent change in overall numbers from 76,900 pairs in 1970 to 65,200 in 2000 is well within counting error and that the population has changed little in the 30-year period.

Populations of the other abundant auks of the Shiants have approximately doubled in size in this period. Common Guillemots *Uria aalge* increased from 7970 individuals in 1970 to 15,171 in 2000 while Razorbills *Alca torda* increased from 3535 to 8046 (Brooke 1973, Seabird 2000 data). The number of predatory Great Black-backed Gulls *Larus marinus* has also increased, from 197 nests in 1970 to 310 in 2000 (Brooke 1973, Seabird 2000 data). Black Rats *Rattus rattus* remain on the islands, and stable isotope analysis indicates the coastal dwelling rats do prey upon seabirds, but it is debatable whether their presence depresses these particular seabird populations (Stapp 2002). These observations broadly suggest that

Table 1 ***Estimates of number of occupied burrows in Shiant Puffin colonies. See Brooke (1972) for precise locations of colonies. A-E are on Eilean Mhuire, F-J on Garbh Eilean, K on Galta Beag, and L on Galta Mor. Standard errors are given for 2000 counts using transect or quadrat methods. The censuses by other methods were undertaken once only in the stated colonies and no error estimate is given.***

Colony	Census method	1970 count	2000 count ± se	
A	(i)	3600	4020	± 429
	(A)	-	4020[1]	± 530
B	(i)	200	36	± 24
C	(ii)	10,100	8950	
	(iii)	-	4300	
	(B)	-	3280	
	(C)	-	6040	
D (i)	(i)	420	No longer present	
(ii)	(i)	670	No longer present	
E	(i)	80	No longer present	
F	(iii)	43,000	37,900[3]	
G (i)	(i)	4050	4220	± 825
	(A)	-	4850[2]	± 800
(ii)	(i)	2860	2640	± 322
H	(iii)	9000	3620[3]	
I	(i)	710	376	± 113
J	(iv)	200	200	
K	(iv)	1000	3500	
L	(iv)	1000	2700	
	Totals	76,900	65,200[4]	

1.Based on mapped area of 6637m^2
2.Based on mapped area of 7094m^2
3.Comparing the number of Puffins standing in this colony with the numbers in G(i) and G(ii)
4.For calculating this total, the mean estimate was used for those colonies counted by more than one method.

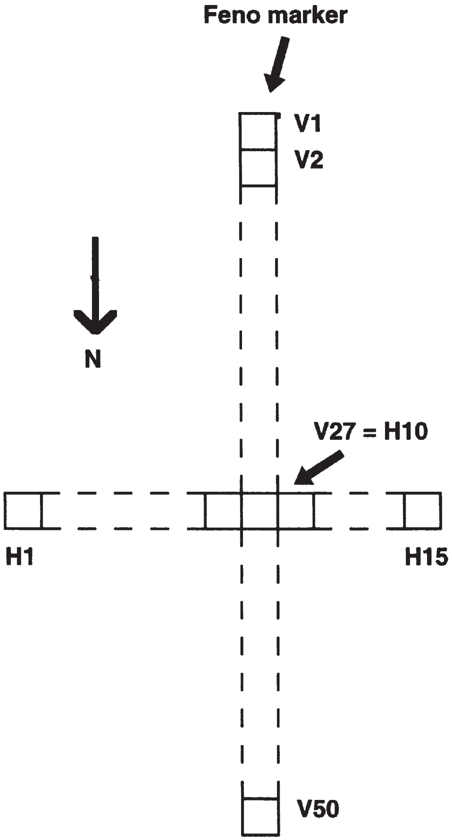

Figure 1 ***A schematic sketch showing the arrangement of the new permanent 3 x 3 m quadrats established in Puffin colony G on the northern slope of Garbh Eilean. There are 50 'vertical' (V) and 15 horizontal (H) quadrats, with one quadrat shared where the 2 transect lines intersect (V 27 = H10).***

conditions for auks breeding on the Shiants have not deteriorated since 1970. They therefore accord with our census data suggesting little overall change in the major Atlantic Puffin colony on the Shiants and give us no reason to question Harris's (1984) optimism 'about the Puffin's future and the general state of Puffindom'.

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Scavenging by birds upon Salmon carcasses during the spawning season

R HEWSON

Scavenging of Salmon by birds on the river Dee in north east Scotland was studied during 6 spawning seasons. Spawning took place mainly between early November and the end of January. Otters brought ashore, usually at selected landing places, carcasses of Salmon which they had killed or which had died after spawning. Other carcasses were deposited by changes in water level. Birds scavenged 21% to 49% of carcasses but rarely completely. Great Black-backed Gull was the main avian scavenger, followed by Grey Heron and Carrion Crow. During the spawning season Great Black-backed Gulls flew along the river at treetop height searching for carcasses, the number of such flights being related to the number of carcasses. Carrion Crows were dependent upon other scavengers to open up carcasses and in many cases simply removed eyes from them.

Introduction

On the River Dee in north east Scotland Otters *Lutra lutra* obtain much of their food from November through January by predation on spawning Salmon *Salmo salar* and scavenging the carcasses of those dying after spawning (Carss *et al*. 1990, Hewson 1995). This leads to a substantial amount of fish carrion being left on the river bank which becomes available to avian scavengers.

The present study considers the amounts of Salmon carrion available to scavenging birds and the use made of it.

Study Area

The study area, in the middle reaches of the river, comprised 7.5 km of the south bank of the Dee between Banchory and Aboyne. The river was up to 70 m wide, fast flowing, with pools in which Salmon lie during the summer. The Burn of Cattie, a tributary stream used by spawning Salmon, entered the Dee towards the upstream end of the study area. Fish which had spawned there between early November and the end of January made their way back to the river. Many died there or were taken by Otters which foraged regularly in the study area feeding largely on Salmon during the spawning season. (Hewson 1995).

In areas used by fishermen the banks were kept clear of tall vegetation. Elsewhere, commercially planted conifers extended along three-quarters of the study area with alder *Alnus glutinosa* and birch *Betula* sp. or gorse *Ulex europaeus* growing at the water's edge. The study area, used in the spawning seasons of 1992-93 and 1994-95 to 1996-97, formed part of a larger area used for an earlier study of scavenging of Salmon carcasses in 1990-92 (Hewson 1995).

Methods

Salmon carcasses on the river bank were counted weekly from early November to late January in 1990-91 to 1996-97 with the exception of 1993-94. Carcasses were measured from the snout to the tail fork, weighed, and any damage was described. Predator and/or scavenger species were ascribed to a carcass where there was diagnostic damage or tracks or signs were found or the feeding animal seen.

Scavenging by birds could be readily distinguished from scavenging by mammals. The removal of eyes and the making of small pits in the flesh could be identified as the work of crows but it was not possible to differentiate the large tears made by Great Black-backed Gulls from those made by Grey Herons. Scavenging by birds usually followed breaking of the carcass by otters, but both Great Black-backed Gulls and herons *Ardea cinerea* were capable of breaking into Salmon carcasses and were occasionally seen to do so.

Results

Availability of Salmon carrion

Salmon carcasses first appeared upon the river bank in early November. A majority of those found throughout November, December and January had been put there by Otters.

The median length of Salmon carcasses appearing on the river bank in 1990-91 was 76 cm and in the next year 78 cm; the median weight for both years was 3.2 kg. Of this 2.6 kg was available to scavengers, the inedible remainder comprised skeleton, gills, fins etc. (Hewson 1995). The greatest weight of carrion occurred in mid December (Table 1). The annual amount was always large, between 15.6 kg and 36.7 kg per kilometre of bank from December onwards, with a corresponding amount on the opposite bank. It was under used by vertebrate scavengers.

Scavenging of Salmon carcasses by birds

In many cases scavenging by birds was restricted to the removal of the upper eye (both eyes if they could be reached) from Salmon carcasses. Less than half were further scavenged (Table 2). There was a sharp falling off in the extent of further scavenging between the 2 years 1992-93 and 1994-5 and the following 2 years (X^2 = 4.86, $P<0.05$). Similarly Great Black-backed Gulls, the main scavenger of Salmon carcasses, appeared at 33.3 per cent of carcasses in 1992-93, 53.1 per cent in 1994-95 but only 5.7 per cent in 1995-96 and 4.7 per cent in 1996-97 (Table 3)

Birds seen at Salmon carcasses gave the best indicators of avian scavenging because damage by birds could not usually be attributed to particular species unless there were tracks or feathers at the carcass. Great Black-backed Gulls sometimes characteristically everted the skins of small Salmon carcasses in the same way as they do with lambs (Hewson 1984).

Great Black-backed Gulls flew at tree top height along the river in search of Salmon carcasses. If they found one they circled over it, or flew past and came back or landed and waited for a time before going to the carcass. Such flights (Table 4) were correlated with the number of carcasses 2 x 10 day periods earlier, (Spearman rank correlation coefficient r_s = 1.00, $P<0.01$), reflecting an accumulation of carrion lying on the bank.

Discussion

There was no obvious explanation for the falling off in scavenging by birds between 1994-95 and 1995-96. All the birds concerned were wary of human disturbance and may have been affected by forestry or agricultural operations. Even when the extent of scavenging was highest less than half the Salmon carcasses on the river bank were scavenged beyond the removal of eyes. The small amounts of carrion usually eaten by birds were difficult to measure and few carcasses were wholly scavenged by birds.

Only Great Black-backed Gulls, which scavenge at fishing boats (Beaman 1978, Buckley 1990) and ewe and lamb carcasses (Hewson 1984) were influenced by the number of Salmon carcasses available. The patrolling flights along the river resembled similar flights by Great Black-backed Gulls over areas where sheep were lambing in search of ewe or lamb carcasses, couped ewes or ewes having protracted labour when the protruding lamb might be attacked (Hewson 1984).

There were about half as many Great Black-backed Gulls and fewer Salmon carcasses on a stretch of the Dee 21 km upstream of the present study area (Hewson 1995). The earlier studies of Marquiss (Appendix) showed that most avian scavenging was done by adult gulls.

In summer Great Black-backed Gulls feed on surface shoaling sand eels *Ammodytes* spp and fish offal (Beaman 1978) or fish and auks *Alcidae* (Buckley 1990).

Besides feeding on carrion herons foraged along the river and tributary streams and elsewhere for small salmonids, amphibians and small mammals. They were often seen at fishing stances in the study area.

Crows were opportunist scavengers, subordinate to herons and Great Black-backed Gulls. Houston (1978) considers that the removal of eyes from lamb carcasses by crows is a form of predatory attack as the eye socket may be penetrated causing damage to the brain. However eyes and tongues are the easiest source of food. Crows removed the upper eye from a sheep carcass within one hour of it being made available and the tongue 2 hours later; they did not feed from the carcass during the following three days (Hewson 1981a). Crows were not seen to hoard carrion (Hewson 1981b) from Salmon carcasses perhaps because it was difficult to collect compared with sheep or Rabbit carrion but probably because observations were too brief as crows are wary and easily disturbed.

Breaking of Salmon carcasses by Otters made them available to scavenging birds in the same way as the breaking of sheep carcasses by Foxes. (Hewson 1981a).

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Appendix (data from M Marquiss)

Great Black-backed Gulls along the Dee

Weekly counts of Great Black-backed Gulls along the Dee throughout the year showed peak numbers in November but extending into February on a 9.5 km section of the Dee a few km downstream of the study area. The counts, during the first 3 hours of daylight to minimise the risk of disturbance by anglers and others, were carried out on 2 sections of the Dee, and on the North Esk about 40 km south, a river also used by spawning Salmon.

On an 11 km section of the Dee upstream of the study area there were half as many Great Black-backed Gulls throughout the year as in the downstream section and peak numbers occurred earlier, in October-December. On both sections of the Dee there were few Great Black-backed Gulls between April and September.

Table 1 ***Seasonal changes in the number of Salmon carcasses arriving on the bank of the River Dee and their weight, 1990-91 to 1996-97.***

	November	December			January
	21 - 30	1 - 10	11 - 20	21 - 30	31 - 9
Number of carcasses	7	47	67	44	34
Weight (kg)	21	198	275	134	117

Table 2 ***The extent of scavenging by birds on Salmon carcasses on a 7.5 km stretch of the River Dee.***

	Carcasses on bank	Scavenged by birds Eye only	Scavenged by birds further scavenged	% further scavenged
1992/93	39	16	19	48.7
1994/95	32	11	11	34.4
1995/96	53	12	12	22.6
1996/97	43	9	9	20.9

Table 3 ***Birds at carcasses on river bank, observations to 31 January.***

	Visits	Carcasses	Great black-backed gull	Heron	Crow
1992/93	24	39	13	8	4
1994/95	18	32	17	1	10
1995/96	11	53	3	1	0
1996/97	12	43	2	2	4

Table 4 ***Patrolling flights by Great Black-backed Gulls in relation to the number of Salmon carcasses during 5 spawning seasons (no data for 1990/91).***

	November	December			January		
	21 - 30	1 - 10	11 - 20	21 - 30	31 - 9	10 - 19	20 - 31
Carcasses	5	46	64	44	34	24	22
Flights	2	3	8	17	32	15	16

The North Esk showed a similar pattern with peaks in Great Black-backed Gulls in October and November. The proportion of immature gulls in their first and second years on the 2 rivers combined increased steadily from 7% in October to 100% in May and then declined steeply; most of the avian scavenging of Salmon carcasses was done by adult Great Black-backed Gulls.

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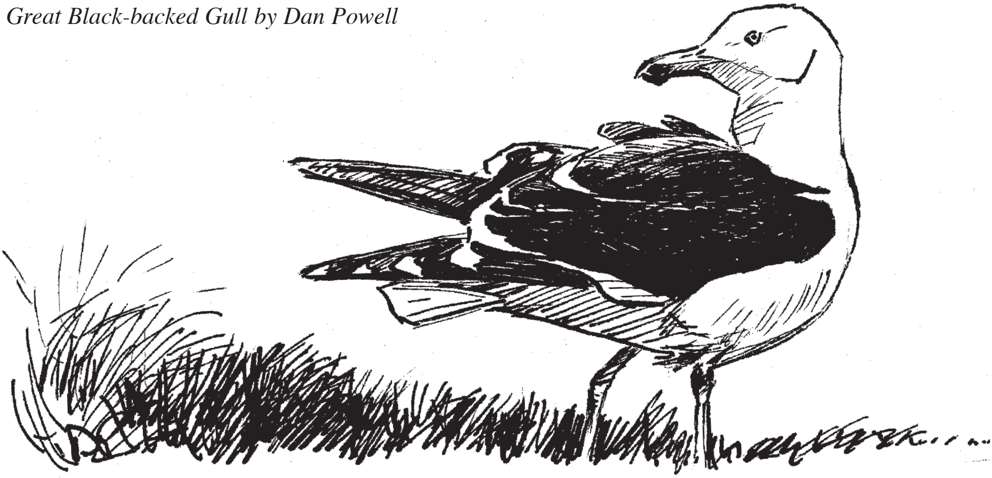
Great Black-backed Gull by Dan Powell



Numbers of Siskins in relation to the size of the Scots Pine cone crop

H McGHIE

The sizes of conifer cone crops vary greatly between years and the numbers of finches dependent on such crops respond accordingly. Most studies have been concerned with changes in populations of crossbills, whilst Siskins have received relatively little attention. In the present paper, I analyse Nethersole-Thompson's (1975) data series for Siskin in relation to the size of the Scots Pine cone crop size and numbers of crossbills.

Methods

Nethersole-Thompson (1975) made estimates of the abundance of Siskins on a 4 point scale in 21 years between 1934 and 1967 (1934–42, 1946–54, 1958, 1962 and 1967), in upper Strathspey. He also made estimates of the abundance of crossbills on a 6 point scale in the same area between 1924–74. These were identified as Scottish Crossbill *Loxia scotica*, but may have included Common Crossbill *Loxia curvirostra* and Parrot Crossbill *Loxia pytyopsittacus*, as these species are known to be present in the area and identification is problematical (Summers 2002). Nethersole-Thompson (1975) also provides an assessment of the size of the Scots Pine *Pinus sylvestris* cone crop in upper Strathspey, made by 2 foresters.

Statistical methods were the same as those used by Summers (1999). Nethersole-Thompson's (1975) data for Siskin, crossbills, and cone crop size were analyzed by splitting both bird and cone data into 2 groups according to their abundances, so that there were approximately equal numbers of observations in the high and low abundance categories. Contingency tables were then constructed to compare bird and cone crop abundances and, secondly, to compare changes in the abundances of birds or the size of the cone crop between consecutive years. Where there was no difference between years, data were included with the 'decrease' category. Interactions between numbers of Siskins, numbers of crossbills and the sizes of the cone crop were tested using Fisher's exact test (2 tailed).

Results

There was a significant positive association between the abundance of Siskins and the size of the Scots Pine cone crop in Strathspey (Table 1). There was a stronger positive association between changes in the numbers of Siskins and changes in the cone crop. There were also strong positive associations between the abundances of Siskins and crossbills, and changes in the abundances of these birds (Table 2). In 3 of the 4 years when Siskin abundance was high but the cone crop was small, the abundance of crossbills was also high (1936, 1942 and 1952). Both Siskins and crossbills increased between 1954–58, although the cone crop remained the same. These similarities suggest that there is a common explanation for these divergences from a direct relationship between bird abundance and cone crop size.

Most instances of divergences from a direct relationship between the size of the cone crop and the abundance of Siskins were where there were high numbers of birds in relation to the size

Table 1 ***Associations between abundance and changes in abundance of Siskins and cones of Scots Pine on upper Strathspey 1934-67.***

Cone crop size[1]	Siskin abundance[1]	
	Low-fair	**High-peak**
Poor-fair	34[2], 35, 37, 39, 41, 47, 48, 50, 51, 53, 54, 67	38, 46, 58, 62
Bumper	40	36, 42, 49, 52

Fisher's exact test, 2 tailed, P=0.047

Change in cone crop	Change in Siskin abundance	
	Decrease or same	**Increase**
Decrease or same	36-37, 38-39, 40-41, 42-46, 46-47, 49-50, 52-53, 58-62, 62-67	54-58
Increase	39-40, 50-51, 53-54	34-35, 35-36, 37-38, 41-42, 47-48, 48-49, 51-52

Fisher's exact test, 2 tailed, P=0.010

1. Data from Nethersole-Thompson 1975. 2. Numbers are years, eg 35=1935, 35-36=1935-1936

Table 2 ***Associations between abundance and changes in abundance of Siskins and Scottish Crossbills on upper Strathspey 1934-67.***

Crossbill abundance[1]	Siskin abundance[1]	
	Low-fair	**High-peak**
Very low-fair	34[2], 37, 39, 40, 41, 47, 48, 50, 51, 53, 54, 67	62
High-peak	35	36, 38, 42, 46, 49, 52, 58

Fisher's exact test, 2 tailed, P<0.001

Change in crossbill abundance	Change in Siskin abundance	
	Decrease or same	**Increase**
Decrease or same	36-37, 38-39, 39-40, 40-41, 42-46, 46-47, 49-50, 52-53, 58-62, 62-67	
Increase	50-51, 53-54	34-35, 35-36, 37-38, 41-42, 47-48, 48-49, 51-52, 54-58

Fisher's exact test, 2 tailed, P<0.001

1. Data from Nethersole-Thompson 1975. 2. Numbers are years, eg 35=1935, 35-36=1935-1936

of the cone crop. The opposite situation applied when considering changes in abundance: most instances of changes in the abundances of Siskins and cones diverging from a direct relationship were where cones increased but Siskins did not. These 2 observations, taken together, perhaps indicate that there was a time lag between changes in cone crop and the size of the Siskin population adjusting to increases and decreases in the food supply. The same situation applied to crossbills in that most instances of changes in numbers of birds and cones diverging from a direct relationship were where cones increased but birds did not. There were the same number of instances of crossbills and cones diverging from a direct relationship in either direction in terms of abundance however (see Summers 1999).

Discussion

Siskins have slender bills which are mainly used like tweezers to extract seeds from cones and seedheads. They feed mainly on birch *Betula* and Alder *Alnus glutinosus* in winter, and conifers through much of the breeding season. These are supplemented by a wide variety of other plant seeds subject to availability, especially those of the *Asteracea*e and docks *Rumex* (MacDonald 1968, Newton 1972). They cannot open unripe pine cones, but feed on pine cones which have been partly opened by crossbills or by dry weather in spring (Nethersole-Thompson 1975, Staines *et al* 1987, Shaw 1990).

The present study confirms Nethersole-Thompson's assertion that there was a relationship between the abundance of Siskins and the size of the Scots Pine cone crop on upper Strathspey. This is in keeping with Summer's (1999) finding for crossbills in the same area, but differs from the situation in Finland, where the numbers of Siskins and Common Crossbills were related to changes in the size of the Norway Spruce *Picea abies* cone crop but not to that of Scots Pine (Haapanen 1966, Reinikainen 1937, Summers 1999). Norway Spruce constitutes the main food of Siskins in Finland (Haapanen 1966, Newton 1972). Shaw (1990) found the greatest numbers of Siskins in years of large cone crops of Sitka Spruce *Picea sitchensis*, the dominant tree species, in Glentrool Forest between 1983–88.

Summers (1999) found that there was a stronger relationship between changes in abundance of crossbills and the cone crop than between abundance of these, and considered this to be due either to inaccurate recording or from a time lag between changes in cone crop and abundance of birds. As this pattern was also found for Siskins, it is perhaps unlikely that inaccuracies would be found for both species in the same years. Factors which will influence the numbers of Siskins which settle in an area will include the numbers of birds searching for food and the availability of food in surrounding areas (see Summers 1999). The availability of Scots Pine seeds to Siskins will depend more on the weather than it will for crossbills, as they rely on dry weather to open pine cones. From the present study, it is clear that Siskins and crossbills respond to changes in the Scots Pine cone crop in broadly the same way.

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Are reintroduced White-tailed Eagles in competition with Golden Eagles?

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Since the White-tailed Eagle was reintroduced into Scotland in 1975, it has been predicted that inter-specific competition for food would displace the Golden Eagle from many coastal ranges. We examined the effects of White-tailed Eagle activity on the breeding performance of Golden Eagle ranges on Mull, where both species occur at relatively high density for Scotland. There was no consistent effect of White-tailed Eagle on Golden Eagle productivity or range occupancy. Only a single and temporary example of occupation of a Golden Eagle nest site by White-tailed Eagles was recorded. While the results may be premature and suffered from low sample sizes, they suggest that Golden Eagles may not be displaced from all ranges that historically were occupied by White-tailed Eagles. We put forward several arguments that cast doubt on previous studies' suggestions that inter-specific competition for food is important and that historical changes in the 2 species' distribution in Scotland were the result of competition. We tentatively suggest that the 2 species can co exist in western Scotland, although continued monitoring and further studies of competition are recommended.

Introduction

Numbers of White-tailed Eagles *Haliaeetus albicilla* have been slowly increasing in western Scotland since their reintroduction started in 1975 (Love 1983, Green *et al* 1996); in 2000 there were 19 breeding pairs in Scotland (22 pairs apparently holding territory) (Evans *et al* in press). It has been suggested that the continued spread of the White-tailed Eagle in Scotland will lead to the displacement of Golden Eagles *Aquila chrysaetos* through competitive effects as coastal ranges are reclaimed (Thom 1986, Watson *et al* 1992, Watson 1997, Halley and Gjershaug 1998, Halley 1998).

The White-tailed Eagle is globally 'near threatened' (Collar *et al* 1994), but both eagle species are treated as vulnerable under European conservation law (Tucker and Heath 1994) and are afforded the highest level of legal protection in the UK. It is important to understand the nature of any inter-specific competition so that, as White-tailed Eagle numbers increase, deleterious effects on the Golden Eagle population may be minimised.

In this paper we attempt to answer 2 questions: is there evidence of competition between the 2 species in western Scotland, and are there any indications of how they may compete? The island of Mull has the highest density of White-tailed Eagles and one of the highest densities of Golden Eagles in Scotland. We use long term data on breeding success and range occupancy of Golden Eagles on Mull to look for spatial patterns in Golden Eagle productivity and for temporal declines in Golden Eagle productivity and range occupation in association with the settlement and use of Golden Eagle ranges by White-tailed Eagles. As both species are long lived and competitive effects may take many years to become obvious, it is possible that, even if competition does occur, it may not be detected by this study. Hence, our study may be premature. But if competition does not take many years to become obvious, our study may help by identifying its form and allow mitigating management to be started while the White-tailed Eagle population is still in an early phase of expansion. We also feel that it is important to report on this issue, given IUCN (1998) calls for the monitoring of reintroduction projects and Fischer and Lindenmayer's (2000) criticism of the lack of communication from reintroduction projects on outcomes.

Methods

Fieldwork was conducted on the island of Mull, where both species of eagle bred until White-tailed Eagles became extinct in the 1860s (Harvie-Brown and Buckley 1892). Golden Eagles continued to breed on Mull in spite of persecution (Gordon 1920) and White-tailed Eagles bred again on the island in 1983, following reintroduction to Rum (Love 1983).

Golden Eagles use and defend a group of nest sites and a surrounding area used for hunting, all of which is known as a home range or territory (Watson 1997). Field methods to determine the range occupation and productivity of Golden Eagles were the same as 2 national surveys of Golden Eagles in Britain (Dennis *et al* 1984, Green 1996) and involved several visits per year to all known home ranges of Golden Eagles and potential nesting areas. Data were collected on range occupancy, breeding status, breeding success and the number of young fledged each year. Some ranges were visited from 1954 onwards, but complete coverage of all ranges was not attempted until 1981 and so our analyses used data from 1981 to 1999.

Following Green (1996) a range was classed as occupied if a pair of Golden Eagles were seen together in spring or if there was evidence of breeding activity (eg a built up nest). We considered a range as unoccupied if a pair was not seen during a visit and there was no sign of breeding activity and as abandoned if it was unoccupied over a 3 year period. We excluded cases where it was known or suspected that eggs had been stolen.

All observations of White-tailed Eagles and the location and fate of breeding attempts were recorded (see also Green *et al* 1996) and assigned to a Golden Eagle home range (McGrady *et al* 2002). Because observer effort per Golden Eagle home range varied both between ranges and between years, it was not possible to assign White-tailed Eagle activity scores on the basis of a wholly objective measure, such as the number of sightings of White-tailed Eagle per Golden Eagle home range per year. Instead, for each year since 1981, we classed the presence and activity of White-tailed Eagles within each Golden Eagle range to one of 5 ordered categories: 0 = no known activity, 1 = rare observations of use, 2 = occasional observations of use, 3 = frequent and regular observations of use, 4 = breeding pair. The simple classification allowed informed estimates to be made of activity by both breeding and non breeding White-tailed Eagles in each year, but assumed that the impact of breeding birds was higher than that of non breeders.

We looked for evidence of competitive effects both spatially and temporally. For our analysis of possible spatial effects, we summed White-tailed Eagle activity scores over the period 1983-1999 for each Golden Eagle range (for example, if there were rare observations of use by White-tailed Eagle (activity score = 1) in every year then the range would have an activity score of 17 (1 x 17 years)). We placed each Golden Eagle range in one of 2 categories based on cumulative activity scores for White-tailed Eagle between

1983 and 1999. Ranges with cumulative activity scores of 34 or less (representing the mid point of potential scores) were classed as having low White-tailed Eagle activity and those with cumulative activity scores over 34 as having high White-tailed Eagle activity. We then compared productivity (number of young fledged per year) of the 2 classes with a Mann-Whitney test. We also correlated Golden Eagle productivity with White-tailed Eagle activity scores for Golden Eagle ranges (variables were approximately normally distributed: one sample Kolmogorov-Smirnov tests).

In our analysis of possible temporal effects, we examined annual White-tailed Eagle activity scores for each Golden Eagle range. We took the first year to show an increase in the activity score as the first year of a 'high White-tailed Eagle activity' period and classed preceding years as the 'low White-tailed Eagle activity period' period. As activity scores did not always remain stable from year to year, we assumed an increase had occurred only when an increase in activity score was sustained for at least 3 years. We then calculated Golden Eagle productivity (number of fledglings per year) of each range for low and high White-tailed Eagle activity periods.

Annual breeding success of Golden Eagles can vary markedly (eg Watson 1997, Steenhof *et al* 1997). Productivity of some Golden Eagle ranges on Mull was also adversely affected by canopy closure of commercial forest plantations (Whitfield *et al* 2001) and this was more likely to occur later in the study period. Hence, we had to account for 'year effect' and any effect of new forests in our productivity measures. We did this by evaluating productivity relative to the productivity of 6 Golden Eagle ranges which experienced no increase in White-tailed Eagle activity or new forests over the study period. In addition, we analysed ranges only if they were not affected by canopy closure of new forests. We calculated standardised productivity scores for each range during both low and high activity periods. A standardised score was the difference in productivity between the range in question (for years with productivity data) and the productivity of the 6 "control" ranges (for the same years). We then carried out a Wilcoxon signed ranks test to determine if standardised productivity scores declined due to increased White-tailed Eagle activity (see Kochert *et al* 1999 and Whitfield *et al* 2001 for use of a similar method).

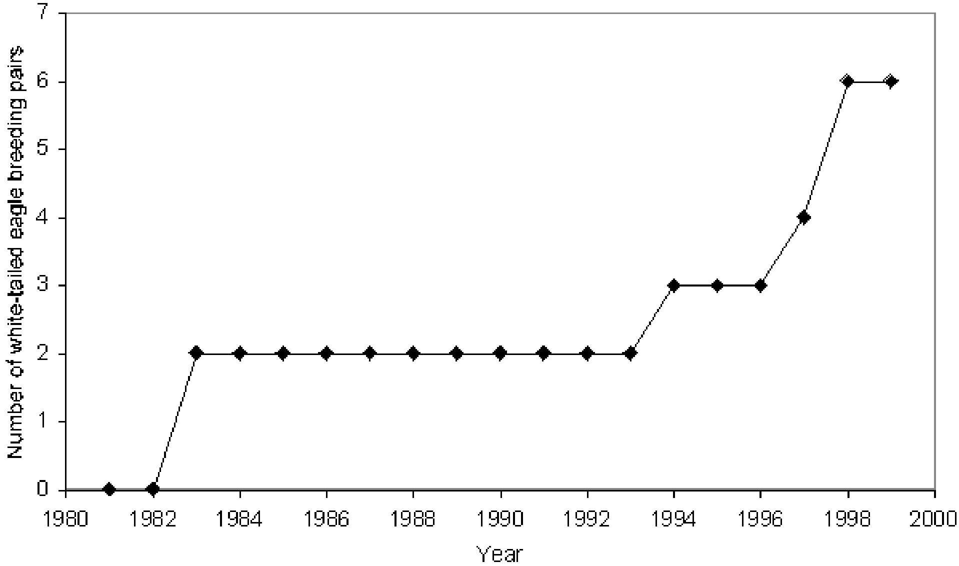
We did not formally test the effect of White-tailed Eagle activity on Golden Eagle range occupancy, as no Golden Eagle ranges were abandoned. Although one tailed tests of possible effects on Golden Eagle productivity are appropriate if one accepts the suggestion made by previous studies that White-tailed Eagle activity will have a negative effect on Golden Eagle biology, there are plausible reasons why White-tailed Eagle activity might have a positive effect on Golden Eagles and so all tests were 2 tailed.

Results

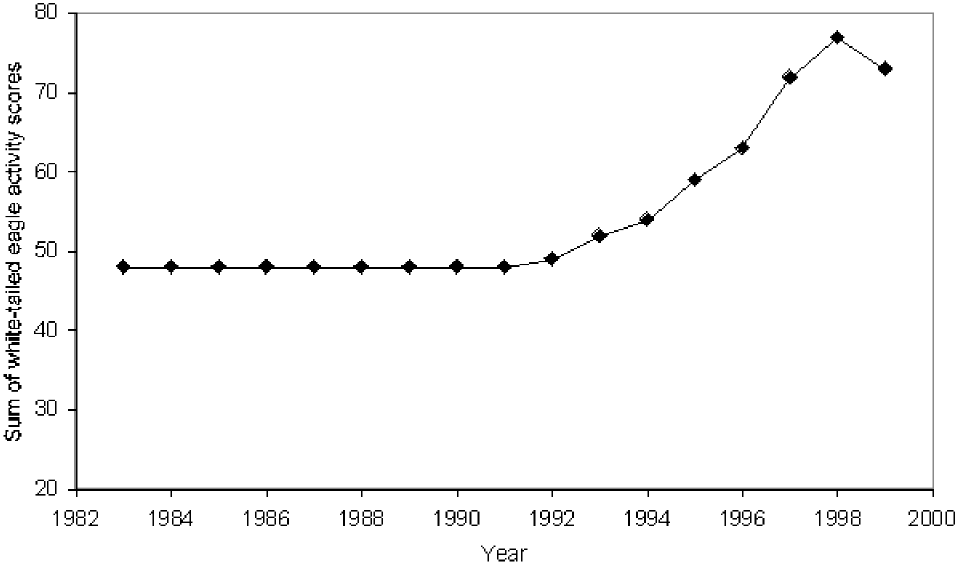
Between 1983 and 1993 the number of breeding White-tailed Eagle pairs and the activity of White-tailed Eagles within Golden Eagle ranges was stable, but from around 1994 onwards, there was a period of increase in both measures (Fig 1). There was no marked difference in productivity between the 2 groups of Golden Eagle ranges that were classified as having high or low White-tailed Eagle activity (median productivity, low activity 0.44, high activity 0.47; $U = 101$, N low = 17, N high = 12, $P = 0.97$). Restricting analysis to only those ranges with no influence of forestry had little effect on the result (median productivity, low activity 0.50, high activity 0.59; $U = 17$, N low = 5, N high = 7, $P = 0.94$). With the available sample size (29 ranges), there was only a reasonable power

Fig. 1. ***Annual changes in a) the number of breeding pairs of White-tailed Eagle, and b) the combined White-tailed Eagle activity scores on Golden Eagles ranges, on the island of Mull, western Scotland.***

a).



b).



(>0.7) to detect a correlation of greater than ± 0.4. Nevertheless, there was no evidence of a strong positive correlation between the productivity of Golden Eagle ranges and the activity scores of White-tailed Eagle for Golden Eagle ranges ($r = -0.20 \pm 0.37$ 95% CL, $P = 0.30$, $N = 29$). The relationship was similar when the analysis was restricted only to ranges where there had been no influence of forestry ($r = -0.20 \pm 0.61$ 95% CL, $P = 0.54$, $N = 12$).

In our analysis of temporal effects, the activity scores for White-tailed Eagle increased in 7 Golden Eagle ranges where there was no influence of forestry during the study period. Median productivity scores were 0.19 and 0.44 for low and high White-tailed Eagle activity periods respectively. One range showed a decrease in productivity score and 6 ranges showed an increase in productivity score following an increase in White-tailed Eagle activity. The change in productivity was in the opposite direction to that expected if White-tailed Eagles were having an adverse effect (Wilcoxon $Z = -1.69$, $P = 0.09$). Two Golden Eagle ranges where White-tailed Eagles started to breed in 1983 could not be included in this analysis as low availability of data from 'unaffected' ranges prior to 1983 prevented calculation of standardised productivity scores for these 2 ranges. Non-standardised productivity (fledging rate) in these 2 ranges before and after the settlement of breeding White-tailed Eagles did not differ consistently (before: 0.78 and 0.46, $N = 9$ and 13 years; after: 0.53 and 0.77, $N = 17$ and 17 years). Six White-tailed Eagle territories were established during the study period. None was associated with range abandonment by Golden Eagles and only one was associated with any change in Golden Eagle nest site use. In this case, 2 years after the death of an adult female Golden Eagle (probably through intra specific aggression) and with no appearance of a replacement female, a favoured Golden Eagle nesting cliff was occupied by a White-tailed Eagle. After 6 years of no successful breeding attempts, White-tailed Eagles abandoned the cliff and it was re occupied by a pair of Golden Eagles.

Discussion

The increase in White-tailed Eagle activity and breeding pairs on Mull from 1994 to 1999 was not mirrored by any island wide change in the fledging rate of Golden Eagles. The production rate of twin fledglings declined in Golden Eagles between 1987 and 1999, but this was probably attributable to changes in weather (Watson *et al* in press). There was also no overall change in the number of occupied Golden Eagle ranges (Whitfield *et al* 2001).

Although our analyses involved 7% of all Golden Eagle ranges in Scotland (Green 1996), our tests of possible competitive effects between the 2 species had low power due to low sample size. This is a common problem in conservation biology, but not one that should necessarily deter judgements of effect (Caughley 1994). In our spatial analyses we found a low negative correlation between Golden Eagle productivity and the activity of White-tailed Eagles. With the available sample size we could not estimate low correlations with a high degree of precision, but we could at least tentatively conclude that the levels of White-tailed Eagle activity observed to date have not had a strong effect on Golden Eagle productivity. Our spatial analyses were confounded by other influences on Golden Eagle productivity and our test of temporal effects was stronger, as between range differences in Golden Eagle productivity were controlled for.

In our test of temporal effects, we found higher productivity of Golden Eagle ranges following an increase in White-tailed Eagle activity. This was unexpected if White-tailed Eagle activity has a depressive effect on Golden Eagle productivity. It is possible that the presence of White-tailed Eagles benefited the Golden Eagles by an increase in protection from nest robbers, but none of the Golden Eagle ranges had a history of nest robberies. Alternatively, the result might suggest local increases in food supplies benefiting both species, or that White-tailed Eagles have tended to settle on ranges occupied by more experienced Golden Eagle pairs, which enjoyed enhanced breeding success. Whatever the explanation, we suggest that the present study found no biologically significant adverse effects of White-tailed Eagles on Golden Eagles.

Only one temporary change in Golden Eagle nest site occupancy remotely suggested exclusion by White-tailed Eagles. Crane and Nellist (1999) describe another example of White-tailed Eagles occupying a Golden Eagle nest site, on the Isle of Skye, although as in this study, Golden Eagles did not abandon the range but merely moved to an alternative nest site. White-tailed Eagles have been known to kill Golden Eagles (Watson 1997) but Golden Eagles can also kill White-tailed Eagles and occupy their nest sites (Willgohs 1961, Bergo 1987). Despite such records, many years of observations on Mull have revealed numerous examples of close proximity between the 2 species with no aggressive interactions (R A Broad unpublished). Two recent reviews of White-tailed Eagles in Scotland away from Mull have also concluded that as yet there appear to be few signs that their re introduction has had a serious effect on resident Golden Eagles (Nellist and Crane 2001, Love in press).

Previous studies suggested that reintroduced White-tailed Eagles would displace Golden Eagles from parts of western Scotland through competition. The argument favouring competition has 3 strands. First, in the nineteenth century, Golden Eagles were scarce on the coast of western Scotland in the presence of White-tailed Eagles, but occupied coastal ranges following extermination of White-tailed Eagles (Love 1983). This has been interpreted as competitive exclusion and subsequent colonization in the absence of a competitor (eg Thom 1986, Watson *et al* 1992; Watson 1997, Halley 1998). Second, a recent comparative dietary study found a strong overlap and inferred competition for food (Watson *et al* 1992). Third, a stronger degree of overlap in the 2 species' distribution in modern Norway than in western Scotland in the nineteenth century has been interpreted as evidence that, when live prey is low due to environmental degradation, White-tailed Eagles will outcompete Golden Eagles (Halley 1998). The assumption of historical competitive exclusion (argument 1) is fundamental. All other lines of evidence for competition rest on this assumption, but we would argue that several arguments point to it being flawed.

The distributions of both eagle species in nineteenth century Scotland were undoubtedly heavily affected by persecution (eg Gordon 1920, Love 1983). Love (1983) suggests that even in inland areas the Golden Eagle was restricted to deer forests in the Scottish Highlands, where land managers were more tolerant of its presence. Incidentally, the figure used by Love (1983) to illustrate this point has since been used to infer competition. Although persecution of both species dramatically intensified during the nineteenth century there is evidence of organised persecution from much earlier (eg Love 1983, Lister-Kaye 1994, Ralph 1996). Intense persecution, coupled with an intrinsic difference in the 2 species' ecology (Morris 1866, Gray 1871, Harvie-Brown and Buckley 1892, Gordon 1915, Baxter and Rintoul 1953, Ralph 1996), seems to us a more likely explanation of nineteenth century distribution patterns than interspecific competition. The subsequent expansion of Golden Eagles into areas formerly associated with the presence of White-tailed Eagles may have been due not so much to the absence of competing White-tailed Eagles, but to reduced persecution (Watson 1997). Changes in food supply resulting from increased numbers of sheep and red deer *Cervus elaphus* (Love 1983, Lister-Kaye 1994, Scottish Natural Heritage 1994) may also have assisted the expansion of Golden Eagle range in western Scotland, although increased stock densities should not necessarily be equated with increased availability of carrion (Fuller and Gough 1999), which may support high densities of Golden Eagles (Watson 1997).

A second argument for competitive effects is an apparently strong overlap in diet found by a study in Scotland in the 1980s, with both species apparently relying heavily on sheep and deer carrion (Watson *et al* 1992). It may be unsafe to place too much emphasis on this study, as it occurred relatively soon after the start of the White-tailed Eagle re introduction scheme and involved only 2 White-tailed Eagle pairs on Mull (Watson *et al* 1992). Overlap in resource utilisation, while a prerequisite for a demonstration of competition, deserves careful consideration and its interpretation is difficult (Wiens 1989). For example, if White-tailed Eagles and Golden Eagles obtain carrion from different habitats, the fact that carrion occurs in both diets does not indicate competition. White-tailed Eagle nests on Mull tend to be found in lower altitude habitats to those used by Golden Eagles and this may suggest that carrion is obtained in different areas (P F Haworth and R J Evans unpublished data, see also Nellist and Crane 2001). In some birds, a substantial overlap in resource use between species can be indicative of a 'superabundant' resource and minimal competition (reviewed by Wiens 1989). Pout (1997) concluded that, on the Isle of Harris, sheep carrion was well in excess of the requirements of most Golden Eagle pairs. Taking all these considerations together, the dietary overlap documented by Watson et al (1992) may be considered as only weak evidence of contemporary competition and recent analysis seems to indicate less dietary overlap than the earlier study (Marquiss *et al* in press, Madders & Marquiss in press).

We see several difficulties in the third argument for competition. A stronger degree of overlap in the 2 species' distribution in modern Norway than in western Scotland in the nineteenth century has been interpreted as evidence that, when live prey is low due to environmental degradation, White-tailed Eagles will outcompete Golden Eagles (Halley and Gjershaug 1998, Halley 1998). First, it is clear from many nineteenth century accounts that, at least at the scale of large islands (such as Mull, Skye and Harris), the ranges of the 2 species overlapped in Scotland (Morris 1866; Gray 1871, Harvie-Brown and Buckley 1892, Gordon 1915, Baxter and Rintoul 1953, Ralph 1996) in spite of persecution and intrinsic differences in the 2 species' ecology. Second, nineteenth century accounts (eg Morris 1866) indicated that the diet of Scottish White-tailed Eagles in the nineteenth century was principally fish and waterbirds, as is the case over much of the species' range today (Wille and Kampp 1983, Willgohs 1984, Sulkava *et al* 1997). Third, sporting estate and fishing fleet records, which form much of the evidence for contemporary environmental degradation of the western Highlands, suggest that widespread declines in wild non predatory fauna did not occur until the early twentieth century, after the White-tailed Eagle had been exterminated (eg Hudson 1992, Hunter 1994). Fourth, Halley (1998) dismissed direct access to food as a competitive mechanism because of the results of Halley and Gjershaug (1998) and favoured an indirect competitive mechanism, of superior digestive capabilities by White-tailed Eagles. However, even though the Golden Eagle is a smaller bird, it seems to require less food relative to body weight than the White-tailed Eagle (Fevold and Craighead 1958, Brown 1978, Love 1979, 1983, Wille and Kampp 1983). This is not in keeping with the Golden Eagle being at a disadvantage in any indirect competition over food supplies.

More attention has focussed on competition over food than competition over nest sites. Tree nesting by Scottish White-tailed Eagles in the nineteenth century appears to have been less common than in modern western Scotland (Love 1983, this study). It is possible that suitable trees for nest sites are more available now than formerly (Birks 1988, Lister-Kaye 1994, Halley 1998), but trees currently used by White-tailed Eagle for nesting in Scotland tend to be large (R J Evans unpublished data) and therefore probably old and of types likely to have been equally available during the nineteenth century. More probably, the low number of documented tree sites in nineteenth century Scotland was due to the greater vulnerability of tree sites to persecution and the earlier abandonment of these sites (eg MacKenzie 1921). It is also possible that lower numbers of socially dominant Golden Eagles (Halley and Gjershaug 1998) in coastal Scotland in the nineteenth century may have allowed White-tailed Eagles to use cliff nest sites more often. Disentangling the effects of differences in woodland cover, persecution and possible direct competition over nest sites is difficult, but it may be that, in modern Scotland, the presence of Golden Eagles combined with a shortage of suitable trees may restrict the availability of unoccupied nest sites for White-tailed Eagles. In some areas, this effect may be limiting the expansion of White-tailed Eagles. Direct interference competition over nest sites may be very difficult to demonstrate, but is worthy of examination.

It is only 15 years since White-tailed Eagles started to breed again on Mull but so far there have been few of the indications of attrition in either productivity or range occupation of Golden Eagles which might be expected if the 2 species were competing for food. Evidence for competition is weak: so far the field signs suggest that the re introduction of the White-tailed Eagle may have only minimal effects on the Golden Eagle population and that the 2 species can co exist at current resource levels. It may still be too early in the reintroduction programme of the White-tailed Eagle to dismiss completely competition for food as an important factor. Hence, efforts to increase the availability of live prey should be encouraged; even if an increase in prey does not affect interspecific competition, it may increase productivity and/or numbers of breeding pairs. If competition for nest sites occurs, it may slow the re establishment of White-tailed Eagles, unless artificial nests are provided. Monitoring of both eagle species should be continued and the present type of analysis repeated in the future and in other parts of western Scotland to overcome the main problems with the present study; small sample sizes and a short period of interspecific contact.

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SHORT NOTES

Winter nesting Tawny Owl in West Lothian

On 9 March 2001 a juvenile Tawny Owl *Strix aluco* was found freshly dead in a field near Linlithgow Loch in West Lothian, at the end of a very cold spell during which the loch was partially frozen over. Although well feathered the plumage was still partly downy especially on the head and underside, and the main flight feathers on the wings and retrices on the tail were still half encased in their quill cases. It was found on open grass among parkland trees and it seemed very unlikely that it had been able to fly more than a very short distance from its nest. The bird was very thin and had probably starved to death.

At first it was thought to be a Little Owl *Athene noctua* as the overall length was only 21cms, little more than half the length of a fully grown juvenile Tawny Owl, 37-38 cms. From the feather development it was estimated to be not less than 5 or 6 weeks from hatching, which gives a laying date in late December when there had been much milder weather. The breeding chart in *The Birds of the Western Palearctic* shows only exceptional laying before mid February in north west Europe and Britain, with the earliest hatching at the beginning of March, the average date being mid April.

Due to foot and mouth restrictions in the area, it was not possible to attempt to locate where the young bird had come from or what had happened to any other young from the brood. Tawny Owls breed regularly in the area but there is no previous record of unusually early breeding.

The specimen has been submitted to the Royal Museum of Scotland in order to validate the record.

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Common Ravens breeding for the first time at 5 years old

On 10 April 2000, while walking along a stretch of cliffs in the West Mainland of Orkney, I flushed a Common Raven *Corvus corax* from a nest. This was the first time that I had seen Common Ravens nesting at this location, which was close to a public footpath. I knew from a white colour ring that this was a bird I had ringed as a nestling in 1995. I returned to the site on 21 April but it was deserted. The nest had been pulled off the ledge onto the beach below and the eggs lay broken amongst the lining.

In early May 2001, I was informed that a pair of Common Ravens had a nest with young in a small coniferous plantation in the West Mainland. This was a territory that had only been occupied on one previous occasion, when no young had been reared. I visited the site on 10 May but found that the nest, which had been built on top of the remains of the original one, contained 3 young. The adult was circling over the plantation and I was able to see from a yellow colour ring that this was a bird ringed as a nestling 5 years before in 1996.

As I monitor the Common Raven breeding population of Mainland Orkney each year I am fairly certain that both 5 year old colour ringed birds were breeding for the first time. The only previous occasion I had been able to obtain information on the age at which Common Ravens first breed in Orkney was for a 6 year old wing tagged bird (Booth, C J 1986 Raven breeding for the first time at 6 years old *Scottish Birds* 14:51). Ratcliffe (Derek Ratcliffe 1997 *The Raven* T & A D Poyser, London) gives 4 instances of first breeding at 2 years old and mentions a captive bird first laying at 4 years old. He notes that the average age of first breeding is not known.

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Talon grappling and aggressive interactions by Merlins in winter

Merlins *Falco columbarius* will touch talons during aerial chases at their roosts and during the day in winter, apparently with little antagonism (Dickson 1973, *Scottish Birds* 7: 228-292; 1991, 16:141-142), but extensions of this behaviour occurred in west Galloway on 3 occasions in 1986-97.

On 7 October 1986 a brown Merlin, female or juvenile, was sitting on a fence post when it was swooped on by a brown Merlin, a male by size. They gained height and were joined by another brown Merlin. All swooped on each other, turning over on their sides and interlocked talons. On 4 October 1991 a brown Merlin was hunting a Common Linnet *Carduelis cannabina* flock when another, smaller brown Merlin, male by size, appeared. Both swooped up, turning on their sides, talon grappling. The first Merlin flew away followed by the smaller Merlin which landed in the field only to be swooped, closely and aggressively, by the other bird. On 26 January 1997 a brown Merlin, male by size, was hunting a Common Linnet flock. It flew quickly across the field for a short distance, met another brown Merlin and both talon grappled and flew on. The only published record on talon locking in winter involved a Merlin and a Peregrine Falcon *Falco peregrinus* when the Peregrine rolled upside down and interlocked talons (Wallen 1992, *British Birds* 85:496).

Apart from talon grappling, I recorded only 4 other occasions between 1965-2000 when Merlins reacted aggressively during hunts. On 6 January 1974 a brown Merlin swooped on another brown Merlin sitting on a fence post and displaced it. For the next 35 minutes, the first Merlin displaced the second Merlin 5 times, each time the birds fluttered together in the air. The first Merlin eventually flew away to hunt. On 16 January 1991 a brown Merlin flew down from a fence post and swooped, threateningly, on another brown Merlin on the ground, which ‘fluttered’ its wings and mantled its prey. The first Merlin landed beside it and tried to displace the other Merlin from its prey before flying back to the post. Five minutes later the first Merlin repeated the same tactics swooping on the second Merlin which again mantled its prey. The first Merlin circled and flew back to the fence post before flying away whilst the second bird ate its prey. On 13 November 1994 while a male Merlin hunted Sky Larks *Alauda arvensis*, a brown Merlin appeared and both birds flew towards some fence posts. The male swooped, antagonistically, on the other Merlin and, as he landed, the brown Merlin displaced him from one of the posts. The male Merlin flew away followed by the brown bird. On 8 November 1996 a male Merlin hunted a Common Linnet, unsuccessfully, and landed on a fence post only to be displaced by a brown Merlin. A second brown Merlin appeared and landed beside the other 2 Merlins. Four minutes later a male Hen Harrier *Circus cyneus* approached the Merlins and all 3 flew up and circled. The male Merlin flew in a wide circle and tried to displace a brown Merlin from a fence post by hovering directly above but the male failed to displace it.

Interestingly, Warkentin & Oliphant (1990, *Journal of Zoology*, London 221:539-563) found similar interactions in winter in Canada when a yearling female Merlin ignored a second brown bird hunting in the vicinity while she was eating, but proceeded to chase this same bird once she had finished her meal. In another instance a yearling female chased a brown bird, male by size, to the ground and took a partially plucked House Sparrow *Passer domesticus* he was carrying.

There is, apparently, little aggressive behaviour between conspecifics in winter (Cramp & Simmons 1980, *The Birds of the Western Palearctic*, vol 2, Oxford) but it would seem that talon grappling and displacement activity are aggressive encounters between Merlins, especially if one interferes with another during a hunt.

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Hen Harrier's sunning behaviour in summer and winter

Information on the sunning behaviour by Hen Harriers *Circus cyaneus* has not been well documented, although Brown and Amadon (1968, *Eagles, Hawks and Falcons of the World*, London) mention, without details, they have been observed to 'sun bathe'. This note reports 4 instances of the Hen Harrier's sunning behaviour in winter and summer recorded during studies in west Galloway.

On 16 December 1979 at 1036 GMT a relatively cool, cloudless, sunny day (5°C), I watched a female or juvenile Hen Harrier preening and stretching on a fence post. Half an hour later the harrier adopted the standing spreadeagled sunning posture with its back turned towards the sun. The harrier's wings were outspread for more than a minute, similar to the behaviour recorded by a Peregrine Falcon *Falco peregrinus* in winter (Dickson 1995, *Scottish Birds* 18:58-59).

On 12 May 1984 at 1200 BST on a warm and sunny day, a female Hen Harrier arrived back in its breeding area and landed on a grouse (Willow Ptarmigan *Lagopus lagopus*) butt. Two minutes later, after preening, she adopted a standing full spreadeagled sunning posture, with her tail spread and her back to the sun showing her white rump.

On 27 August 1984 at 0946 BST on a warm but misty day, I watched 3 fledgling Hen Harriers standing on a grouse butt in a different breeding area about 300m from the nest site. They stood idly, occasionally preened and walked about on the butt. Ten minutes later, the sun broke through and one of the young lay flat on the butt with its wings spreadeagled in a sunning posture, back to sun exposing its white rump.

On 1 May 2002 at 1050 BST a day of sunny spells and a cool wind, a male Hen Harrier arrived back in its breeding area and landed in a grassy patch where it preened on the lee side of a heather ridge. During a spell of warm sun at 1124 hrs, the male adopted the full spreadeagled sunning posture, standing with wings outspread showing his white rump. Twice more it adopted the same attitude when the sun shone, latterly adopting a loose spreadeagled posture before flying away at 1135 hrs.

Other raptor like the Eurasian Sparrowhawk *Accipiter nisus*, Merlin *Falco columbarius* and Peregrine Falcon use a standing full or loose spread wing sunning posture and the spreadeagle sunning position on the ground has also been observed in these species (Simmons 1986, *The Sunning Behaviour of Birds*, Bristol; Dickson op cit, 1998 *Scottish Birds* 19:176; Rollie 1999, *Scottish Birds* 20:39) although this behaviour is not previously documented in the wild by Hen Harriers.

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Mass deaths of Northern Gannets

On approximately 25 May 1988 (verbally reported to JBN on 2 July as 5-6 weeks ago) Fred Marr of North Berwick and F Bremner, Principal Lighthouse Keeper on the Bass Rock, noted the remarkable phenomenon of a large number (conservatively estimated between 50-100) of dead and dying Northern Gannets *Morus bassanus* in the sea less than one km north east of the Rock. Several appeared to have twisted or broken wings. There was no clue as to cause of death. As the merest speculation one might suspect an underwater detonation affecting a 'raft' of resting birds. There was no sign of a rock fall that might conceivably have hurled nesting birds into the sea nor is the Bass prone to them. Until recently JBN had no record of anything comparable affecting gannets elsewhere. But on 16 March 2001 BA chanced across 76 dead gannets on about 100m of beach at the mouth of a burn near Dunbar NT629815. Some were partly buried and all were thought to have been dead for perhaps 2 weeks. They were not oiled and no other species were involved. Previously there had been a period of strong to gale force north and north easterly winds, but due to limited access (Foot & Mouth Disease) the weight and condition of the birds was not noted. In any case it seems most unlikely that even if 76 birds had starved individually they would all have ended up within 100m, and more likely that a single incident had affected them all. Again, however, there is no clue as to what it was. An underwater explosion seems possible but the nature of such an event remains obscure. One or 2 possibilities spring to mind but speculation would not be fruitful.

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Fulmars nesting in a man made ditch

In Shetland many Northern Fulmars *Fulmarus glacialis* nest away from sea cliffs, occupying banks and disused buildings (e g Gibbons, D W, Reid J B & Chapman R A, 1993. *The New Atlas of Breeding Birds in Britain and Ireland*; 1988-1991. Poyser, London, Johnston J L, 1999. *A Naturalist's Shetland*. Poyser, London). On 9 June 2001 I located 16 birds incubating in a shallow ditch, some 200m in length, running parallel with the airfield runway on Unst. The runway ceased to be used on a regular basis from March 2001; it is not known whether the birds occupied the site before then but this would seem likely. The ditch is situated about one km from the sea at Baltasound. I photographed the site and birds on 9 June; they were all reluctant to leave and were not disturbed. Birds were scattered the length of the ditch, presumably occupying the better ledges; in one small area there were 6 birds sitting within about 30m.

I checked the site again on the 30 July expecting to see some chicks but all had gone, presumably having suffered predation; the only trace of their presence being some egg shell fragments.

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Winter site fidelity of Fieldfares in south west Scotland

Wintering Fieldfares *Turdus pilaris* in Britain are generally thought to have a highly variable, nomadic, migratory behaviour (Snow, D W 1986, Fieldfare, in *The Atlas of Wintering Birds in Britain & Ireland*. Calton). At the start of winter 1996 a study was initiated to investigate various aspects of wintering Fieldfare behaviour on the north shore of the Solway Firth, Dumfries and Galloway, south west Scotland (55° 00'N, 3° 26'W). This note presents evidence of site fidelity resulting from the study, which was centred around the small village of Clarencefield. The study area comprised open lowland farmland, much of which adjoined large conifer plantations where most of the birds roosted.

Fieldfares were colour ringed to assess movement within the study area. Birds were mainly trapped at the centre of the study site. Birds were caught either by an elastic powered clap net baited with apples sited in an orchard or mist nets set adjacent to low (< 3m.) Hawthorn *Cartaegus monogyna* hedges, in feeding areas. Mist netting usually took place in the morning utilising tape lures and often a stuffed specimen as a decoy. Birds caught during 1996/97 were colour ringed using a sequence relating to month and year. All birds were individually colour ringed throughout the 1997-98 season.

Fieldfares normally arrived in the study area in late October. The study area was visited weekly during 2 (1996-97 and 1997-98) winters from October to April inclusive. A fixed route through the study area was normally driven early in the morning but often in different directions, until it was established that there was minimal movement between feeding areas. From here on weekly transects ceased and remaining visits concentrated on more detailed observations of birds feeding within one feeding area.

Fieldfare numbers and presence/absence of marked birds were recorded along this 38 mile transect. Large flocks of similar size within neighbouring feeding areas were frequently checked to see if movement and hence double counting had taken place. This was determined by rechecking the size and location of specific flocks. No double counting was recorded. Observations were mainly made from a car using 10x40 binoculars and a 20-60x60 spotting scope. Field number and crop type utilised were recorded. Fieldfares usually fed on one of 7 identified "favoured" areas; each consisted of approximately 4 or 5 neighbouring fields. The numbers of birds checked and number of birds ringed and resighted is shown in Table 1. All 7 feeding areas were checked for colour marked birds; only one was found to support colour ringed birds (area 4).

Table 1 ***Total number of Fieldfares colour ringed and checked during 2 winter seasons.***

Winter	Number of birds colour ringed	Number checked for colour rings	Total number of colour ringing sightings*
1996-97	32	1237	21
1997-98	19	1693	41

*This includes some repeat sightings as birds in 1996-1997 were not idividually identifiable. Birds were marked individually after the 1996-1997 season.

Fieldfare presence within the study area showed a generally similar pattern during both winters (1996-97 & 1997-98). The number of birds counted during weekly transect counts was low during October and November, with a mean of around 75 birds counted per transect. December proved to be a somewhat indeterminate month to establish any pattern. However numbers of Fieldfares noticeably rose during January, averaging over 150 birds. This trend increased until numbers peaked in March, with an average of 340 birds, dropping back down to an average of 190 birds per transect in April. Both winters were relatively mild with only occasional light snow and morning frosts.

The number of birds checked for colour rings (including ad hoc counts) as a percentage of all birds seen was relatively low; 25% in 1996-97 and 39% in 1997-98 (Table 1). During weekly transects of the study area (1996-1998) an average of 27.5% (range of 15-43%) birds were checked for colour rings within each "favoured" feeding area. Colour ringed birds were found within only one "favoured" feeding area (area 4). This involved a total of 33 observations of marked birds (including repeats). Six birds (12%) out of 51 colour ringed were recorded in subsequent months of the same winter, with individuals remaining present into April.

On 12 December 1997 a bird ringed in the previous winter returned to the study area and another bird trapped during April 1997 was seen again on 6 March 1998. Three individually marked Fieldfares (birds B, C and D) that showed strong site fidelity during the same season as their capture (Table 2), were noted wintering at the same site the subsequent winter, during January 1999. During a brief check through a Fieldfare flock on 28 November 2001, one of these birds (bird B) was seen again.

Of the 6 birds marked with the same colour sequence on 4 April 1997, 11 resightings were made, 9 during winter 1997-98 and 2 during 1998-99. On the 6 March 1998 2 birds carrying this sequence were seen together. Out of 51 colour ringed birds, 5 (10%) showed signs of site fidelity in subsequent winters. Birds trapped between mid November and early January showed a greater propensity to remain site faithful than those trapped before and after this period (Table 2). Only one bird marked in October was resighted, possibly as birds were still migrating through the area at this time. Numbers trapped

Table 2 ***Minimum number of colour ringed Fieldfares observed during same season as of original ringing, both winters combined.***

Month ringed	Number ringed	Month colour ringed birds observed: Oct	Nov	Dec	Jan	Feb	Mar	Apr
Oct	13		A					
Nov	11			B	B	B*	B	B
Dec	9			C	C,D*	C,D	C,D	D
Jan	11				*	*	E*	
Feb-Apr	7							

Individually ringed birds coded bird A- bird E.
*Colour ringed bird from 1996-1997 not individually identifiable.

after January were too small to provide reliable data. Counts undertaken after January suggest that birds marked during this period may include individuals already on the return passage.

Ringing recoveries show that many Fieldfares spend consecutive winters as far apart as Ireland and Italy. However some individuals, and possibly some populations, are faithful to winter sites (Milwright R D P 1994, Fieldfare *Turdus pilaris* ringing recoveries during autumn, winter and spring, analysed in relation to river basins and watersheds in Europe and the Near East. *Ringing and Migration*, 15, 129-189). At one site in Eastern England, out of 910 birds, 11 (1.2%) were trapped again in later winters (Milwright pers comm). Of the 278 British and Irish ringed Fieldfares which have been recovered during a winter subsequent to that of ringing, 15 (5.4%) were recovered within 20km of their ringing site (Milwright op cit). Thus the limited evidence of site fidelity found in Dumfries and Galloway is not unique. It may be that such behaviour is important, either for some individuals or for birds from a particular geographical range. More winter studies are needed to elucidate why site faithfulness in the species is so variable.

Environmental factors could have an impact on winter movements. Dumfries & Galloway is usually a very mild part of Scotland, which may go some way to explain the relatively high rates of winter fidelity found in this area.

Fully grown Fieldfares are difficult to catch, especially during mild weather conditions. It was only during snow or frost that Fieldfares became more susceptible to trapping, often coming to apples in an orchard. The small number of birds colour ringed has been a limiting factor int he amount of data collected and presented.

We thank the Wildfowl and Wetlands Trust at Caerlaverock, Mr & Mrs Freeman of Clarencefield Farm and Mr & Mrs Goldie of Longbridgemuir Farm for permission to catch Fieldfares on their land. Thanks also to Carl Mitchell and David Norman for help and encouragement, Sarah Berker, Ken Bruce, Steven Cooper, June Randell & Derek Skilling for fieldwork or by providing observations on local birds, North Solway Ringing Group for support and supplying metal rings. T W Dougall, R Riddington and R L Swann kindly commented on earlier drafts of this paper.

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Some hazards of barbed wire as a nesting material

In some areas of Orkney nesting material, such as sticks and twigs, is scarce. In these circumstances members of the crow family, particularly Common Ravens *Corvus corax* and Carrion Crows *Corvus corone* usually of the hooded race *cornix*, use lengths of discarded barbed wire to build the framework of their nests. Less frequently Rooks *Corvus frugilegus* and Eurasian Jackdaws *Corvus monedula* may also incorporate barbed wire in their nests. I have watched Eurasian Jackdaws repeatedly visit the disused nest of a Raven, break off pieces of rusty barbed wire and fly with them to their nesting crevices.

Although I have not so far come upon any of the nest builders who have had problems with barbed wire, on 3 occasions I have found Northern Fulmars *Fulmarus glacialis*, a species that often occupies disused Common Ravens' nests, that have suffered. On 7 February 1987 I visited a traditional Common Raven nesting site on the west coast of Mainland, Orkney. On a ledge were the remains of a Ravens' nest from the previous year, the framework of which was composed almost entirely of lengths of barbed wire. A freshly dead Fulmar was suspended from the nest, with its wing caught on the wire. At the same site, on 4 March 1997 and again on 14 June 2000, I discovered single, recently dead, Fulmars hanging upside down on the edge of the nest having become entangled in the wire. On the latter date another Fulmar was sitting the nest but flew away as I approached.

The use of barbed wire can also prove a nuisance to humans. At a rookery in the West Mainland of Orkney nests are built in branches which overhang the driveway of a house. Car tyres have been punctured by driving over small peices of barbed wire that had fallen from the nests.

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Female Eurasian Sparrowhawk caching prey

K Needle *et al* describe this in the December 2001 *Scottish Birds*. We had a similar experience in February 2001. The bird plucked the pigeon, moved along and commenced eating it. It hopped away and put it on a bush (there was snow on the ground) and then flew on to a nearby Sitka Spruce *Picea sitchensis* where it sat for a while and flew off. I examined the carcass and judged there was no meat left on it and binned it. The Sparrowhawk reappeared next morning, hopped around the bush where it had laid the carcass, apparently looking for it before flying off.

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Drowning of Short-Eared Owl by gulls

On 10 August 2002 we were working on the northeastern shore of Waulkmill Bay, Mainland, Orkney. At 1505hrs ARL saw a Short-Eared Owl (*Asio flammeus*) flying across the bay from heathland on the northeastern side of the bay towards similar habitat on the southwestern side. The tide was on the ebb and the owl was flying more or less above the water's edge at a height of about 25 m. Its flight was unhindered and characteristic of the species, that is, deliberate wing beats interspersed with brief glides. ARL drew TWW's attention to the bird and both watched it as it progressed on its way. When the bird was approximately two thirds of the way across the bay it disturbed a juvenile Herring Gull (*Larus argentatus*) which had been standing on an exposed sandbank at the water's edge. This in turn caused 4 Mew Gulls (*L canus*) to take flight, whereupon they started to mob the owl. Their mobbing did not appear intense, the nearest approach being estimated at more than one metre, with no contact or deviation in the owl's flight being noted. Then, after about a minute of this activity, the owl suddenly turned sharply to the left and peeled off into an almost vertical dive onto the water's surface, where it settled, at around 1508hrs. Initially it appeared unperturbed and the gulls ceased mobbing it. After a few seconds, however, the owl attempted to take off, but failed, its wings spread forward into the water. It made a second attempt, but was evidently becoming waterlogged, as its body was sinking lower into the water, especially at the anterior. It continued to flap its wings, apparently in an attempt to make for shore, but it was rapidly drifting towards the mouth of the bay under the influence of the force 3 northwesterly wind. At this point it was briefly mobbed by an adult Herring Gull. It now seemed to be struggling to keep its head above water, presumably being only intermittently able to breathe as a consequence. At 1518hrs, the owl's movements ceased and it was presumed to have drowned as a result of inability to keep its waterlogged body in a position where it could breathe. Several Common Eiders (*Somateria mollissima*) swam over to investigate the corpse, but on close approach, they immediately turned and swam rapidly away.

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Erratum

In Chris Mylne's note on high numbers of auks in the Forth, the figure of 60,000 recorded on the 11 January should be 6,000 (page 112, paragraph 2, *Scottish Birds* Vol. 22 No.2). Our apologies to the author.

OBITUARIES

Alan Hilton
1958–2001

It is with great sadness that we record the death of Tree Sparrow enthusiast and ringer Alan Hilton. Alan was a husband and father, and worked as an Information Analysis manager in the Lothian University Hospitals NHS Trust. Alan's death was the result of a sudden haemorrhage.

For Alan, ringing was less of a hobby and more of a way of life. He had a boundless enthusiasm for birds, and possessed a persistence and inventiveness that few could match. One example was over a decade of work at his Constant Effort Site at Turnhouse, Edinburgh, which was the second longest running in Scotland, and one of the longest running in the whole Scheme. Another was his important Tree Sparrow colour ringing project at Hallyards on the Almond. He persisted where other surveyors had given up, not only rediscovering the population but also establishing a nest box scheme with a remarkably high take up from the birds. He reported his findings in *Scottish Bird News* 60, December 2000 and, posthumously, in *SBN* 64, June 2002.

Alan's interest in birds went hand in hand with his attachment to natural places. From Mull to the Isle of May Alan always sought the company of wild places as an antidote to the humdrum of everyday life, and there he found and befriended many likeminded people. His spiritual home though was Tayside, and the Tay and its surrounding countryside remained thus for all of his life.

In his many years in the Edinburgh area he put down strong roots in the land. He was adept at ferreting out the best birding sites and developed an unrivalled knowledge of their rhythms and natural history. This knowledge he willingly shared with others, consequently many ringers in Lothian and Tayside benefited from his training. Many of us have fond memories of fruitful ringing sessions with Alan as well as the rare fruitless ones, which were an opportunity to share his witticisms and sideways glances at life.

Alan was fiercely independent in character, and was protective of his local birds. He used his local knowledge to great effect to extract practical conservation support from landowners, conservation organisations, the local council and the like, and was instrumental in dramatically saving Craigie wood from the paintball nightmare which would surely have surely been its demise. A Craigie fit for both people and wildlife is surely one of Alan's great legacies. He will be sorely missed by his family and friends.

Clive Walton

Bruce C Forrester
1955–2002

All of Scotland's birdwatchers will be greatly saddened by the death of Bruce Forrester on 24 February 2002. A tall, slightly gangling character, almost always present on the scene of British rarities, Bruce had personal qualities which reached far beyond the friendliness experienced by many at such gatherings.

Born in 1955 at Crosby, near Liverpool, his family moved north to Eaglesham in the summer of 1960. Attending Eaglesham Primary, and later Williamwood High, a further move following the death of Bruce's father, saw him come to Ayrshire where he attended firstly Prestwick Academy and later Ayr Academy. Obtaining a diploma from Glasgow Art School, he started teaching Art at Largs Academy in 1977 before taking up a post at Carrick Academy, Maybole in 1992. He was indeed a very skilful artist, specialising in mosaics and hosting annual art displays at his house. The move to Carrick Academy was well timed since he had just married Eleanor who taught in Maidens Primary. The marriage itself, at Culzean Castle, was very appropriate since many of Bruce's ancestors had lived in the parish of Kirkoswald. After their marriage in 1991, they spent a lot of time travelling widely both in the UK and abroad, and were entirely devoted to each other.

My first acquaintance with Bruce was as a pure beginner at the Ayr Branch of the SOC where he generously gave his time and advice on both where to watch birds and how to identify them. At this time, during the early 1970s, both he and the late Billy Brackenridge were the local 'gurus' whose advice one always sought - and obtained. Bruce's commitment to birding was almost total, and his enthusiasm, along with that of his brother Ron, kindled many projects such as the local bird reports. Youngsters keen to take up the hobby found Bruce to be a patient coach, involving himself for many years with the Young Ornithologists' Club. In later years he would become the Chairman of the SOC Ayr Branch.

Patient he may well have been with people, but his frenzied antics in the field revealed another type of character (he was always credited with seeing the 1965 Cream-coloured Courser at Aberlady from his pushchair!). The fact that he could so easily dismiss such derision merely strengthened the belief that here was a man who would stop at nothing to pursue a rarity. Having experienced trips to the Scillies, and elsewhere in the UK, with Bruce at the helm, one escapade stands out in particular. Having arrived in Kent at 10pm one evening during the Easter holidays, news broke of a Savannah Sparrow at Portland. Most people would have sighed, and maybe thought of heading there on the following day. Not Bruce! It was as if his car had been caught in a gust of wind and spun around - we were now heading for Portland. The next 6 days took us to the tip of Cornwall, the New Forest, back to Kent and back north via Norfolk, Bruce well pleased with his haul of 9 BB rarities!

He was always keen to push on. So much so that, on one trip to the USA, having acquired one 'tick' more than he bargained for, I had to carry out minor surgery on Bruce's scalp with my penknife while he concentrated on driving as fast as possible to the next location! The notion that he was only keen on 'ticks', though, could not have been further from the truth since repeated trips to Brazil earned him the respect of birders just starting to visit South America, and he was often at his most enthusiastic when discussing birds that most of us would struggle to visualise.

I can still see Eleanor and Bruce at Scotland's first Snowy Egret, and well remember his appearance on January 3rd this year when an American Wigeon showed up at Irvine; (he'd already been up to Montrose the previous day to see an Ivory Gull!). This extreme eagerness to see and find was always evident and we'll all miss it. His infectious enthusiasm, enormous energy in seeking out birds, willingness to contribute to the future of birding, great skill and thoroughness in matters of identification and strong artistic talent were all encompassed by a genuine thoughtfulness towards both colleagues and strangers alike. These are qualities which singled out Bruce as one of Scotland's most accomplished and respected birders.

Angus Hogg

Dr Ian Durance Pennie MB ChB 1916–2002

Ian was born in the Parish of Fyvie, Aberdeenshire, on 20 March 1916, the son of a Canon in the Scottish Episcopal Church. He went on to Aberdeen Grammar School, and thence to Aberdeen University, where he took his medical degrees in 1939. This was followed by a period of service in the RAMC - first in France, Belgium and Holland, and finally in India, from where he was demobilised in the rank of Major.

Almost the whole of the remainder of his life was destined to be spent as a general practitioner in the County of Sutherland. He started in 1948 at Tongue, one of the most remote practices on mainland Britain. In 1940 he had married Janet Gillies, and after 5 years at Tongue, the educational requirements of their 2 growing daughters caused them to move to Golspie where, in addition to his practice, Ian held the post of anaesthetist at the local hospital. But 1966 saw a crisis point in his life. His marriage was foundering; he was becoming increasingly dissatisfied with the medical set up in Golspie; and he saw his chance of setting up a new life in a different field which had always been his main interest.

So he returned to Aberdeen University, and in 1967 emerged with a degree of MSc in Ecology. A year with the Nature Conservancy convinced him that there were no adequate prospects there for a man of his age. Reluctantly he returned to medical practice and found a temporary job in West Lothian, which he hated. This was the nadir of his life, from which he was rescued by a chance meeting with Edith Wilkinson, then working as a consultant anaesthetist in Liverpool, whom he had met 20 years earlier, while they were both serving with the RAMC in India. Ian was able to return to Sutherland in 1970 when the medical practice in Scourie fell vacant. Janet's tragic death in a car crash in 1971 enabled Ian and Edith to marry the following year. He retired in 1977, when he and Edith built their dream house above Badcall Bay, with a panoramic view over all the sensational Sutherland peaks that Ian had come to know so well in his earlier days.

Ian's contribution to the ornithological literature spanned over 50 years. His first was in 1942, when he recorded the finding of a White-tailed Eagle in Kincardineshire (*British Birds* 36:113): his last was in 1988, when, in typically scholarly style, he quoted historical evidence for the fact the killing by Great Skuas of Kittiwakes was no recent phenomenon. Of his many contributions between these dates, the following deserve special mention:-

Summer bird notes from Foula (*Scottish Naturalist* 1948: 157-163).
The history and distribution of the Capercaillie in Scotland (*Scottish Naturalist* 1950: 65-87, 157-178; 1951: 4-7, 135).
The Clo Mor bird cliffs (*Scottish Naturalist* 1951: 26-32).
Bird Notes from Spitsbergen, summer 1955 (*Sterna* 27: 49-63).
A century of bird watching in Sutherland (*Scottish Birds* 2: 167-192).
Scottish Ornithologists: 1. Sir Robert Sibbald (*Scottish Birds* 3: 159-166).
Scottish Ornithologists: 2. Martin Martin (*Scottish Birds* 4: 64-73).
Bird watching in Scotland (*Scottish Birds* 4: 126-142).
Bird watching in Sutherland (*Scottish Birds* 12: 113-117).
Sutherland Birds (1983) - joint author.
William Eagle Clarke (*Scottish Birds* 14: 153-156).

But of all his published notes by far the most bizarre concerned 3 separate cases of Fulmars perching on trees in Golspie - on one occasion 4 sitting together in a row on a single branch (*British Birds* 60: 90). That was in 1966, There is no mention of perching on trees in, for instance, *BWP*, but there have been several similar subsequent records in Sutherland.

Ian was a romantic at heart, and his imagination was particularly fired by remote places - the further north, the better. In 1948 he spent 16 days on Foula. The following year he accompanied the legendary yachtsman 'Blondie' Hasler in sailing to North Rona, where he landed and made the gruesome discovery of a desiccated human hand jutting up from the earth floor of the old village! He could not have imagined then that he would be landing again on North Rona 40 years later - this time as very much the senior statesman on *Ocean Bounty* in 1989, and again in 1990.

In 1953 he led one of the first post war pioneering expeditions to Swedish Lapland and 2 years later he achieved his ultimate ambition in leading a small party up to Spitsbergen, to which he was able to return in 1973 and 1981. His contributions in this field were acknowledged by his being made a life member of the Norsk Ornitologist Forening. Back at home, recognition came when he was elected to serve as President of the SOC for 1963–1966, and he was later elected an Honorary Member of the Club in 1980.

Ian was a typical product of the environment in which he had been brought up - down to earth, blunt, incisive, resourceful, inventive, and highly receptive of the excellent education which he had been given. He never lost the robust Aberdeenshire dialect, though he did allow it to be overlaid by the softer Highland accents of his adopted county, and he exploited this mixture to marvellous effect. His interests were wide, as was his knowledge of literature, and over the years he amassed one of the finest ornithological libraries in Scotland. In the field he was the very best of companions, unperturbed by any vicissitudes, though never lacking in words to describe them! His devotion to the Great Game of birding was splendidly recalled by one of his old Sutherland friends at his funeral service in the densely packed little church at Scourie. A patient, well known for hypochondriac tendency, telephoned his surgery demanding Ian's immediate attention. When told that the doctor was not immediately available but would come as soon as he could, the sour comment came back: "He'd have come quickly enough if I had been wearing feathers!"

Ian was a complete man. He was a major contributor to Scottish ornithology, and he enriched the lives of all those lucky enough to cross his path. His death removes the fund of much laughter. He is survived by his second wife Edith; by Catriona and Rona, daughters by his first marriage; and by his 6 grandchildren and 3 great grandchildren. Catriona continues the ornithological connection as a leading figure in the Fair Isle community. Rona, a keen naturalist who inherited her father's love of books and now lives in Norfolk, carries with her the name of the remote island that was part of her father's dreams - to be so happily and completely accomplished.

Dougal G Andrew

Ian Pennie with grandson Ewen, about 1985

Advice to contributors

Authors should bear in mind that only a small proportion of the *Scottish Birds* readership are scientists and should aim to present their material concisely, interestingly and clearly. Unfamiliar technical terms and symbols should be avoided wherever possible and, if deemed essential, should be explained. Supporting statistics should be kept to a minimum. All papers and short notes are accepted on the understanding that they have not been offered for publication elsewhere and that they will be subject to editing. Papers will be acknowledged on receipt and are normally reviewed by at least 2 members of the editorial panel and, in most cases, also by an independent referee. They will normally be published in order of acceptance of fully revised manuscripts. The editor will be happy to advise authors on the preparation of papers.

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Headings should not be underlined, nor typed entirely in capitals. Scientific names in italics should normally follow the first text reference to each species unless all can be incorporated into a table. Names of birds should follow the official Scottish List (*Scottish Birds* 2001 Vol 22:33-49). Only single quotation marks should be used throughout. Numbers should be written as numerals except for one and the start of sentences. Avoid hyphens except where essential eg in bird names. Dates should be written: ...on 5 August 1991...but not ...on the 5th... (if the name of the month does not follow). Please **do not** use headers, footers and page numbers. Please note that papers shorter than c700 words will normally be treated as short notes, where all references should be incorporated into the text, and not listed at the end, as in full papers.

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The Scottish Ornithologists' Club (SOC) was established by a group of Scottish ornithologists who met together in the rooms of the Royal Scottish Geographical Society in Edinburgh on 24 March 1936.

Now, 66 years on, in 2002, the Club has 2200 members and 14 branches around Scotland. It plays a central role in Scottish birdwatching, bringing together amateur birdwatchers, keen birders and research ornithologists with the aims of documenting, studying and, not least, enjoying Scotland's varied birdlife. Above all the SOC is a club, relying heavily on keen volunteers and the support of its membership.

Headquarters provide central publications and an annual conference, and houses the Waterston Library, the most comprehensive library of bird literature in Scotland. The network of branches, which meet in Aberdeen, Ayr, the Borders, Dumfries, Dundee, Edinburgh, Glasgow, Inverness, New Galloway, Orkney, St Andrews, Stirling, Stranraer and Thurso, organise field meetings, a winter programme of talks and social events.

The SOC also supports the Local Recorders' Network and the Scottish Birds Records Committee. The latter maintains the "official" Scottish List on behalf of the Club. The Club supports research and survey work through its Research Grants.

The Club maintains a regularly updated web site, which not only contains much information about the Club, but is also the key source of information about birds and birdwatching in Scotland. ***www.the-soc.org.uk***

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