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North east Scottish counts of Goldeneye, Goosander, Red-breasted Merganser and Cormorant in 1944-50 compared with 1988-97

A WATSON, M MARQUISS & P J COSGROVE

Unpublished counts of Goldeneyes, sawbill ducks and Cormorants are presented from part of the River Deveron and other sites in north east Scotland in 1944-50 and 1997, and compared with published data from 1988-90 and 1996. The Deveron held many Goldeneyes in the 1940s, and also many other waterfowl, especially when lochs were frozen. The proportion of adult drake Goldeneyes on estuaries, at sea, and on the coastal Loch of Strathbeg exceeded that on inland waters. The numbers of Goldeneyes and Goosanders on the Deveron were higher during periods of hard frost. Adult drake Goosanders formed a minority on the Deveron and on Haddo House lakes, but a majority on Loch of Strathbeg and on Lochs Davan and Kinord. Adult drake Mergansers were in a minority on all sites. Counts from the Don estuary in 1989-90 showed no material change in Goldeneye numbers or the proportion of adult drakes since 1944-50. Counts in 1996 and 1997 show more Goldeneyes and Goosanders than on the same parts of the River Deveron in 1944-50, fewer Mergansers, and few Cormorants in both periods. Many sawbills and Cormorants were culled on the Deveron in both periods.

Introduction

Counts of wintering ducks in Britain in 1966-92 showed that most species increased over this period (Kirby *et al* 1995), but these counts were mainly at standing waters. Recent papers documenting counts in north east Scotland (Duncan & Marquiss 1993, Marquiss & Duncan 1994a, Cosgrove 1996, 1997) showed the importance of rivers for some birds such as Goldeneye *Bucephala clangula*, Goosander *Mergus merganser*, and Red-breasted Merganser *Mergus serrator*, yet few data are available for such sites. Here we document previously unpublished counts in 1944-50, to compare with 1988-97 data.

Cosgrove (1996) reported his January 1996 count of Goldeneye on all of the main stem of the River Deveron, and noted that there appeared to be no previous published data on Goldeneye there. This led AW to inspect field notes for his many counts on certain stretches of the Deveron in 1944-50, and to visit these same stretches again in January 1997. Also, Cosgrove (1997) reported his 1996 count of Goosander, Red-breasted Merganser and Cormorant *Phalacrocorax carbo* done simultaneously with his Goldeneye count. Although PC's summarised published data cannot be related to AW's data because PC used different subdivisions of the river, PC had map references for each

1996 sighting in his field notes. This enabled us to obtain his counts on the same stretches used earlier by AW. Similarly, much of MM's data in 1988-90 has been published (Duncan & Marquiss 1993, Marquiss & Duncan 1993, 1994a and b), but we returned to the unpublished field notes to compare their counts on the same stretches covered by AW in earlier years.

The aim of this paper was to find whether the numbers of these waterfowl changed between the 2 time periods, so we compared AW's 1944-50 counts

- a) on certain stretches of the lower Deveron with PC's single mid January 1996 count there and 2 counts by AW in late January 1997, and
- b) on other waters with MM's data in 1987-94.

Methods

Nearly all Goldeneyes in north east Scotland are winter visitors arriving in October and leaving in March, but Goosanders, Mergansers and Cormorants occur all year round (Buckland *et al* 1990). However, AW saw no Mergansers on the Deveron from April to August in 1944-50.

AW's counts from September till April were made using a telescope from concealed vantage points such as drystone dykes and shooters' hides, and binoculars where birds were confiding (eg Deveron Bridge by Turriff, Banff Bridge and Bridge of Don). Most birds remained undisturbed. This minimised errors that arise when flushed birds alight unseen on water not yet scanned. He told adult drakes from young drakes and ducks by their different plumage.

Results

Goldeneyes in 1944-50

Seasonal variation

Early dates for AW were 3 at Meikle Loch of Slains on 28 September and 3 at Loch of Strathbeg on 5 October, but an occasional bird summered on loch and river, including one with a Scaup *Aythya marila* on Deveron above Banff in 1947. Birds on the Deveron by Turriff usually came in late October, increasing till late December irrespective of frost, eg in 1946 the first seen on a 1-km stretch were 2 on 25 October, rising to 5 on 28 October, and 9 on 5 November and 18 December. In 1947, however, none came until 10 November. He saw none there after 27 March, and a last flock of 12 on the Ythan estuary on 14 April 1947. Duncan & Marquiss (1993) found similar arrival and departure times for Goldeneye on 3 other rivers and on standing waters in north east Scotland.

Counts during icy periods

Numbers on the Deveron rose after ice sealed lochs and fell after thaws. On the Turriff stretch, numbers at 1.0-4.7/km rose to 18.4/km during frost in January 1945 and 19.4/km in January-March 1947 (biggest flocks 15 and 28 respectively). After thaws in February 1945 and late March 1947, numbers fell to 4/km. Many in a flock showed sexual display on 1 February 1947, a sunny frosty day.

Flock size

The biggest flocks were of 25 on the Ythan estuary, 28 at Turriff, 33 at Boyndie Bay, 43 at Don mouth, 60 in Aberdeen Bay, and once 400 at Loch of Strathbeg when flocks up to 50 combined temporarily after disturbance by

shooting, but AW saw a flock of 100 on a day at Strathbeg with no shooters.

Proportion of adult drakes

The mean percentage of adult drakes on the Deveron at Turriff was 28%. It fell from February to March 1946 (36% to 27% in 28

and 15 seen), and from January to February 1945 (50% to 25% in 16 and 12 seen) and 1948 (63% to 54% in 16 and 13 seen), but rose from January through February to March 1947 (21% through 24% to 45% in 24, 89, and 76 seen). Variation between years was too big and sample size too lacking in independence within and between months for statistical tests to be valid.

Table 1 Percentage of adult drake Goldeneyes seen in 1944-50.

		N(day n)*	%
River	Deveron, Turriff	405 (44)	28
	Deveron, Eden-Ashogle	108 (18)	21
	Deveron, Alvah	35 (3)	40
	Don, Kinaldie	10 (10)	20
	Don, Br. of Dyce	34 (32)	29
Loch	Loy	7 (7)	0
	Alvie	4 (4)	50
	of Strathbeg	c770 (c400)	60"
	Meikle Loch of Slains	96 (39)	36
	Cotehill Loch	16 (8)	63
	Haddo, Upper & Kelly	18 (18)	17
	of Fyvie	12 (3)	0
	Davan & Kinord	38 (31)	26
	of Skene	18 (18)	0
Estuary	Spey	17 (8)	35
	Deveron	121 (25)	58
	Ugie	12 (12)	25
	Ythan	94 (38)	37
	Don	213 (43)	82
	Montrose Basin	13 (12)	23
Sea	Findhorn	8 (4)	50
	Spey Bay	10 (4)	40
	Whitehills	38 (4)	82
	Boyndie Bay	66 (33)	100
	Foveran Links	72 (40)	46
	Aberdeen Bay	123 (30)	75

* N is total seen, and (day n) is biggest number seen in a day at one place.

" From a sample flock of 50.

Some seasonal variation may be confounded with frost hard enough to seal lochs and flood ponds. The percentage of adult drakes in January 1945 during frost (50% of 52 seen) exceeded that on ice free days before the frost (44% of 9 sightings) and after (21% of 14 seen). The percentages in hard frost in February-March 1947 (24% of 89 seen and 31% of 103) exceeded those before the frost (22% of 27 seen), and after it in late March (25% of 8). Similarly, in frost during January 1948 the percentage exceeded that in ice free February but AW's data from December 1947 were too few for a pre January check. However, the 1946 data came from months without hard frost.

The percentage of adult drakes was high on estuaries (Table 1), especially on the Don. On one occasion AW saw birds fly from Donmouth on to the sea off the sandbar nearby, so they used both estuary and sea. The percentage

of adult drakes was very high at sea, up to 100% on Boyndie Bay, Banff. On lochs near the sea it exceeded the percentage on inland lochs, especially at Loch of Strathbeg which is hard by the sea. On inland lochs it broadly resembled that on rivers, but varied considerably between one inland loch and another.

It would be invalid to apply statistical analysis and probabilities to the totals in Table 1, as they probably involved some birds seen more than once, especially at Turriff where AW did many counts on the same stretch even within a month, sometimes almost daily. However, it was valid to test numbers at different places on the same day (he often saw birds at the first site as he returned from the second), and at widely different places visited within two days (Table 2). This showed that the main differences in the percentage of adult drakes noted above at different places were very unlikely to be random.

Table 2 *Percentage of adult drake Goldeneyes at pairs of places on the same date or similar dates*

Date	Place	%	n*	Fisher exact P
17 Feb 46	Haddo House lakes	17	18	
	Foveran Links, sea	57	30	0.014
2 Mar 46	Don, Dyce/Kinaldie	28	65	
	Aberdeen Bay, sea	75	60	<0.0001
1 Dec 46	Boyndie Bay, Banff, sea	100	33	
	Deveron, Turriff	25	12	<0.0001
14-15 Dec 46	Don mouth	69	26	
	Don, Kinaldie	20	10	0.011
19 Jan 47	Deveron estuary	60	25	
	Whitehills, sea	100	12	0.015
25 Jan 48	Loch of Strathbeg	60	50	
	Meikle Loch of Slains	32	25	0.029

* number counted

Goosanders in 1944-50

The earliest were on the Deveron by Turriff on 7 October and Meikle Loch of Slains on 14 October, and the last small groups on 20 March by Turriff. AW saw an occasional pair as late as 26 April, so perhaps they bred there. In winter, he often saw Goosanders on Deveron at Turriff and on other parts of Deveron that he visited frequently between Laithers and Banff Bridge.

Counts during icy periods

As with Goldeneyes, numbers on the Deveron by Turriff were much higher when ice sealed lochs and ponds. During such periods, the total number seen was 98, with 4.4/km, whereas during mild ice free periods the total was 61, with only 1.6/km. As successive counts cannot be regarded as statistically independent, formal analysis with probabilities would be invalid. However, out of 45 counts in mild periods, 69% had no birds, 18% one bird, 7% 2, and 7% 3 or more (up to 15) birds. In contrast, out of 22 counts in periods of frost, only 14% had no birds, 18% one bird, 27% 2, and 41% 3 or more (up to 30) birds.

On the Deveron by Turriff they sometimes flew in long strings far higher than usual (> 50 m up). This was normal on days with shooting, but at times occurred on days without shooting, when ice had sealed lochs and flood ponds. For instance, AW saw 30 in strings flying up and down the Deveron on 23 January 1947, by which time lochs had 5 cm of ice. On 12 January 1947 he saw 52 on a 3 km stretch (12 on the water and at least 40 flying up and down), when lochs and ponds in lowland north east Scotland were open but hard frost affected England and south Scotland. He noted this behaviour occasionally on days that were mild for the

whole UK, eg 15 on 29 February 1948. Shooting elsewhere on the Deveron can be ruled out as an explanation, as this was a Sunday and no shooting was done on Sundays in 1944-50.

Proportion of adult drakes

Adult drakes comprised a majority at Loch of Strathbeg (64% out of a total of 42, with 15/20 in a count selected at random), and at Lochs Davan and Kinord (67% out of a total of 24, with 6/7 in a count selected at random). They were in a slight minority in most places. They comprised 42.5% out of a total of 254 seen on the lower Deveron from Laithers down to Alvah gorge (with 4/12 in a count selected at random from the Deveron stretch by Turriff), 18% in a total of 39 at Haddo House lakes (with 4/30 selected at random), and 30% out of a total of 37 at other places. A Fisher exact test showed that the difference in the proportion of adult drakes between the randomly selected Davan/Kinord count and the Haddo one was highly significant ($P = 0.0001$), and for the randomly selected counts at Strathbeg and Deveron by Turriff was significant ($P = 0.03$).

On the Deveron at Turriff, adult drakes comprised 45% of a total of 98 seen during frosty periods in 1945, 1946 and 1947 when ice sealed lochs and ponds. This included 45% out of 87 during the hard 1947 frost, when the largest flock of 30 birds contained 12 adult drakes. The proportion of adult drakes there did not differ materially during mild periods, with 44% out of 61.

The biggest flocks seen were of 30 on the Deveron at Turriff, 30 on the Upper Lake at Haddo House, and 20 at Loch of Strathbeg. AW twice saw a few fly downstream to rest on the lowest parts of the Ythan estuary including

the north bar and once a bird at sea just off Donmouth, but otherwise he saw none at sea. Some were in close pairs away from others nearby, in all winter months but especially in late winter. On 25 January 1947, 8 drakes and 4 ducks in a flock showed much chase and courtship at Alvah in hard frost.

Red-breasted Mergansers in 1944-50

AW often saw these at sea, on estuaries, on lochs near the coast, and occasionally on the lower Deveron (up to 7 at a time on the estuary) and Haddo lakes (up to 5). The sighting furthest up Deveron was a duck below the bridge by Turriff. Flocks were seen at sea (up to 26 at Boyndie Bay), and largest numbers in September-October at sea and on the Ythan estuary. Many were in close pairs, as early as 6 November on Spey. The last seen were 2 pairs on 4 May at Loch of Strathbeg and 4 pairs on 7 May at Ythan estuary, maybe on passage.

Adult drakes comprised a slight minority in December-May (46% out of 213). We regard the lower September-November value (13% out of 106) as false, due to moulting adult drakes being unrecognised then, especially when far out at sea.

Dawn and dusk flights on the Deveron at Turriff in 1944-50

All duck species present flew upstream over Deveron Bridge at dusk, mostly after sunset, and particularly so on short midwinter days with poor light, as Marquiss & Duncan (1994a) noted for Goosanders arriving at their roosting site. The Bridge was a good watch point, as they flew close above it, within a few metres if one hid low. Goldeneyes, Goosanders and many others then turned south east in the

direction of Hatton Castle lochs and flood ponds on Turriff Haughs, where AW saw ducks fly in to roost on other dusks. However, a Goosander once came upstream on the dusk flight, landed on a quiet stretch above the Bridge, and stayed there until after dark. Ducks returned down the Deveron at dawn.

Cormorants in 1944-50

During each winter in 1944-50, AW saw single birds on Deveron by Turriff (once 2 together), and up to 5 at a time at Alvah gorge. He often saw them flying but also fishing on the river, and basking on rocks and trees at the gorge. They were mainly adults, but some immature. On 18 January 1947 one swam on the Deveron above the A920 bridge at 150 m altitude, above Huntly.

Shooting in 1944-50

In the 1940s, ducks other than sawbills were often shot for sport on the Deveron, occasionally including Goldeneyes (a shooter bagged 6 one evening at Forglen). Goosanders have long been shot. Every second Saturday during winter in 1944-50, many lairds and keepers had an onslaught in the afternoon, directed by the Deveron Fishery Board and aimed at killing sawbill ducks and Cormorants. Any that were missed at one spot might be shot further up or down and got no respite. The birds tended to fly directly above the river, and departed from the river line only across big bends, where shooters were placed. An immature drake Goosander injured by shooting could not fly on 29 February 1948, and PC saw an injured duck Goosander in 1996, so shooters did not adequately dispatch wounded birds.

Comparison of 1944-50 data with 1987-94

Duncan & Marquiss (1993) found that a high percentage of Goldeneyes on estuaries and at sea were adult drakes. AW's data confirm this; clearly this feature is long standing. Figure 7 in Duncan & Marquiss (1993) shows a big variation in the percentage of adult drakes on different lochs, and AW's data confirm this also.

Marquiss & Duncan (1993) noted a September-October peak of Red-breasted Mergansers on the North Esk estuary but not on the river. AW's data show a September-October peak also on the Ythan estuary and at sea.

We compared AW's data on the Don estuary with MM's data in 1988-90 to check for change in numbers or proportions of adult drake Goldeneyes. The sole count in 1988 revealed an unusually high value of 118, but it was noted as atypical because it included many birds from off the nearby sea. The only counts in 1989 and 1990, one in each January, showed 17 and 20 Goldeneyes respectively, of which 14 and 13 were adult drakes (mean 73%). This signified no material change in numbers since 1944-50, when AW's 7 counts ranged from 7 to 43 with a mean of 16. It indicated also no material change in the percentage of adult drakes which in AW's counts had a mean of 82%. The proportion in a count selected randomly from AW's data (18 adult drakes out of 24) did not differ significantly from that in a count selected randomly from MM's data (13 out of 20, $\chi^2=0.33$).

On Lochs Davan and Kinord near Dinnet, AW's 3 counts in 1946, 1947 and 1948 showed 31, 7, and 0 Goldeneyes, little different from 5 counts run by MM in 1988, 1990, 1991,

1992, and 1994 with 33, 0,0,0 and 0. Adult drakes comprised 26% in AW's counts and 36% in MM's, and given the small sample sizes it is unsurprising that there was no significant difference ($\chi^2=0.26$).

A preponderance of adult drake Goosanders was apparent in AW's 3 counts at Lochs Davan and Kinord in 1946-48 (67% in a total of 18 birds). The larger number of counts in MM's data at these 2 lochs confirms this preponderance, with 76% adult drakes in a total of 68 birds seen during single midwinter counts in each of 6 winters in 1987-94. The 2 sets of data suggest a possible increase (mean 1946-48 count 6, range 0-11, and 1987-94 mean 11.3, range 4-22), but there were insufficient counts for analysis. Marquiss & Duncan (1994b) found a preponderance of adult drakes on the lower parts of Dee also, unlike AW's slight minority of adult drakes on the lower Deveron in 1944-50

Comparison of 1944-50 data with 1996 and 1997

As AW's data from 1944-50 showed a bigger proportion of adult drake Goldeneyes on estuaries than inland, we checked this for the Deveron using PC's 1996 field notes. These showed 61% adult drakes out of 28 birds on the tidal Deveron, but only 34% in the 273 further up (Fisher exact $P = 0.006$), so confirming the point. The 61% was closely similar to AW's 1944-50 mean of 58% there (Table 1) and AW's 1997 value of 54%. PC's proportion of adult drakes in January 1996 on the Turriff stretch covered by AW in 1944-50 was 29% out of 17, broadly similar to AW's 1944-50 mean of 28%, and similar also to AW's January 1997 value of 28% there. Hence the differences in proportion of adult drakes between sites were consistent and long standing.

Comparison was made with PC's unpublished notes from the same stretches as AW covered (Table 4). This showed more Goldeneyes and Goosanders in 1996 than in 1944-50, fewer (no) Mergansers, and very few Cormorants. One must treat such comparisons with caution, as birds on a stretch of a few km may not be restricted to it. This seems likely from the high variability in AW's counts of Goldeneyes, Goosanders and Cormorants within months on the Turriff stretch (Table 3). Nevertheless, the higher values in 1996 on all 7 stretches covered in the 1940s are suggestive of an increase since 1950.

The question arises whether this was a sustained increase or merely a short term peak, as a single recent winter count cannot distinguish between these alternatives. To help elucidate this, AW did a count on 2 mild, ice free days in late January 1997. On 40 km covered in both years, Goldeneye numbers were very close to PC's in 1996, with Goosanders slightly fewer; AW was told there

was some Goosander shooting in the week before his counts. On one of the 2 days chosen randomly, the proportion of adult drake Goldeneyes was higher at the estuary than inland (15/28 vs 20/92, Fisher exact $P = 0.002$). On every stretch that AW covered in 1944-50, Goldeneye numbers in 1997 exceeded those in 1944-50, in most cases exceeded AW's highest count for the same stretches from the earlier years, and were closely similar to PC's 1996 counts for the same stretches. Hence recent high Goldeneye counts on Deveron are probably due to a real increase. This fits the overall increase in Britain generally (Kirby *et al* 1995).

Adult drakes comprised 47% of Goosanders seen on the entire Deveron in the 1996 count (Cosgrove 1997). This included a lower proportion on the section 10 km from the sea (Cosgrove's Figure 2), thus fitting in broad terms the minority of adult drakes on the low sections near Turriff in AW's 1944-50 data. AW's 2 counts in 1997 again showed a

Table 3 Day to day variation in counts on 2km of the Deveron by Turriff in 1944-48.

Period	Goldeneye	Goosander	Cormorant
Jan 44	0,0,2,6	0,0,1,1	0,0,0,0
Nov-Dec 44	0,2,0,0,0,0,0	0,1,2,0,2,0,0	0,0,0,0,0,0,0
Jan 45 mild	0,0,1,5	0,0,0,2	0,0,0,0
Jan 45 frost	16,23,13	0,2,0	0,0,0
Feb 45	5,5,2,1,2,3,1	2,0,0,0,0,0,0	0,0,0,0,0,0,0
Jan 46	7,0,0,0,0,0,0,1	2,1,1,0,1,0,1,0	0,1,0,0,0,0,0,0
Feb 46	4,3,0,2,4,2,12	0,2,0,0,0,3,0	0,0,0,0,0,0,0
Mar 46	9,0,6,4	0,0,0,1	0,0,0,0
Oct-Nov 46	2,5,3,9,0,0,0	0,0,4,0,0,0,1	0,0,0,0,0,0,0
Jan 47	7,3,2,3	12,0,0,2	0,0,2,0
Jan-Mar 47	15,29,29,19,22,	30,15,2,12,4,	0,0,0,1,1,0,
frost	15,11,37,9,15,8	1,6,2,3,2,18	0,0,0,0,0
Jan 48 frost	0,6,2,4,6	1,1,10,8,0	0,0,0,0,0
Feb 48	8,0,1,4,0,1	1,1,1,0,1,0	0,0,0,0,0,0

Table 4 January counts on ice free days on the Deveron in the 1940s, 1996 and 1997.

Place	Km	Goldeneye			Goosander			Merganser	Cormorant	
		40s	96	97	40	96	97	40s	40s	96
Estuary	1.0	3.3	28	28.5	0	1	4	1.6	0	0
Alvah gorge	0.6	0.8	2	1.5	0.8	2	1.5	1.2	1.8	0
Bridge of Alvah	0.7	0.3	2	2	0.5	1	1	0	0	0
Eden-Ashogle	5.1	12.4	54	54	5.7	13	8.5	0	0	1
Turriff #	1.7	2.9	14	12.5	1.4	3	2	0.2	1.0	0
Carnoustie	0.9	0.7	3	3.5	0.4	2	1	0	0	0
Laithers	1	0.5	3	3	0.5	2	1	0	0	0
Total	11	20.9	103	105	9.3	24	19	3.0	2.8	1

1940s data are from counts on mild January days in 1944-48 (only one count in a given day at one place, number of counts ranged from 9 at the estuary to 26 at Turriff, and the mean number of counts at all 7 places was 12). The mean number of each bird species was calculated for each place in each year, and then an overall mean for that place for the five years, which is the value shown in the Table. 1996 and 1997 data cover several places in the same day. 1996 data from one count, 1997 data from 2 counts on 2 days, no Mergansers seen 1996 and 1997, and no Cormorants in 1997.

From 1km below Deveron Bridge to 0.7km above.

For Goldeneye and Goosander separately, the probability of obtaining all 7 of the 1996 values greater than their 1940s paired mean values is 0.016 (sign test, on the hypothesis that one would expect as many increases as decreases in each 1996 value compared with its respective 1940s paired mean). The difference in the opposite direction for Merganser is not significant, as so few sites had any.

minority of adult drakes on the lower Deveron centred on Turriff between Laithers and Alvah gorge, where a count selected randomly showed 44% out of 18, and at the estuary (25% out of 4). PC's detailed field notes show 53% adult drakes out of 32 on these 2 stretches in 1996 but only 46% out of 39 when the stretch between the estuary and Alvah gorge was included.

Cosgrove (1997) saw no Red-breasted Mergansers on Deveron, but in 1944-50 AW noted up to 7 at a time on the estuary, up to

4 at a time on deep pools at Alvah gorge, and once a duck by Turriff. In 1997 he saw no Merganser and no Cormorant on the same stretches as he covered in 1944-50.

Discussion

This paper's main conclusions are that the River Deveron's importance for wintering Goldeneyes and Goosanders is long standing, that Goldeneyes and Goosanders were more abundant in 1996 and 1997 than in 1944-50, and that the proportion of adult

drakes in both species has not changed materially. The proportions of adult drake Goldeneyes at sea, at estuaries, and at the Loch of Strathbeg hard by the coast, exceed those on inland rivers and on most lochs.

A possible explanation for the increase of Goldeneyes on the Deveron is eutrophication following more use of inorganic fertilizers on farmland, leading to more food for this duck. Another possibility is that coastal Goldeneyes declined after reduction of coastal sewage and industrial outfalls, as on coastal sites in the Moray Firth (Barrett & Barrett 1985), and may have moved to inland sites such as the Deveron. These and other possible explanations are speculative.

John Edelsten's many counts of Goldeneyes at sea between Banff Bridge and Whitehills in 1981-96 are of interest, as he found the main concentrations of them at the sewage outfalls at Banff harbour and from Ladysbridge Hospital. Numbers seen varied greatly within and between winters, the highest counts being 138 in January 1987, 222 in November 1993, and 121 in February 1994.

On the Deveron in the 1940s, much shooting of sawbill ducks and Cormorants took place in winter, in addition to other shooting. Shooting of sawbill ducks is now under licence, and numbers reported to have been shot are known (Cosgrove 1997). We do not have a record of numbers shot in the 1940s. Despite all the killing, however, Goosanders were more numerous in 1996 and 1997 than in 1944-50, though Mergansers were scarcer, and Cormorants possibly so.

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Amendments to the Scottish List

R W FORRESTER
for Scottish Birds Records Committee

(incorporating an update to records of species recorded in Scotland on 5 or fewer occasions)

The Scottish Birds Records Committee is responsible for maintaining the Scottish List first published in 1994 (Scottish Birds 17: 146-159). This is the second subsequent report of the Committee (the first being in Scottish Birds 18: 129-131), and contains 4 additions to and one deletion from the list.

Also in 1996 (Scottish Birds 18: 132-143) SBRC detailed all acceptable records of species which had occurred in Scotland on 5 or fewer occasions. We also now update these records.

Red-breasted Goose *Branta ruficollis*
Adult Insh Marshes, Highland, 9-19 March 1994 (*British Birds* 89:485).
Adult Vane Farm, then Tayside, now Perth & Kinross, 28 September 1994 (*British Birds* 90:461).
4th and 5th Scottish records.

Lesser Scaup *Aythya affinis*
Male, St John's Loch and Loch Watten, Caithness, 1 February-10 March 1996 (*British Birds* 90:464).
4th Scottish record.

Pallid Harrier *Circus macrourus*
2nd summer male Dunkadale area, Orkney, 18 April-27 June 1995, also 13 September (*British Birds* 89:496).
4th Scottish record.

Black-winged Pratincole *Glareola nordmanni*

Juvenile, Monikie, Angus & Dundee, 14-16 August, 1996. (*British Birds* 90:468).
3rd Scottish record.

Caspian Plover *Charadrius asiaticus*
Female Skelberry, Shetland, 3-4 June, 1996 (*British Birds* 90:469).
2nd Scottish record.

Terek Sandpiper *Xenus cinereus*
Boddam, Shetland, 11-13 June 1995 (*British Birds* 89:503)
River Leven, Clyde, 22-30 September 1996 (*British Birds* 90:479).
5th and 6th Scottish records.

Forster's Tern *Sterna forsteri*
1st W Musselburgh area, Lothian intermittently from 16 December 1994 (*British Birds* 88:522) on coast from Portobello, Edinburgh to Aberlady Bay, but mainly Musselburgh, to 10 April 1995 (*British Birds* 89:507) and probably the same bird Ythan Estuary, Grampian 3 May-1 August, 1995 (*British Birds* 89:507).
2nd Scottish record.

Bridled Tern *Sterna anaethetus*

Tiree, Strathclyde, 30 June-9 July 1994
(*British Birds* 89:507).
4th Scottish record.

Eagle Owl *Bubo bubo*

Remove from Category B

Following an extensive review the BOU concluded that there was no evidence that Eagle Owl had occurred in a wild state in Britain and Ireland for over 200 years and removed the species from Category B of the British List (*Ibis* 139:198). The species had been on the Scottish List as a result of 4 records during the period 1830-1883. No Scottish records are therefore now considered acceptable and the species is removed from Category B.

Pallid Swift *Apus pallidus*

Add to Category A

Moribund, North Ronaldsay, Orkney 26 October 1996 (*British Birds* 90:490).
1st Scottish record.

There are now 5 species on the Scottish list. Only recorded as dead or dying.

Blyth's Pipit *Anthus godlewskii*

Add to Category A

1st W Fair Isle, Shetland, 31 October-4 November 1993 (*British Birds* 89:512).
1st Scottish record and 4th British record.

Isabelline Wheatear *Oenanthe isabellina*

The details for the 2nd Scottish Record were shown as "20-21 September 1993, Whalsay, Shetland" (*Scottish Birds* 18:139). The year should read 1994.

Hermit Thrush *Catharus guttatus*

1st W Fair Isle, Shetland, 19 October 1995
(*British Birds* 89:516).
2nd Scottish record.

Swainson's Thrush *Catharus ustulatus*

South Uist, Outer Hebrides, 6 October 1996
(*British Birds* 90:497).
4th Scottish record.

Veery *Catharus fuscescens*

Add to Category A

Newton, North Uist, Outer Hebrides, 20-22 October, 1995 (*British Birds* 90:497).
1st Scottish record.

Cetti's Warbler *Cettia cetti*

The details for the first Scottish record were shown as "5th October 1993, freshly dead, Leith, Edinburgh". (*Scottish Birds* 18:140). This should be changed to 4 October 1993.

Olivaceous Warbler *Hippolais pallida*

Fair Isle, Shetland, 5-13 June 1995 (trapped 5th June), (*British Birds* 89:517).
2nd Scottish record.

Southern Grey Shrike *Lanius meridionalis*

Add to Category A

The BOU have now split Southern Grey Shrike from Great Grey Shrike *Lanius excubitor* (*Ibis* 139:199). The first acceptable record was of the subspecies *L.m. pallidirostris* (also known as Steppe Shrike), trapped Fair Isle, Shetland, 22 September 1964 (*British Birds* 66:401-402).

This is both the first Scottish and 1st British record.

Tennessee Warbler *Vermivora peregrina*

Hirta, St Kilda, Western Isles, 20 September 1995 (*British Birds* 89:524).
4th Scottish record (all 4 British records are from Scottish islands).

Yellow-rumped Warbler *Dendroica coronata*

1st W North Ronaldsay, Orkney, 13 October, 1995 (*British Birds* 89:525).

3rd Scottish record.

With the addition of Pallid Swift, Blyth's Pipit, Veery and Southern Grey Shrike to Category A and removal of Eagle Owl from Category B, the totals for the various categories of the Scottish List now stand at:

Category A	458
Category B	14
Category C	<u>6</u>
	478
Category D	<u>12</u>
	490

The British Ornithologists' Union has recently separated Hume's Warbler *Phylloscopus humei* from Yellow-browed Warbler *Phylloscopus inornatus*. Several records of birds resembling *humei* are currently being examined by the British Birds Rarities Committee and we await with interest to see whether they find that any Scottish records are acceptable. It now seems only a matter of time before the BOU separates Yellow-

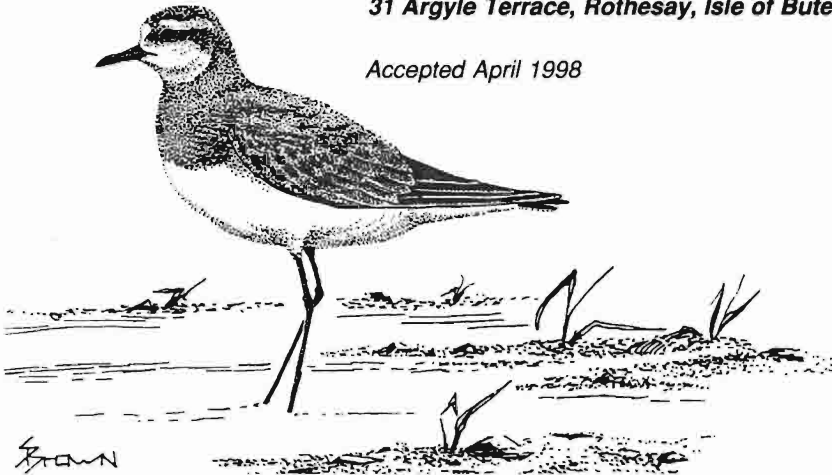
legged Gull from Herring Gull *Larus argentatus* to enable yet another species to be added to the Scottish List. Also, we await acceptance by the British Birds Rarities Committee of the Blue-cheeked Bee-eater recorded in Shetland.

A similar system of categories has been used for the Scottish List to that used for many years by the BOU for the British List. Early in 1998 the BOU announced the introduction of a revised categories to their British List. Although they have been working on the new system for some time, they have only now published the details. Consideration will be given to the merits of revising the categories used for the Scottish List, to keep it in line with the BOU's British List.

The Scottish Birds Records Committee, which is responsible for maintaining the Scottish List now consists of Peter Gordon, Eric Meek, Kevin Osborn, David Clugston, Bruce Forrester, Ian Andrews, Colin Crooke and Ron Forrester (Secretary).

**Ronald W Forester, Secretary, Scottish Birds Records Committee,
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Stippled
Caspian Plover

Steven Brown

Winter habitats of Twites in Scotland

H CLARK & R M SELLERS

This paper presents the results of a questionnaire survey of habitats used by Twites in Scotland in the winter months. A variety of habitats was identified, chief among them weedy turnip fields, rape and rape stubbles, other stubbles especially barley, pasture and other farmland, waste ground, saltmarsh and beaches and the strand line. These are important both in terms of the number of areas in which they are used and the numbers of birds using them. Other habitats including pasture and other farmland, dunes and machair were also used. These results contrast with the position in England where saltmarsh is the principal habitat used. Conservation aspects of the results are discussed and attention is drawn to the declines in the acreage of turnips planted in some areas in recent years and the apparent switch to rape and rape stubbles, a new crop in Scotland.

Introduction

Scotland is one of the main strongholds in Western Europe of the Twite *Carduelis flavirostris*. Its breeding range extends in a broad but patchy band from south west Scotland through Argyll, the Western Isles and north west Scotland to Caithness and the Northern Isles with smaller numbers in the Grampians (Jardine & Reid 1993). There is a complex redistribution of birds following breeding (Clark & Sellers 1998) with the main wintering areas including south west Scotland, Argyll, south-west Perthshire, the southern part of the Outer Hebrides, certain islands of the Inner Hebrides, Orkney, Caithness and low lying areas adjoining the Moray Firth, with lesser numbers in the Borders, Lothian, Central and elsewhere (Lack 1986). The habitats used in Scotland in the non-breeding season are not well known, but, in contrast to the position in England, it is clear from the general winter distribution that both inland and coastal habitats are used. In an earlier

study of Twites wintering in Caithness we found that the principal habitats used were weedy turnip fields, fields of rape and rape stubbles and noted that these agricultural habitats might be used more generally in Scotland (Clark & Sellers 1997a).

Materials and methods

The material for this study was obtained primarily from a questionnaire circulated to all local bird recorders in Scotland except Caithness which we completed on the basis of our own studies and interested birdwatchers. This solicited information on the following:

(i) *Habitats used in the period November to February inclusive:* Recorders were asked to assign one of the following status categories:

- 0 Habitats not used in winter or none of this habitat in the area

- 1 Occurs irregularly in winter in small numbers (flocks <30 birds)
- 2 Occurs irregularly in winter in moderate numbers (flocks <100 birds)
- 3 Occurs regularly in winter in small numbers (flocks generally <30 birds)
- 4 Occurs regularly in winter in moderate numbers (flocks generally <100 birds)
- 5 Occurs regularly in winter in good numbers (flocks of >100 birds not uncommon)

to each of the following habitat types: turnip field, rape and rape stubbles, other stubbles, pasture, other farmland, waste ground, birch woodland, machair, dunes, beaches and the strand line, saltmarsh and other. Compilers were asked to use only one abundance category per habitat, and in cases of doubt to use the highest appropriate category. For the other stubbles, other farmland and other categories, recorders were asked to provide additional information as appropriate. This list of habitat types was drawn up primarily on the basis of experience in Caithness and elsewhere in Scotland and various published sources, but was not exhaustive and the notes accompanying the survey form asked for details of other habitats where these were used.

(ii) *Foods*: Recorders were asked to supply any information they could on foods and, if possible, to differentiate between principal food sources and minor ones.

(iii) *Area*: Area to which the habitats and foods related (usually a Region or District).

Further details about the survey are given in Clark & Sellers (1997b), which includes sample copies of the survey forms.

We supplemented the information from the

questionnaire with data from fieldwork carried out by ourselves, covering especially low lying land adjoining the Moray Firth, and published sources including local avifaunas and local bird reports from all parts of Scotland. We obtained sufficient information to determine habitats for all parts of the Twite's winter range in Scotland except Wester Ross and W Inverness. However, neither of these appear to be important areas for Twites in the non breeding season (cf Jardine & Reid 1993).

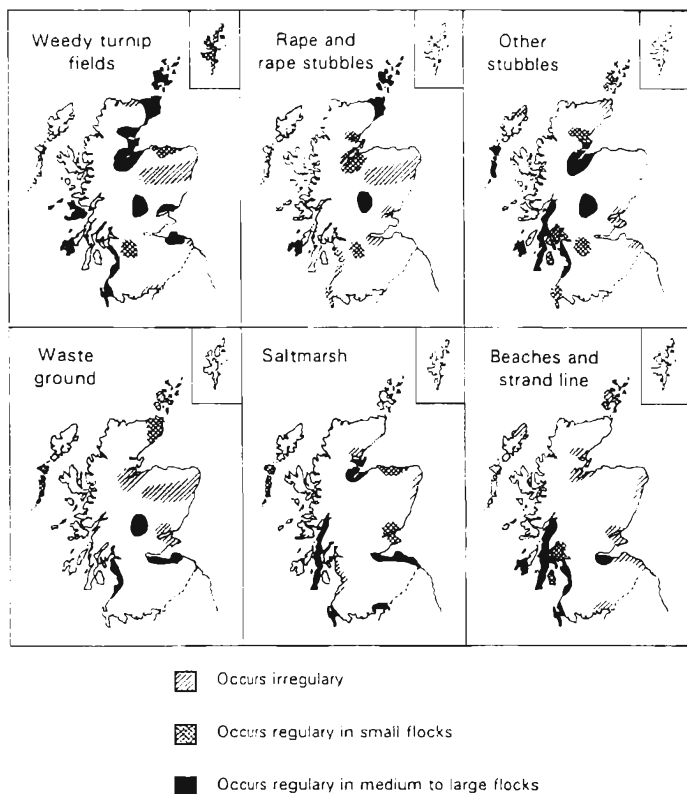
For the purposes of this study winter is taken to be the period November to February inclusive.

Results

Habitats

Table 1 shows the habitats identified in this study. They comprise 2 main types: agricultural habitats and the maritime habitats. The former category included weedy turnip fields, rape and rape stubbles, other stubbles (mainly barley), fields of potatoes, kale and other cultivated land, pasture (usually weedy pasture), crofting land, cattle feed troughs and silage rings, and set aside. The maritime habitats category covered saltmarsh, beaches and the strand line, weedy areas backing onto beaches, dunes and maritime grassland which might also be included under agricultural habitats. A number of other habitats were also recorded as being used, most importantly weedy areas such as waste ground and roadside verges (typically adjoining pasture or other agricultural land) and to a lesser extent others such as moorland and moorland edge, rough grassland and birch woodland. The latter seems surprising for a species usually

Figure 1: Distribution of major Twite winter habitats in Scotland



associated with open country, but parallels some observations of Smart (1978) of birds wintering in woodland in England.

The information presented here is not quantitative and the areas in which habitats were recorded were not of uniform size. However a rough indication of the relative importance of the habitats can be judged from the number of areas from which they were recorded. The results of this are shown in the lower part of Table 1. The most widely used habitat was weedy turnip fields, followed

by other stubbles, beaches and the strand line, saltmarsh, rape and rape stubbles, pasture, waste ground, dunes and other farmland.

The geographical distribution of the 6 most important habitat types is shown in Figure 1. Saltmarsh appears to be primarily a feature of birds wintering on the shores of the Moray Firth, Firth of Forth, Argyll, Ayrshire and Dumfries and Galloway. Agricultural habitats have a more northerly bias. Although we did not specifically collect information on the

altitude at which habitats were situated, it is clear from Figure 1 that they were located in low lying areas relatively close to coasts, presumably because these are the areas least likely to suffer from frosts and prolonged snow cover. One or 2 of the survey forms returned noted a tendency for birds to disappear from agricultural habitats during periods of hard weather for instance in Caithness and Strathallan in SW Perthshire and to appear on the coasts at such times, for instance in Fife. Birds usually reappeared, very shortly after the weather improved and evidently did not move far. These fragmentary observations do suggest, however, that habitats only occasionally used may sometimes be important for the birds' survival in bad weather.

Foods

Table 2 presents a summary of the principal foods seen to be taken by Twites in Scotland in the winter months. However, many of the questionnaire returns noted a lack of information on foods, so Table 2 is undoubtedly incomplete. Several forms made reference to plants such as grasses, sedges, seaweed (*cf* Jardine 1992), Nettle *Urtica*, Chickweed *Cerastium* and Thrift *Armeria maritima*, used in the period April-October, and we think it likely that some of these may also be used in winter. The foodplants listed are, however, typical of those recorded elsewhere in the Twite's Western European range (*eg* Cramp & Perrins 1994), and reflect a diet based primarily on small seeds, especially those of the weeds of cultivation, and of various coastal plants.

Discussion

This study confirms the importance of agricultural habitats, especially turnip fields,

rape and rape stubbles, other stubbles, pasture and other farmland as wintering areas for Twites in Scotland. With the exception of rape and rape stubbles, the common factor in these habitats is the presence of weeds. Saltmarsh, beaches and the strand line are also important, however, and others such as machair, dunes and waste ground are also used but in fewer places and mostly by only small numbers of birds. These findings are in contrast to the situation in England where saltmarsh is by far the most important habitat used in winter (Davies 1988) and we believe that they have important implications for the development of proper conservation measures for Twites in Scotland. Weedy turnip fields, in particular, are important in Scotland for a variety of other species including all such declining farmland birds as Grey Partridge *Perdix perdix*, Skylark *Alauda arvensis*, Song Thrush *Turdus philomelos*, Tree Sparrow *Passer montanus*, Linnets *Carduelis cannabina*, Reed Bunting *Emberiza schoeniclus* and Corn Bunting *Miliaria calandra* (M Hancock pers comm based on observations in NE Scotland, and our own unpublished data based on observations in Caithness, Sutherland and Easter Ross).

We have noted elsewhere declines by a factor of about 8 in the acreage of turnips in Caithness over the past half century, and similar trends in Sutherland (Clark & Sellers 1997a). It seems likely that the associated weed flora has decreased by at least the same amount and possibly more, given the widespread use of herbicides in recent decades. In Caithness, our observations suggest that only about a quarter of the current acreage of turnips contains enough weeds to be suitable for Twites. We suspect that the trends in turnip acreages in other parts of Scotland are similar, and this is also likely to be true of all the other weedy habitats.

TABLE 1 Habitat types used by Twites wintering in Scotland

Area	weedy turnip fields	rape & rape stubbles	other stubbles	pasture	other farmland	waste ground	machair	dunes	beaches & strand line	salt marsh	other
Shetland	3				3 ^a						
Fair Isle											1 ^b
Orkney	5	5	3			1			1		1
Caithness	5	5	2			3		2			
E Sutherland	4		3	4					1	1	2 ^c
N & W Sutherland	2			1	1		1	1			
E Ross, E Inverness	5	3	4	3		3			2	4	
Moray & Nairn	3							1		3	
NE Scotland	2	2				1		3	1	1	
Angus	4	1	1	1	3 ^d			1	1	3	
Fife			1		1	1			1	1	
SW Perthshire	5	5	5			4					
Inner Forth		2							4		
Lothian	4				1 ^e	4			1	4	1 ^f
Borders	1		1								1 ^g
Harris & Lewis			3	3			3		1		
Uists, Benbecula			4	2	3 ^a	3	4 ^h	3	1	3	3 ⁱ
Argyll (excl Bute)	4 ^j	4 ^{ik}	4	4			4 ^l	4	4	5	4 ^m
Central Strathclyde	3	3	3								
Arran, Bute, Cumbræes			3						3		
Ayrshire	5	2	5	4	5 ⁿ	4		1	4	2	4 ^o
Galloway	4		3	5				3	5	4	2 ^p
Dumfries-shire	2				4				1	4	
No. areas	17	10	15	9	8	9	4	9	15	12	9
No. areas with Abundance of 4 or 5	10	4	5	4	2	3	2	1	4	5	2

Table 1: footnotes

a	Potato fields and other cultivated land
b	Croftland and moorland
c	Birch woodland and moorland edge
d	Setaside
e	Rough grassland
f	Set aside and moorland
g	Moorland edge
h	Stubble
i	Moorland, roadsides and uninhabited islands
j	Islay only
k	Fodder rape; all other entries in this column refer to oil seed rape. Fodder rape is grown as winter feed for stock and is grazed before it sets seed; Twites presumably feed on weeds associated with the fodder rape rather than the rape itself.
l	Often associated with cattle feeding areas
m	airfield (4), coastal grassland (4) and crofting land (4)
n	Potato fields
o	Short grass in beach parks
p	Around cattle feed troughs and silage rings

Abundance categories:

No entry	Habitats not used in winter (or none of this habitat in area)
1	Occurs irregularly in winter in small numbers (flocks <30 birds)
2	Occurs irregularly in winter in moderate numbers (flocks <100 birds)
3	Occurs regularly in winter in small numbers (flocks generally <30 birds)
4	Occurs regularly in winter in moderate numbers (flocks generally <100 birds)
5	Occurs regularly in winter in good numbers (flocks of >100 birds not uncommon)

Table 2 Principal foods taken by Twites in winter in Scotland

Habitat	Principal foodplants etc
Turnip fields	Charlock <i>Sinapis arvensis</i> , Turnip <i>Brassica rapa</i> , Dock <i>Rumex</i> , weed seeds
Rape and Rape stubble	Rape <i>Brassica napus</i> , Charlock <i>Sinapis arvensis</i> , Dock <i>Rumex</i> , weed seeds (cf footnote k in Table 1)
Other stubbles	Barley, Oats, Linseed, Rye, Hay (all presumed to be food Plants) plus associated weeds including Dock <i>Rumex</i>
Pasture	Dock <i>Rumex</i> , Thistle <i>Carduus</i> , Knapweed <i>Centaurea</i> , Annual Meadowgrass <i>Poa annua</i>
Other farmland	Weeds in fields of sprouts, potatoes and set-aside
Waste ground	Dock <i>Rumex</i> , Thistle <i>Carduus</i> , Dandelion <i>Taraxacum</i> and other blown seed, weed seeds
Machair	Seeds of maritime flowers (Elliott 1989), Thistle <i>Carduus</i> , weed seeds
Dune systems	Marram <i>Ammophila arenaria</i> , <i>Chenopodium</i> , Black Knapweed <i>Centaurea nigra</i> , weed seeds
Beaches	Strand line (seeds and other detritus washed up by tide), Orache <i>Atriplex</i> , Groundsel <i>Senecio vulgaris</i> , <i>Chenopodium</i> , weed seeds
Saltmarsh	Glasswort <i>Salicornia</i> , Sea Aster <i>Aster tripolium</i>
Other	Birch <i>Betula</i> , weed seeds

The main mitigating factor in Caithness has been the recent introduction of oil seed rape as a crop and the strong preference that Twites have for it. The results presented here show that this is not unique to Caithness and that Twites have taken to using rape or rape stubbles in several parts of Scotland. To what extent rape has a role as a substitute for the weeds of turnip fields etc. remains to be resolved. In the short term the availability of subsidies for growing rape is likely to be the main factor determining the amount of rape that is grown; any reform of the EU Common Agricultural Policy should take into account the consequences for conservation of any changes in subsidies on this crop. The role of coastal habitats, especially saltmarsh and dunes, as a possible insurance against

the non availability of agricultural habitats in hard weather merits further investigation. Protection of the remaining small areas of saltmarsh in Scotland is also a high priority.

Acknowledgements

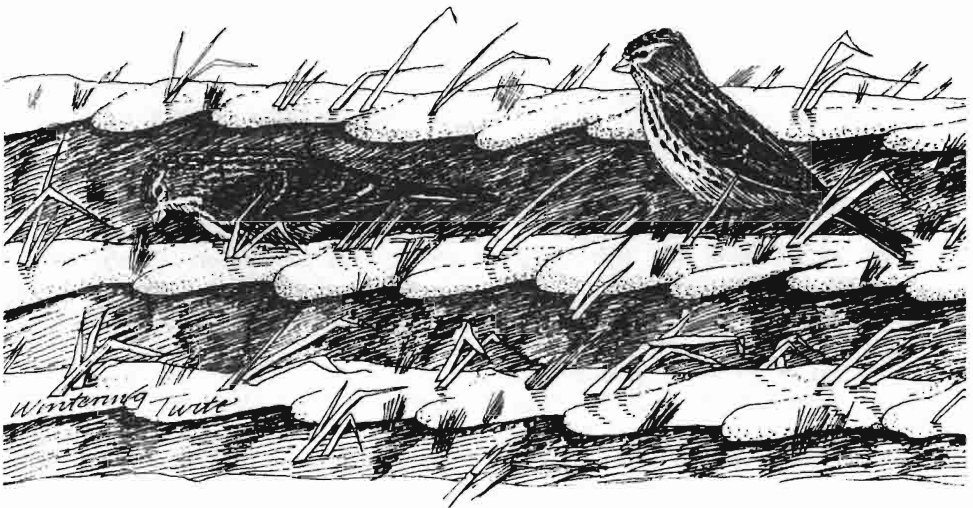
This study would not have been possible without the patience and dedication of local bird recorders and other birdwatchers throughout Scotland and we are grateful to them all for their help. We thank also Ian Bainbridge and Mark Hancock of RSPB Scotland for their advice and support during the course of this work and their comments on an earlier draft of this report.

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Wintering Twite

Mike Ashley

Movements of Twites in Scotland

H CLARK & R M SELLERS

Scottish Twites undergo a complex set of movements between breeding and wintering quarters. Three migration routes, probably best described as partial migrations, are tentatively identified: (i) from Shetland through Fair Isle to Orkney probably extending south to Caithness, the Moray Firth and NE Scotland, (ii) from the NW Highlands and the Western Isles to Caithness, (iii) from the W Highlands through Argyll to the north coast of Ireland. The wintering areas of birds breeding in the Grampians, and the origins of birds wintering in southern Scotland remain unknown. The breeding populations of Caithness, and possibly those of E Sutherland, Easter Ross, Orkney, the southern islands of the Outer Hebrides and the southern islands of the Inner Hebrides appear to be resident throughout the year. There is no evidence that significant numbers of the Scandinavian race regularly reach Scotland. Conservation aspects of the results are discussed and the need for further studies highlighted.

Introduction

The Twite *Carduelis flavirostris* has a restricted breeding distribution in Western Europe, ranging discontinuously from the west and north coasts of Ireland through northern England and Scotland to western Norway and the Kola peninsula in northern Russia (Cramp & Perrins 1994, Hagemeyer & Blair 1997). The Norwegian population migrates south in the autumn mainly across the Skagerrak and through Denmark to winter along the coasts of northern France, the Low Countries and Germany (Bernhoft-Osa 1965). The movements of Twites in Britain are less well known. The small breeding population of the Peak District and southern Pennines moves to winter around southern North Sea coasts (Davies 1988); Scottish and Irish Twites, on the other hand, have been

described as largely sedentary (eg Jardine & Reid 1993). This paper describes an analysis of what is known about the movements undertaken by Twites in Scotland.

Materials and Methods

The analysis draws on 4 main sources of information: a comparison of breeding and non breeding distributions, field observations of migrating birds, seasonal variations in numbers, and ringing recoveries.

The distribution of Twites in Britain and Ireland has been described as a result of surveys in 1968-72 (Sharrock 1976) and 1988-91 (Jardine & Reid 1993) for breeding birds, and in 1981-84 for wintering birds (Lack 1986). We supplemented these surveys with information obtained from a questionnaire

circulated to all local bird recorders in Scotland plus other knowledgeable birdwatchers with an interest in Twites (Clark & Sellers 1997a). The questionnaire asked for information on (i) timing of occurrence (especially where there was an appreciable difference in the numbers present between the breeding and non breeding seasons) and (ii) visible migration. The survey also solicited information on habitats, foods, numbers and changes in status; an analysis of these is published concurrently. Responses were received from all parts of Scotland except Wester Ross and west Inverness. We also checked relevant local avifaunas and bird reports. Information on Twites in Caithness came mainly from our earlier study (Clark & Sellers 1997b) and subsequent observations, and from records published in Caithness Birds, formerly the Caithness Bird Report.

Ringling recoveries for Twites marked in Scotland were kindly made available by the British Trust for Ornithology. The total number of recoveries available was 26; 12 recovered at the site of ringing in the same season provided no information on movements and were excluded from the analysis.

Results

Distributions in the breeding and non breeding seasons

When the distributions in the breeding and non breeding seasons are superimposed (Figure 1), it is evident that only a few areas hold birds throughout the year, chief amongst them being the Northern Isles (principally Orkney), Caithness, E Sutherland, SE Ross, E Inverness, the southern islands of the Outer Hebrides (Uists, Benbecula), the southern islands of the Inner Hebrides (Coll, Tiree, Colonsay, Oronsay and Islay) and W

Galloway. By contrast a large part of the breeding range including Lewis, most of Skye, Mull, the NW Highlands from Cape Wrath to the Firth of Lorn, and N Perthshire is largely devoid of Twites in winter. Areas where birds appear only in the non breeding season include the coasts of Ayrshire, E Galloway, Lanarkshire, the inner Solway Firth, SW Perthshire, the shores of the Moray Firth south of the Dornoch Firth, Angus, Fife, inner Firth of Forth, coastal Lothian and the E Grampians.

Other observations

A summary of observations on the occurrence of migrating Twites in Scotland is given in Table 1. These show that in several of the areas identified as holding birds in both the breeding and non breeding seasons there is a substantial winter influx of birds. Included in this category are Caithness, E Sutherland, E Inverness, Islay and E Galloway. By contrast, there is a reduction in the numbers of birds in winter in Shetland. It appears that most movements occur in October-November and March-April.

The most detailed information on the passage of Twites comes from Fair Isle and North Ronaldsay, where regular observations have been made over many years. At the former, the main migration periods are August-October with a much smaller passage in April and May (Dymond 1991), whilst on North Ronaldsay there is a small autumn passage from mid August to early November but little evidence of a spring passage (K Woodbridge, *pers comm*). Migrant flocks have also been noted on the Isle of May, and what appear to be migrant flocks have been noted on both sides of the Pentland Firth, in E Sutherland, in several places on the west coast (Lewis, Eigg, Mull, mainland Argyll, Oronsay, Islay

Figure 1 *Distribution of the Twite in Scotland in the breeding and non breeding seasons*



and Arran) and the Gargunnock Hills (Stirlingshire). In addition, Twites are occasionally noted on oil and gas platforms in the North Sea, with the majority of such sightings coming from those in the Forties field off Aberdeen, although there are a few from the oil rigs off Shetland (Table 1).

A number of the replies to our questionnaire made reference to hard weather movements. For instance, Twites were reported as appearing in hard weather on the coasts of

Fife and Ayrshire and as disappearing from SW Perthshire, perhaps connected with their appearance in Fife. We have noted similar behaviour in Caithness, with birds disappearing with the onset of snow cover and reappearing more or less immediately once a thaw was underway. We do not know where the birds went but evidently it was not far; it was probably nearby coasts, which at such times are likely to be the only places where Twites can find food. Coastal movements noted near Aberdeen and in Lothian may also be related to hard weather.

Table 1 Summary of sightings of migrating Twites in Scotland

Area	Principal observations
North Sea Oil Platforms	Occasionally noted on spring and autumn passage; most records from oil rigs in the Forties field ca150km off Aberdeen, a few from those between Shetland and Norway (Bourne <i>et al</i> 1978, North Sea Bird Reports).
Shetland	Less common in winter than in breeding season (K Osborn, <i>pers. comm</i>) Large numbers on passage Unst, 26 September and 4 December 1911 (Baxter & Rintoul 1953).
Fair Isle	Fairly common as a breeding species; winters occasionally in small numbers (formerly wintered more regularly); distinct spring and autumn passage, April-May and August-October (Dymond 1991).
Orkney	Present all year, in strength late October – early May. Regular autumn passage noted on North Ronaldsay, but little evidence of spring passage (K Woodbridge, <i>pers comm</i>). Regular passage suspected, Pentland Skerries, 1880s (eg Harvie-Brown 1886). Large numbers on passage, Pentland Skerries, 12 October, 6 November and 6 December 1911 (Baxter & Rintoul 1953); flock of 40 on Pentland Skerries on 18 September 1976 may also have been on passage (Booth, Cuthbert & Reynolds 1984).
Sule Skerry	"...most commonly seen in April and May, sometimes in large flocks, which remain for a few day. Small numbers appear in August and September and occasionally in November" (Clark 1912).
Caithness	Much more common in winter than in the breeding season though varying somewhat between years (Clark & Sellers 1997b); present in strength in October-March. One record of flock of 250 birds coming in off sea at Duncansby Head in October 1995 and one record on Stroma probably relate to migrants.
NW Sutherland	Post-breeding flocks of up to 100 birds present mid August-September; irregular in winter months.
E Sutherland	Present throughout the year but more common in late October-March when confined to low ground. Small parties of birds seen moving west through Clynelish Valley, Brora, late February and early March.
E Ross, E Inverness	More common in the winter months, when occurs on low ground near coast. Flock of 40 flying south, possibly migrating, Buachaille Etive Beag, Lochaber, 15 September 1990 (Highland Bird Report 1990).
Moray & Nairn	A century ago good breeding and wintering numbers with apparent movement from high ground to low ground and coast in winter. Numbers now much smaller but still mainly present on high ground in breeding season and low ground October-April (Cook 1992).
NE Scotland	Wintering numbers variable, but far exceed the breeding population in most years (Buckland <i>et al</i> 1990); higher numbers present early November – end February. On 24 December 1995 at Aberdeen Beach several hundred moving "along coast and swinging inland"; this exceptional record was thought to be the result of a hard weather movement.

- Fife Winter visitor in small numbers (Smout 1986); occurrence perhaps associated with hard weather (D E Dickson, *pers comm*). Single birds or small flocks seen from time to time on Isle of May mostly in October and March/April, often with Scandinavian migrants such as Brambling, Black Redstart, Lapland Bunting and Snow Bunting (I M Darling, *pers comm*). Thom (1986) says that "Some immigration is also believed to take place, as Twites are sometimes seen arriving on the east coast in autumn and parties of up to 50 have been recorded on the Isle of May in both autumn and spring"; we have not been able to corroborate this statement.
- SW Perth Winter visitor in good numbers; present mid-October – early May, in
-shire strength early November – end February
- Stirlingshire Winter visitor, present mid-October – early March, in strength
& Inner November-February. Flock of 25 flying west, Stronend, Gargunnoch Hills, 25
Firth of Forth October 1976 presumed to be migrants.
- Lothian Winter visitor (though breeds in very small numbers in the Pentland Hills),
present early October – early May, in strength late October – early March.
Small numbers noted occasionally moving west along the coast at Aberlady,
Gosford and Musselburgh in October – December and March – April.
- Borders Winter visitor, present early December – late February.
- Outer Hebrides Present all year; irregular as a migrant (Cunningham, Dix & Snow 1995).
- Lewis Large numbers noted on passage, Butt of Lewis, 24 September 1911
(Baxter & Rintoul 1953).
- Uists,
- Benbecula Present all year; no obvious change in numbers.
- Flannan Is Summer visitor (Clark 1912).
- Inner Hebrides
- Rhum Influxes noted in April (Evans & Flower 1967).
- Eigg Evidence of passage, *eg* flock of 150+ 18 August 1958 (Evans & Flower 1967).
- Coll & Present throughout the year (Stroud 1989); on Coll present in strength
Tiree August-April with some evidence of passage August/September.
- Iona Present in small numbers throughout the year, irregular in winter months;
& Mull migrants occasionally seen (Madders & Snow 1987); post-breeding flocks of
up to 60 birds present August-September.
- Colonsay Present throughout the year (Jardine, Clarke & Clarke 1986). Possible
& Oronsay northward passage noted on Oronsay in April 1987 (Jardine 1992).
- Islay Breeds in small numbers; more common in winter; passage evident (Elliott 1989, Ogilvie 1992).
- Argyll Small numbers breed and overwinter; common in suitable habitat o
(mainland) passage (Madders, Snow & Welstead 1991).
- C Strathclyde Winter visitor in small numbers.
- Arran, Bute, Occasional winter visitor in small numbers, present August-March. Some
Cumraes evidence of passage on Arran where birds have been seen arriving from the
sea (T ap Rheinnall, *pers comm*).

- Ayrshire Winter visitor (though a few breed on Ailsa Craig), present end September – early May, in strength mid-November – late March; highest numbers possibly associated with hard weather when occurs with Brambling, Chaffinch and Linnet. Movements often occur at same time as visible migration of Skylarks believed to originate from N and NW Scotland, and possibly from the continent.
- Galloway Small numbers breeding in E Galloway; influx in non-breeding season, present September – April, in strength October – March. Some evidence of a passage of birds in Wigtownshire (Dickson 1992).
- Dumfriesshire Winter visitor.

a Information from this study unless otherwise stated.

Ringling recoveries

Figure 2 shows the 10 recoveries of Scottish Twites involving movements of >40 km. There were 3 movements between Fair Isle (ringing dates September (2) and October) and Orkney where the birds were recovered in May, November and January respectively, and one movement between Shetland and Orkney. A bird ringed on Fair Isle in July 1990 was recovered near Ellon in NE Scotland in March 1992. Two movements were recorded between winter quarters in Caithness and breeding grounds in NW Scotland: one in Wester Ross and one in Lewis. There were 2 movements between W Scotland and Ireland, one in each direction, but involving birds breeding in Scotland and wintering in Ireland. A bird ringed on Fair Isle in July was found dying on a ship off the coast of Germany/Denmark approximately 3 months later. These movements involved 4 males and 4 females of which 5 were first years and 3 adults, as well as 2 birds whose age or sex was not known.

There were, in addition, 4 short distance movements which show evidence of fidelity to an area throughout the year. These included a bird ringed on Out Skerries, Shetland in September and controlled the following February on Whalsay, Shetland (13 km SW), a bird ringed on Foula, Shetland in October and recovered dead in the following January on Wester Skeld, Shetland (35 km E), a first year female ringed at Lynegar, Caithness in January and found dead the following April at Dunbeath, Caithness (29 km W) and a first year male ringed at Northfield, Caithness in December and found tangled in sheep's wool at Hempriggs, Caithness, in June, 2.5 years later (2 km SSE).

Discussion

Movements

Even though the information available is incomplete, it is clear that a substantial part of the Scottish Twite population moves away from the breeding grounds for the winter

months, and, in general, there appears to be a shift from high to low ground. The pattern of movements is evidently complex and, on the basis of the evidence presented here, we believe that at least 3 distinct migratory routes can tentatively be identified as follows:

- (1) from Shetland through Fair Isle to Orkney, and probably extending southwards to Caithness and the low lying coastal strip around the Moray Firth, especially around the Dornoch, Cromarty and Beaulie Firths, and NE Scotland. In the main this probably involves birds breeding in Shetland, though we do not exclude the possibility that some birds from Norway are also involved;
- (2) from the NW Highlands and the Western Isles to Caithness, and possibly to the coastal plain of E Sutherland, and by implication Easter Ross and E Inverness; and
- (3) from the W Highlands through Argyll to the north coast of Ireland.

The wintering areas of birds breeding in the southern Grampians, and the breeding locations of birds wintering in southern Scotland remain unknown. Small numbers of Twites also winter in northern England and the Isle of Man, and we suspect that these are mostly of Scottish origin.

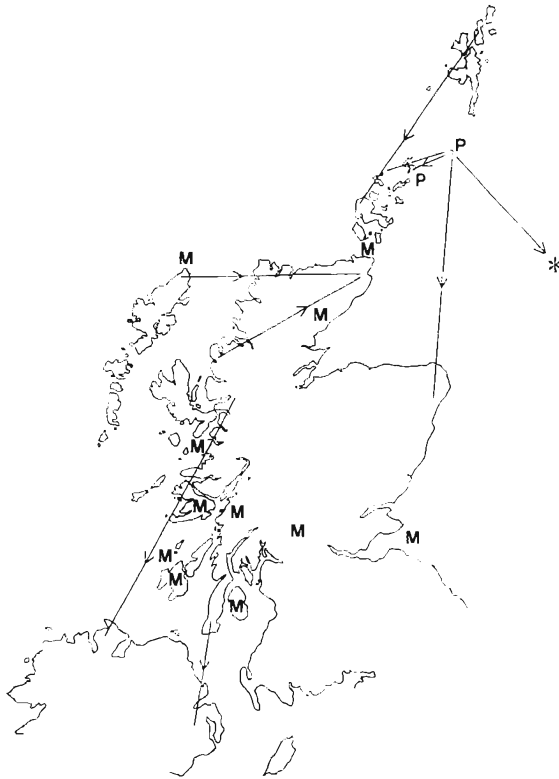
In parts of nearly all the breeding areas just listed, some birds appear to remain during the non breeding season for instance, on Shetland and Orkney, and the Outer and Inner Hebrides, and it may be better to describe all 3 as partial migrations. Birds breeding in Caithness, and probably those in E Sutherland and Easter Ross also, appear to remain close to their breeding grounds throughout the year, undertaking perhaps

short distance movements from high to low ground, though we do not exclude the possibility that some migrate.

There is no direct evidence from ringing that birds from Norway winter in Britain. An extensive ringing programme was carried out in Norway in the 1960s and generated over 100 recoveries, mainly from the countries along the south eastern seaboard of the North Sea, but none from Scotland (Bernhoft-Osa 1965, Cramp & Perrins 1994). The occasional arrival of Twites at sites such as the Isle of May with known Scandinavian migrants suggests that some Norwegian birds do migrate into Britain and this is supported by the records of Twites from oil rigs in the North Sea, especially the northern ones. The sightings from the more southerly rigs are also probably birds from Norway, but it is possible that they are Scottish, probably Shetland, birds migrating to the continent; the bird ringed on Fair Isle and recovered off the German/Danish coast may be such a bird. We think it likely that small numbers of Scandinavian birds do appear in Scotland, but that there is no regular large scale movement across the northern North Sea.

We had hoped to shed further light on the question of whether Scandinavian Twites *C f flavirostris* visit Scotland by examining skins in the collection of the British Museum (Natural History) and some kindly obtained by them on our behalf from the University Zoological Museum, Oslo. In practice, we found the differences in plumage between the Scandinavian race *C f flavirostris* and that breeding in Britain (*C f pipilans*; the Outer Hebrides breeding population is sometimes treated as a separate sub species *C f bensonorum*) to be so slight that they could not be applied with confidence either to skins of wintering birds taken in Scotland or to birds caught in the field. The races also differ

Figure 2 Ringing recoveries of Twites in Scotland. Lines and arrows connect movements from breeding to winter quarters; these may not be the actual routes taken.



*Bird recovered on a ship off the coast of Denmark/Germany

P Sites with a regular passage of Twites

M Sites where migrant flocks have been recorded

slightly in size with *C f flavirostris* the larger (Clark & Sellers unpublished data based on skins), but it also proved impossible to demonstrate conclusively on the wing measurements that any *flavirostris* occur in Britain

Conservation aspects

The Twite is one of the few British breeding landbirds whose population is of international importance and its conservation is therefore of some importance. The prime conservation requirement is to provide protection to the

main breeding and wintering areas (Batten *et al* 1990, Brown & Crockford 1997), but implicit in this is a sound knowledge of migration routes. The picture which emerges from this study is complex, but emphasises that any action to protect Twites in their principal wintering areas in Scotland (Orkney, Caithness, southern part of Western Isles, SW Perthshire, Argyll) must be balanced by equivalent action in the corresponding parts of the breeding range, namely Shetland, Orkney, Caithness, W and NW Scotland, Western Isles, and N Perthshire. Knowledge of the movements of Twites in Scotland is not complete and more information on this is needed to ensure the effective conservation of the species. This will probably be best achieved by a coordinated programme of ringing throughout Scotland.

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Distribution and foraging habitat preferences of Choughs on The Oa peninsula, Islay

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Foraging Choughs on The Oa peninsula, Islay, were studied in relation to the distribution of habitat. A total of 13-14 birds were present in winter 1995, and 6 pairs and one subadult in late summer 1996. In general, foraging Choughs selected grassland habitats. In December-February, the order of Chough foraging preferences was acidic grassland > improved grassland > neutral grassland > other habitats. In July-September, when Choughs were distributed mostly around the coast, the order was neutral (dune) grassland > cliff and slope > acidic grassland and other habitats. Decline in the number of Choughs on The Oa does not appear to be associated with change in the availability of preferred foraging habitats. Other factors that may have had an adverse effect on Chough populations are discussed, and areas of further research identified.

Introduction

The Isle of Islay has traditionally supported a large number of breeding Choughs *Pyrrhocorax pyrrhocorax* (Thom 1986). A survey in 1986 estimated that the Scottish Chough population comprised at least 105 pairs, of which 95 (90%) were on Islay (Monaghan *et al* 1989). Increases in the Islay Chough population between 1968-72 and 1988-91 have been attributed to stable land management and the conservation of nest sites (Gibbons *et al* 1993). However, evidence from The Oa peninsula on Islay suggests that numbers of chough have declined dramatically in recent years. Breeding surveys found 19 pairs and 22 non breeders on The Oa in 1982 (Warnes 1983), and 23 pairs and 20 non breeders in 1986 (Monaghan *et al* 1989). These surveys indicated that The Oa held 31% and 24%, respectively, of the Islay breeding population. By 1992 only 13 pairs were present on The

Oa (E. Bignal *pers comm*), representing 18% of the total number of pairs on Islay. A partial survey in 1994 indicated that The Oa breeding population had further declined to 7 pairs (Bignal 1994).

Few data are available on the size of the wintering population on The Oa. Warnes (1983) reported that 42 Choughs were located during a coastal survey in December 1980, and considered that a further 15 birds found on the Laggan peninsula at the same time were part of The Oa population. More recently, observations of Choughs foraging inland indicated that a minimum of 23 birds were present during winter 1987 (C R McKay *pers comm*).

In order to better understand the factors that influence Chough populations, we studied the distribution of Choughs on The Oa in relation to the availability of habitat. Definitions follow those of Mosher *et al* (1987). *Availability*

of a habitat is its relative area within the study area. *Habitat use* is a measure of the quantity of a habitat utilised. *Habitat selection* occurs when a habitat is used disproportionately in relation to its availability. *Preference* for a habitat is a measure of the likelihood of that habitat being chosen if its availability is equal with that of other habitats.

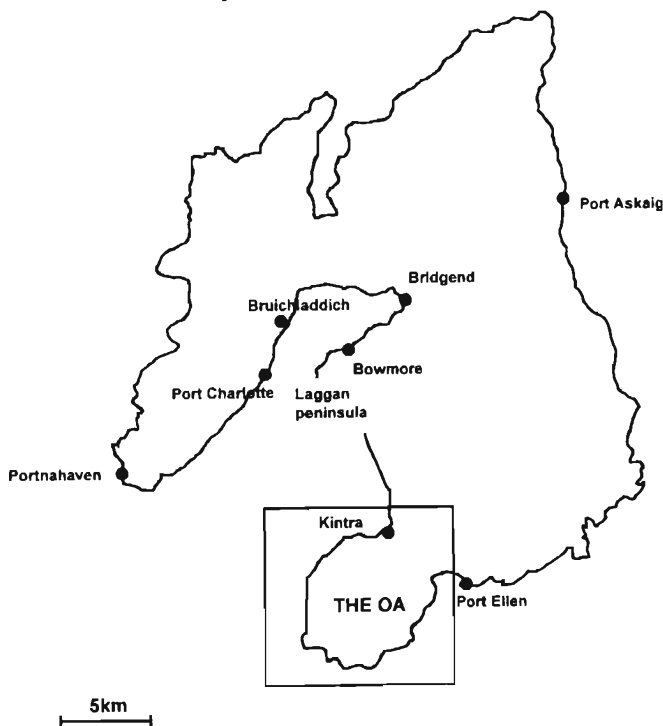
Study area

The Oa is a broad peninsula covering approximately 47km² in the southwest of Islay (Figure 1). A wide range of habitats are supported, including bog and dwarf shrub

heath, semi improved acid and neutral grasslands, and improved and semi improved pastures and arable habitats. The coast comprises mainly steep rocky cliffs in the west and south, and lower profile cliffs and raised beaches in the east. An extensive dune system adjoins the area at Kintra, and extends northwards to the Laggan peninsula. The Oa is extremely exposed and generally treeless, although some of the eastern part was planted with conifers during the 1980s.

Land use is geared mainly to the production of beef cattle and sheep. The inbye pastures and semi improved grasslands are used

Figure 1 Location of The Oa, Islay

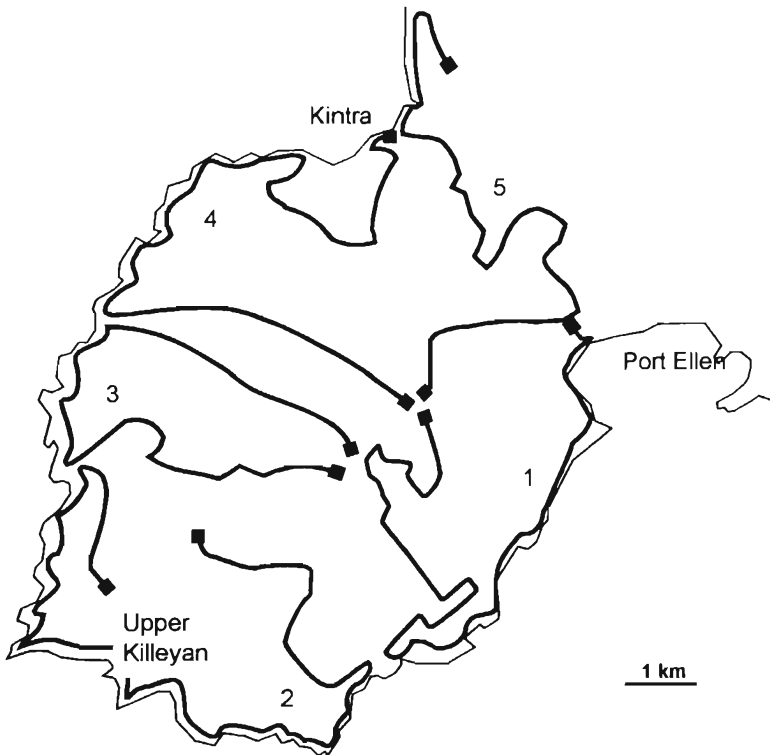


mostly for grazing in spring and silage production in summer. Most improved grass is left ungrazed by cattle during winter to avoid poaching, except at Kintra where the ground is better drained as a result of the sandy substrate. Elsewhere, the semi improved grasslands and heath/grassland mosaics are extensively grazed by sheep and small numbers of cattle throughout the year. The coastal cliffs are grazed by a population of c.100-150 feral goats (Newton 1984). Rabbits *Oryctolagus cuniculus* occur in several localities, and are particularly numerous in the dune grassland at Kintra.

Methods

Chough distribution and behaviour were recorded during 2 study periods: December-February 1995-6 and July-September 1996. Five survey routes were used to systematically search for Choughs on The Oa and in a buffer zone extending approximately 1km east. Routes were selected to pass within 0.5km of all areas of habitat considered likely to hold Choughs, ie sea cliffs and slopes, grassland, and cultivated ground (Figure

Figure 2 Location of 5 routes used to systematically survey Choughs on The Oa, Islay.



2). Routes were allowed to meander so that suitable ground could be covered as thoroughly as possible. Where routes followed the coast, headlands were used to carefully scan the seacliff and shoreline. The total area visible from all routes was estimated to be 40 km^2 , ie 85% of the study area.

Each route was walked 12 times (6 times each in December-February and July-September). The direction in which routes were undertaken was reversed between visits, to help control for diurnal variation in Chough activity. Possible bias due to differences in Chough detection between different observers was minimised by ensuring that each observer undertook each route an equal number of times. Observations were carried out only in conditions of good visibility, and in wind speeds $<14 \text{ ms}^{-1}$ (Beaufort scale 6).

All Choughs detected from the routes were recorded. To reduce dependency within the data, individuals considered to have been seen previously from the same route on the same day were excluded. These decisions were based on observations of Chough movements and, in a small number of cases, from observations of uniquely colour ringed individuals. Locations at which Choughs were initially detected were plotted onto 1:10,000 scale maps and the habitat at each location classified by reference to Phase 1 (NCC 1990) habitat maps drawn in 1995. For each observation, the number of Choughs were recorded, and the activity of each bird classified as foraging or not. Where possible, each bird was checked for colour rings and aged as either adult, sub adult (at least one calendar year old), or juvenile/immature.

The area of each available habitat class was estimated using a point sampling technique. Points were selected by overlaying Phase 1 habitat maps with a grid, the cells of which

represented $200 \times 200 \text{ m}$ on the ground. Preliminary analysis indicated that, up to 200m from the route surveyed, the frequency with which Choughs were detected did not decline with distance. However, numbers declined rapidly beyond this distance, such that only 33% of the total observations related to Choughs located greater than 200m away ($n = 24$). Ideally, we would have liked to determine habitat selection using only data from points 0-200m from survey routes. However, this would have resulted in unacceptably small sample sizes, and would have reduced both the areas and range of the habitats sampled. Accordingly, habitat was classified at all grid intersections within 200m of the survey routes, and at a random sample of 50% of the other available intersections within 1km. Intersections were used regardless of whether they had been classified for other routes. Using this approach, the distribution of habitat sampling points reflected bias in the locations of the Choughs observed. Grid intersections that fell within areas of sea were ignored. The availability of each habitat was determined simply by counting the number of sample points within each habitat class.

Foraging habitat preferences were investigated by comparing selection probability functions (Manly et al 1993) for habitats in which Choughs were observed to feed. These functions represent the proportion of the available units in a particular habitat class that are used. In this case, they can be estimated by dividing the proportion of Chough foraging observations in a particular habitat class by the proportion of that habitat class observed, ie

$$w_i = (u_i / u_+) / (a_i / a_+)$$

where w_i is the sample selection ratio, u_i is the number of records of foraging Choughs in habitat class i , u_+ is the total number of

records of foraging Choughs, a_i is the area of habitat class i observed, and a_j is the total area of all habitat classes observed. Selection functions were standardised so that they summed to one. These standardised ratios (B_i) can be interpreted as being the estimated probability that a habitat would be the next one selected if each class could be made equally available to a foraging Chough. Possible values for B_i can range from 0 (no selection) to 1 (always selected).

Results

Numbers and distribution

Choughs were observed 68 times (29 times in December-February and 39 times in July-September). Each observation involved between one and 13 birds. The distribution of sightings differed markedly between seasons, with more birds encountered around the western coast during July-September, and greater use of inland pastures in December-February (Figure 3). This shift away from coastal habitats in winter was statistically highly significant (mean distance from High Water Mark in metres \pm Standard Error: July-September 325.6 ± 62.7 , $n = 39$; December-February 967.2 ± 114.4 , $n = 29$; $t = -5.24$, $df = 66$, 2-tailed $P < 0.001$).

Based on simultaneous sightings of Choughs in different localities, together with observations of 2 colour ringed individuals, The Oa wintering population in 1995/6 was estimated to comprise 13-14 birds, including at least 4 adult pairs. Excluding juveniles, a total of thirteen Choughs was present during July-September 1996, including 6 adult pairs and a sub adult. In July, 5 pairs were accompanied a total of 10 fledged young. However, one juvenile had disappeared by September. One family moved to the adjoining

duneland north of Kintra shortly after fledging, and did not return to The Oa until September. The remaining birds mostly occupied the south western cliffs and adjacent pastures, where they often coalesced into a single foraging group.

Habitat selection

Fifty Chough observations involved one or more foraging individual (December-February: 24; July-September: 26). Foraging Choughs occupied 10 Phase 1 habitat classes, comprising 5 grassland and 2 heathland types, plus cliff and slope, arable, and inter tidal habitats (Table 1). A further 7 habitat classes available on The Oa were avoided by Choughs. These included woodland and scrub, marshy grassland, bracken, and mires and flushes. The only area of arable habitat selected was a stubble field at Upper Killeyan, which was used by varying numbers of Choughs after it was cut in late August. Choughs feeding in this field appeared to forage for invertebrates within the soil rather than on any residual grain. Overall, Choughs preferred semi improved to unimproved acidic grassland. Wintering Choughs foraged preferentially in acidic grassland and improved grassland (Figure 4). Neutral grasslands were less preferred, and other habitats were used little or not at all. In July-September, Choughs showed a strong preference for neutral grasslands, followed by maritime cliff/slope and acidic grasslands. Other habitats used by Choughs included arable and inter tidal habitats (July-September only), and dwarf shrub heaths.

According to the Phase 1 vegetation maps Choughs foraged in wet and dry heaths during both study periods. However, field observations indicated that Choughs were in fact using small patches of unimproved

Figure 3 Sites where Choughs were initially located during systematic coverage of survey routes. Dot size represents the number of Choughs in each group located (including juveniles). Arrows show the direction and number of flying birds.

(a) December-February

(b) July-September

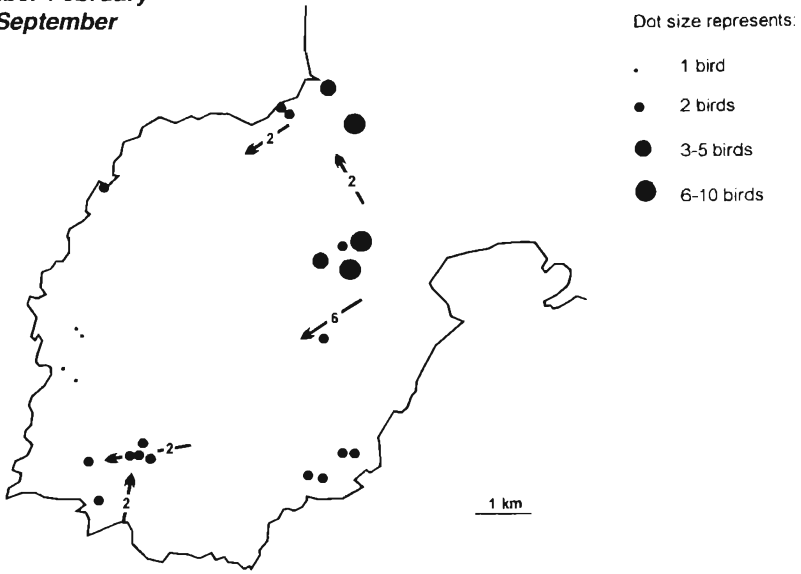


Figure 3a

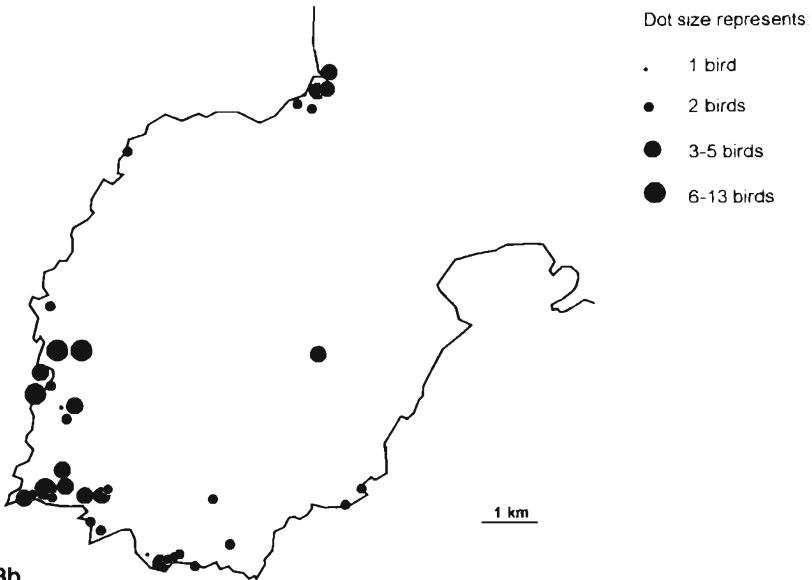


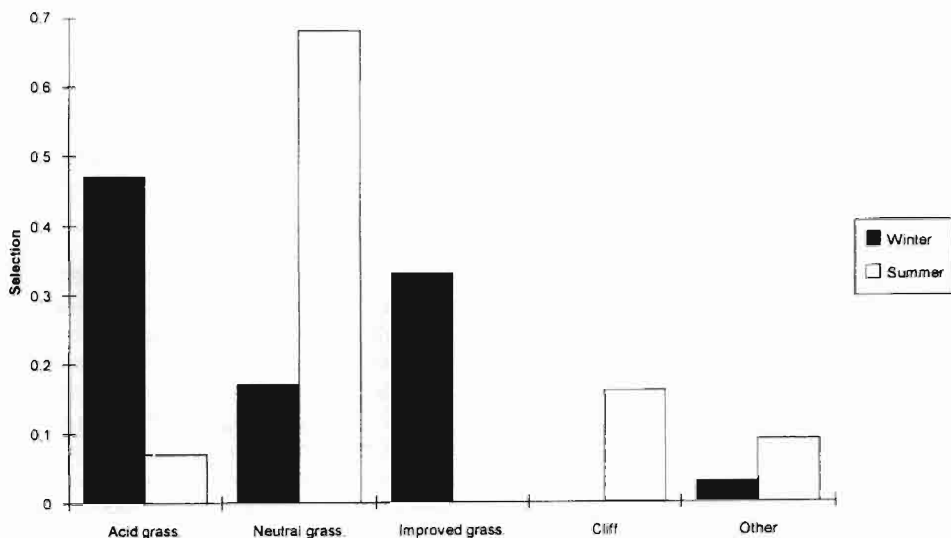
Figure 3b

Table 1 Availability of Phase 1 habitat classes on The Oa and their selection by foraging Choughs.

Phase 1 habitat class	Habitat Available		Habitat selected							
	<i>a</i>	<i>a/a</i>	<i>u</i>	<i>u/u</i>	<i>w</i>	<i>B</i>	<i>u</i>	<i>u/u</i>	<i>w</i>	<i>B</i>
Woodland & scrub	37	.040	0	-	-	-	0	-	-	-
Acidic grassland										
<i>Semi improved</i>	12	.013	3	.125	9.61	.44	1	.038	2.92	.05
<i>Unimproved</i>	57	.062	1	.042	.68	.03	2	.077	1.24	.02
Neutral grassland										
<i>Semi improved</i>	124	.134	12	.500	3.73	.17	7	.269	2.01	.03
<i>Unimproved</i>	4	.004	0	-	-	-	0	-	-	-
Calcareous grassland										
<i>Unimproved</i>	8	.009	0	-	-	-	0	-	-	-
Improved grassland	27	.029	5	.208	7.17	.33	0	-	-	-
Marshy grassland	63	.068	0	-	-	-	0	-	-	-
Bracken	21	.023	0	-	-	-	0	-	-	-
Dry dwarf shrub heath	125	.135	1	.042	.31	.01	4	.154	1.14	.02
Wet dwarf shrub heath	213	.230	2	.083	.36	.02	4	.154	.67	.01
Mires & flushes	168	.182	0	-	-	-	0	-	-	-
Lochs	9	.009	0	-	-	-	0	-	-	-
Coastal grassland	3	.003	0	-	-	-	3	.115	38.33	.65
Cliff	12	.012	0	-	-	-	3	.115	9.58	.16
Arable land	21	.023	0	-	-	-	1	.038	1.65	.03
Unclassified										
<i>Inter tidal</i>	21	.023	0	-	-	-	1	.038	1.65	.03

Key: *a* = number of sampling points in habitat class *i*; *a* = total number of sampling points ($\Sigma a = 925$); *a/a* = habitat class *i* as a proportion of total habitat classes; *U* = number of records of foraging Choughs in habitat class *i*; *u* = total number of records of foraging Choughs (Dec-Feb: $\Sigma u = 24$; Jul-Sept: $\Sigma u = 26$); *u/u* = number of records of foraging Choughs in habitat class *i* as a proportion of total number of records of foraging Choughs; *w*_{*i*} = selection ratio; *B*_{*i*} = standardised selection ratio.

Figure 4 *Habitat preferences of foraging Choughs in Jul-Sept and Dec-Feb. The graph shows standardised selection indices for 5 Phase 1 habitat groupings (semi improved and improved acidic grasslands combined; coastal and semi improved neutral grasslands combined; other = wet and dry heaths, arable land and inter tidal habitats).*



grassland within heathland habitats. These were presumably too small to be discriminated by the Phase 1 mapping resolution. It was notable that many of these patches were located in areas overlying bands of limestone.

Discussion

Comparison with data from the 1980s (Warnes 1983; Monaghan et al 1989) indicates that The Oa breeding population has decreased by about 75% and the wintering population by about 60%, a serious long term decline. Warnes (1982) considered that approximately 30% of The Oa population wintered on the Laggan peninsula. We found no evidence to

suggest that this is currently the case, although one family group from The Oa took up temporary residence in duneland south of Laggan during late summer.

Important differences in habitat selection by foraging Choughs were apparent between the 2 study periods. Choughs used a wider range of habitats in July-September, and were less reliant on improved grasslands and semi-improved acidic grasslands. This is consistent with McKay (1996), who found that Choughs on the Rinns of Islay used the narrowest range of habitats in late winter, when most birds fed in improved or semi-improved pasture. Chough nest sites on The

Oa are mostly coastal (Warnes 1982), and increased preference for maritime cliff/slope habitat in the breeding season (April-July) is perhaps unsurprising. However, examination of the data shows that this habitat was much used as late as September. This suggests that Choughs' preference for cliff and slope habitat at this time may have been more than simply an artefact of nest site selection.

Neutral grasslands were the most preferred habitat in July-September. By far the most intensively used area of this habitat was the dune grassland at Kintra, where 4-6 Choughs were more-or-less resident during September. It is probable that these birds found the short grassy swards, grazed by cattle and rabbits, preferable to the more structured vegetation characteristic of many other grasslands at this time (see Bullock *et al* 1983). Most improved and enclosed semi improved pastures, for example, were effectively unavailable to Choughs much before August because they were used for silage crops.

We can think of no dramatic change in the availability of preferred foraging habitats on The Oa over the past decade, although it is accepted that insidious change (eg the spread of bracken) is difficult to detect and that there is a clear need for a proper historical review, perhaps by mapping habitats from aerial photographs. Farming practices are likely to have had an important effect on Choughs. Several case studies (Bullock *et al* 1983) have demonstrated the importance of grazing herbivores to Chough feeding ecology. These maintain the sward at a height short enough to allow Choughs access to soil invertebrates (Bullock 1980), while dung beetles *Aphodius* found in the faeces of cattle and sheep represent an important additional source of prey (Bullock *et al* 1983). We do not know how numbers of grazing livestock have

changed on The Oa, and suggest that this would be a useful area for further investigation.

Improved animal husbandry may have had an adverse effect on Choughs. An increasing number of cattle are wintered indoors on The Oa, and this will have inevitably led to a reduction in the availability of cow dung. At the same time, the trend toward the supplementary feeding of those animals wintered outdoors is likely to have concentrated dung in fewer areas. Finally, there is concern over the use of the anthelmintic drug, Ivermectin, which may prevent invasion of dung by invertebrates (McCracken & Foster 1992).

Other factors which may have had an effect on Chough numbers, such as nest site availability and numbers of potential predators, are not known to have changed. The Oa holds a relatively strong population (10 pairs) of breeding Raven *Corvus corax* (Madders 1997). It is not known whether Raven numbers have increased in recent years, or if such an increase could have been detrimental to Choughs.

The Chough's decline on The Oa may be linked to changes in the population as a whole. A survey in 1992 (Bignal *unpublished*) indicated that numbers on Islay had declined by 35% since 1986, and that decline was greatest in the non breeding population. Our results indicate that a further widespread decline may have occurred, and the results of an island wide survey in 1998 are awaited with interest.

Acknowledgements

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Ross Lilley, Fiona Rout and Anthony Williams assisted with various aspects of the study. We thank Paul Thompson and an anonymous referee for their valuable comments on the manuscript. Fieldwork was carried out under contract to Scottish Natural Heritage.

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Choughs

Steven Brown

Orkney Hen Harriers: a major population decline in the absence of persecution

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The numbers of breeding male and female Hen Harriers in Orkney's West Mainland in 1996 and 1997 were estimated to have declined by about two thirds since their peaks in the 1970s. For the whole of Orkney during 1996 and 1997, 25% of the females which built nests apparently did not lay eggs. Of the nests located with eggs, 60% did not produce any fledged young. A maximum of 39 young were fledged over the 2 years giving a productivity range of 0.4 young per female, 0.6 young per nest built or 0.9 young per nest with eggs. This represented a decline of about two thirds in breeding production since the peaks in the early and mid 1970s. It is suggested that reduced food availability, associated with land use change, and avian predation may have been the main reasons for the change in status.

Introduction

The Hen Harrier *Circus cyaneus* population of the West Mainland of Orkney (Figure 1) has been well documented (Balfour 1957, 1962, 1963, Balfour & Cadbury 1975, 1979, Picozzi 1980, 1984a,b). Orkney was one of the species' few refuges from persecution in Britain during the late 19th and early 20th centuries and it is possible that the islands provided a source from which mainland Scotland was recolonised when gamekeeping pressure was relaxed during and immediately after World War II (1939-1945) (Watson 1977). More recently, it has been confirmed that Hen Harriers reared in Orkney have bred on mainland Scotland (Balfour & Cadbury 1975, Picozzi & Watson 1985).

Hen Harriers have suffered severe persecution over much of mainland Britain for most of the 20th century (Watson 1977, Bibby & Etheridge 1993, Etheridge *et al* 1997, Redpath & Thirgood 1997, Scottish Raptor Study Groups 1997, Potts 1998, Stott 1998). The Orkney Islands are unusual in Britain in that human persecution of Hen Harriers is

virtually non-existent and there are no Red Foxes *Vulpes vulpes*, one of the species' main natural predators (Watson 1977, Berry 1985, Redpath & Thirgood 1997).

The Orkney Hen Harrier population increased between the late 1940s and the mid 1970s by which time polygynous breeding was widespread in the West Mainland (Balfour & Cadbury 1979). In 1978, an exceptional year, 95 females nested in the West Mainland and it was also estimated that there were 43 breeding males (Picozzi 1984a,b, Table 1). Breeding also occurred in the 1970s on Rousay (5 to 8 nests), Hoy (4 nests), East Mainland (3 to 4 nests) and Eday (1 to 2 nests) (Balfour & Cadbury 1975, M Cockram, N Picozzi & E J Williams *pers comm*). The total number of breeding females for the whole of Orkney in 1978 may therefore have exceeded 110. Polygyny has also been recorded on Rousay and in the East Mainland but not on Hoy or Eday (RSPB unpublished, M Cockram, T Prescott & J Plowman *pers comm*). Thus, the total number of breeding males for the whole of Orkney in 1978 was probably between 51 and 55.

Figure 1 Map of the Orkney Islands, north Scotland



In 1981, 57 female and 21 male Hen Harriers were found on West Mainland (Picozzi 1984a,b). Thereafter (apart from 1989) it became impractical to establish the annual number of harriers attempting to breed, mainly because of a lack of full time field study. However, it is believed that most, probably all, successful nests were found in the whole of Orkney for the period 1982-95 (RSPB unpublished). In 1989 a concentrated effort was made to locate all breeding attempts as part of a national Hen Harrier survey (Downing 1990, Bibby & Etheridge 1993) and a total of 71 breeding females was found, with 62 in the West Mainland (Table 1). The West Mainland figure was within the range found during Picozzi's intensive study and did not cause immediate concern. However, by 1994, it

was evident that the decline had continued, possibly as a result of increasing nest failure and declining clutch size during 1982-94 (Kalejta-Summers 1995).

In 1996 and 1997 the Royal Society for the Protection of Birds attempted to census the Orkney Hen Harrier population and record breeding success, allowing comparisons to be made with the earlier studies of Balfour & Cadbury (1975, 1979), Picozzi (1984a,b) and Downing (1990).

Methods

In 1996 and 1997 all known nesting areas and other suitable moorland habitat in the West Mainland, Rousay, Hoy and Eday were visited and/or watched on several occasions between mid April and the end of May. The

Table 1 The numbers of breeding Hen Harriers in West Mainland, Orkney in years when all breeding attempts were thought to have been known.

Year	Females	Males	Source
1970	42	16	Balfour & Cadbury
1979			
1971	44	21	"
1972	49	24	"
1973	51	36	"
1974	62	45	"
1975	47		Picozzi 1984 a,b
1976	56		"
1977	85	44	"
1978	95	43	"
1979	60	32	"
1980	80	27	"
1981	57	21	"
1989	62		Dowing 1990
1996	24	14	present study
1997	26	14	"

East Mainland now has little suitable moorland (Bennett 1986) and was only visited once in each breeding season. The initial fieldwork coincided with the courtship, pairing, nest building and peak egg laying periods when Hen Harriers are at their most obvious on the breeding grounds (Balfour 1957, 1963, Watson 1977). In addition, 6 transects of 7-8 km were each walked on 4 occasions during 15 April to 15 May in both years. Five were on West Mainland and one was on Rousay and they were designed so as to traverse blocks of moorland with recent records of breeding Hen Harriers. Further visits were made between mid May and early August to survey suitable habitat again, visit nests and record breeding success.

A breeding female was defined as one which built at least a partial nest, whether or not eggs were proven to have been laid. A non breeding female was defined as one which was not observed nest building. For example, if we regularly saw the females of a polygynous group of 3 (see Balfour & Cadbury 1979 and Picozzi 1984a,b) between mid April and the end of May and only found or saw 2 nests being built, the third female was classed as a non breeder. As there was limited time available for lengthy observations we could have underestimated the number of females that built nests. Accurate assessment of the number of adult males was difficult as none were individually marked (see Balfour & Cadbury 1979 & Picozzi 1984a,b for

Figure 2 *The number of fledged or almost fledged young Hen Harriers in the West Mainland, Orkney between 1953 and 1997. Data from 1953-74 is from Picozzi (1980) and is a minimum count for some years as some broods were omitted from his analysis. Data from 1975-95 is the annual total of fledged young (Picozzi 1984a for 1975-81 and RSPB unpublished for 1982-95).*

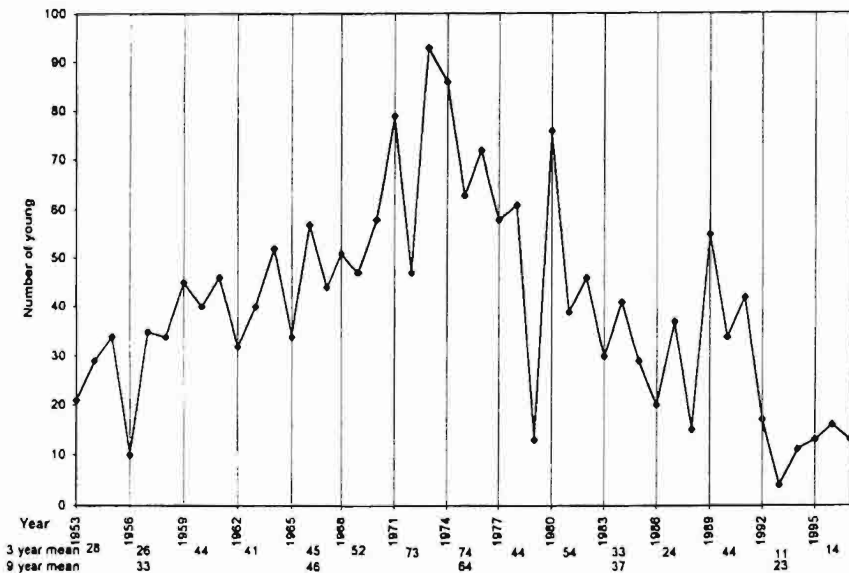
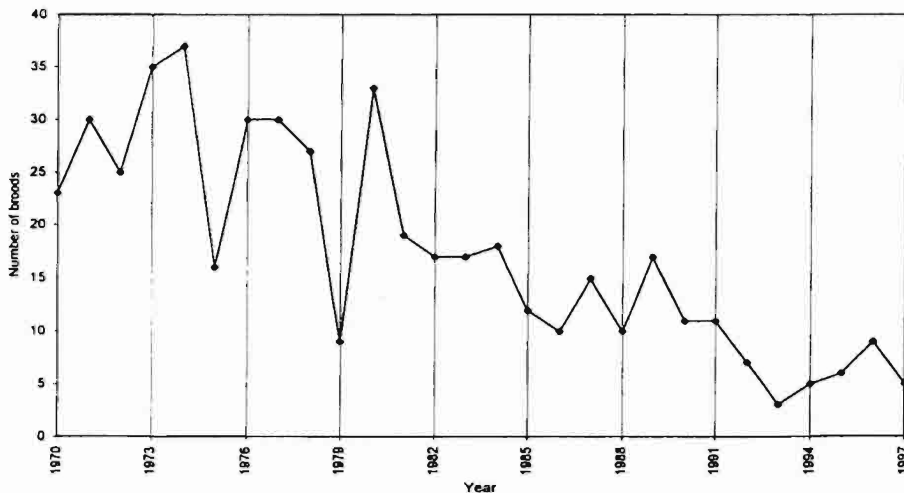


Figure 3 The number of broods of Hen Harriers with at least one fledged or almost fledged young in the West Mainland, Orkney between 1970 and 1997, years in which all successful nests are likely to have been located. Data from 1970-73 from Kalejta-Summers (1995), 1974 from C J Cadbury (in litt), 1975-81 from Picozzi (1984a) and 1982-95 from RSPB (unpublished).



descriptions of marked birds). In addition, the members of a male's polygynous group of females may not necessarily have all been in the same valley, and therefore not all simultaneously visible to an individual observer. Our estimated figures for males were quantified using plumage characteristics and behavioural traits, together with close comparison of the timing of sightings in different areas by individual observers.

To measure breeding success we aimed to visit all nests at least once during the incubation, nestling and fledging stages. If the number of fledged young actually counted was less than the brood size at ringing, at about 3 weeks old, (i.e. the maximum number) we searched the nest and its environs for the remains of chicks. Mortality in the late nestling

period is known to be low for Orkney harriers (Picozzi 1980), and when it does occur, remains are found (ERM *pers obs*). Therefore if no remains were found we presumed that the complete brood had fledged and these maximum figures were used to calculate productivity.

Results

Numbers

There were 29 and 31 breeding females respectively and 19 breeding males in Orkney in 1996 and 1997 (Table 2). Between the 2 years there was, however, a marked reduction in apparently non breeding females from 19 to 6, giving an overall total for females of 48 and 37 respectively (Table 2). In the West

Table 2 *The estimated numbers of breeding Hen Harriers and non breeding females in Orkney in 1996 and 1997.*

Island	Females			Males	
	breeding	non breeding	totals	adults	first year
1996					
West Mainland	24	16	40	12	2
Eday	0	0	-	0	0
Rousay	1	1	2	1	0
Hoy	4	2	6	3	1
Totals	29	19	48	16	3
1997					
West Mainland	26	5	31	13	1
Eday	0	0	-	0	0
Rousay	1	1	2	1	0
Hoy	4	0	4	4	0
Totals	31	6	37	18	1

Mainland, the numbers of breeding females in 1996 and 1997 were 24 and 26 respectively, mean 25; males numbered 14 in each year (Tables 1, 2 & 4).

Breeding success

The breeding success in 1996 and 1997 is detailed in Table 3. The percentage of females building, at least partial nests, but apparently not subsequently laying eggs, was 17% in 1996 and 32% in 1997. In total, 45 nests with eggs were located, 24 in 1996 and 21 in 1997. Of these, 9 failed during incubation in 1996 and 13 in 1997. Five complete broods were lost, 4 in 1996 and 1 in 1997. Overall, 40% of nests found with eggs fledged at least one young. The total numbers of young believed to have fledged were 22 in 1996 and 17 in 1997. The maximum productivity of both years combined was 0.9 young per nest located with eggs, 0.6 young per nest built or

0.4 young per female (Table 3). In the 4 study periods where realistic comparisons could be made (1970-74, 1975-81, 1989 and 1996-97) there were significant differences between studies in the numbers of breeding females and the production of young, ANOVA for breeding females, $F_{3,11}=5.51$, $p<0.02$ and for young per breeding female, $F_{3,11}=5.12$, $p<0.02$. Females averaged 68.6 during 1975-81 but had dropped to 25 by 1996-97. Average productivity was 1.5 young per breeding female in 1970-74 but had dropped to 0.6 by 1996-97 (Table 4). Interestingly, 1975-81 was the study period with the highest mean number of breeding females and was preceded by the highest period of mean productivity, 1970-74 (Table 4).

The estimated numbers of Hen Harriers reared annually in the West Mainland between 1953 and 1997 are shown in Figure 2. Since 1992, the numbers of fledged young have

Table 3 Breeding statistics for Hen Harriers In Orkney in 1996 and 1997. Female numbers from Table 2, NB = nest at least partially built, NE = nest with eggs.

Island	Number of nests located	Nests with eggs	Nests with young	Nests with fledged young	Minimum & maximum no. of fledged young	Productivity maximum no. of fledged young per Female NB NE		
1996								
West Mainland	24	19	12	9	13-16			
Rousay	1	1	1	1	1			
Hoy	4	4	2	1	5			
Total	29	24	15	11	19-22	0.4	0.7	0.9
1997								
West Mainland	26	16	5	5	9-13			
Rousay	1	1	1	0	0			
Hoy	4	4	2	2	4			
Total	31	21	8	7	13-17	0.4	0.5	0.8
1996 & 1997 combined								
	60	45	23	18	32-39	0.4	0.6	0.9

Table 4 Differences between studies in the numbers of breeding female Hen Harriers and in the production of young on West Mainland, Orkney (+/- = standard error).

Studies	Years	Mean no of females	Mean no of fledged young/ mean no of breeding females
Balfour & Cadbury 1979 & Picozzi 1980	1970-74	49.6 (+/-6.3)	1.5 (+/-0.2)
Picozzi 1984a	1975-81	68.6 (+/-5.3)	0.8 (+/-0.1)
Downing 1990 & Kalejta-Summers 1995	1989	62	0.9
Present study	1996-97	25	0.6

been consistently low and in the worst year, 1993, only 4 were found. The 3 year means for 1992-94 and 1995-97 and the 9 year mean for 1989-97 were the lowest since records began in the 1950s (Figure 2). Figure

3 shows the number of broods fledged in the West Mainland between 1970 and 1997, years in which all successful nests were believed to have been located. The pattern is similar to Figure 2.

Discussion

Numbers and breeding success

The surveys in 1996 and 1997 were considered to have thoroughly covered all Hen Harrier breeding habitat except in the East Mainland. The latter area did support at least 6 breeding females in the late 1960s (E J Williams *pers comm*) but has lost so much suitable breeding habitat (Bennett 1986) that no more than one pair of harriers is believed to breed there now (ERM *pers obs*).

Search effort in the West Mainland is believed to have been comparable in each of the 4 main study periods (Table 4). This being the case, there has clearly been a major decline since the 1970s and the population in 1996-97 was very low. In order to avoid over emphasising the decline from the exceptional peak year of 1978, 3 year running means were calculated for the number of breeding females between 1970 and 1981. The peak 3 year running mean was in 1977-79 with 80 females, the 1996-97 mean of 25 representing a 69% decline. Three year running means cannot be calculated for males as data are lacking for 1975 and 1976. However, the mean for the 3 peak years for which data are available (1974, 1977 and 1978) was 44 (Table 1). The 1996-97 mean of 14 males represents a 68% decline.

In our study breeding success was poor, with a maximum of 39 young fledged for the whole of Orkney over the 2 years. In the West Mainland, the mean number of young fledged between 1992 and 1997 was only 12.3 +/- 4.6 s.d.; range 4 to 17. Previous poor years in the West Mainland (eg 1979 which was particularly wet) were usually followed by a marked improvement, but the period 1992-97 has been the least productive, in terms of

young fledged, since detailed records began in 1953 (Figure 2). Three year running means of the number of young reared and the number of young reared per breeding female were calculated for 1970-81. The peak 3 year running mean for young reared was in 1973-75 at 80.7; the mean maximum figure for 1996-97 was 14.5, representing a decline of 82%. The 3 year running means for the number of young reared per breeding female peaked in 1971-73 and 1973-75 at 1.5; by 1996-97 productivity had fallen to 0.6, a 60% decline.

These declines, for breeders and production, since the peaks in the 1970s, are in the order of two thirds. In contrast to many other areas of Britain (Etheridge *et al* 1997, Stott 1998) they have occurred in the virtual absence of human persecution, at least when the birds are in Orkney.

Possible reasons for the declines

There has been major moorland reclamation on Orkney since 1932 (Bennett 1986); for example there was at least 40% moorland loss on the Mainland between 1940 and 1985 (Gorman & Reynolds 1993). However, in the West Mainland, no Hen Harrier nest sites have been lost to reclamation since Picozzi's study. Most of the core moorland areas, where the majority of the harriers nest, are Sites of Special Scientific Interest (SSSIs) where Scottish Natural Heritage have negotiated management agreements with landowners to restrict the stocking levels. Nevertheless, some of these areas are still grazed heavily enough to be degrading the areas of rank vegetation in which harriers prefer to nest. On the moorland fringes outwith the SSSIs, there are no restrictions on stocking densities and it is these areas, which in the past were some of the preferred

hunting areas of harriers, which have changed most in character between 1982-97. Changes have also occurred on lower ground where a considerable area of semi natural vegetation, previously used by hunting harriers, has been lost to more intensive farming (ERM *pers obs*). One major change in Orkney agriculture has been the increasing numbers of sheep. In 1981 there were 31,164 breeding ewes in the islands; by 1996 this had risen to 55,541, an increase of 78% (Orkney Islands Council 1982 & 1998). These changes may have resulted in reduced food availability and could be one reason why some females apparently do not nest (Newton 1986, Simmons *et al* 1986) and others breed poorly.

Apparent non breeding amongst female harriers in the West Mainland was known during Picozzi's study and in 1981, for example, was estimated at 26% (Picozzi 1984b). Non breeding appeared to be particularly prevalent in 1996 (40%) and it is possible that such females may disrupt the breeding females. They certainly solicit males for food and copulation with some success (see also Simmons 1988 for Northern Harriers). Non breeding females may also attract predators, particularly Hooded Crows *Corvus corone cornix*, which were the main egg predators of Hen Harriers on Orkney during 1975-81 (Picozzi 1984a). Breeding corvids are abundant on Mainland and Hoy, and in addition flocks of up to 25 apparently non breeding Hooded Crows or Ravens *Corvus corax* were regularly seen on moorland during 1996 and 1997. These corvids were occasionally seen interacting with the apparently non breeding females in the vicinity of viable harrier nests.

Another factor affecting the population may be an increased mortality of males. Picozzi (1984b) suggested that polygyny in the West

Mainland was a result of an imbalance in the sex ratio, possibly caused by a higher mortality of immature males. Observations at a winter roost on Orkney during 1975-81 suggested that more males than females left the islands in winter, possibly exposing themselves to greater risks (Picozzi & Cuthbert 1982). The winter dispersal of young male harriers from Orkney to the mainland of Scotland is presumably because suitable prey is more readily available there at that time (Watson 1977, Picozzi & Cuthbert 1982). The risks of leaving the islands might include lack of familiarity with their new habitat and the possibility of being deliberately killed (Scottish Raptor Study Groups 1997).

The extensive data sets have enabled us to quantify the alarming decline of the Hen Harrier in Orkney but detailed study is necessary to investigate its causes further.

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SHORT NOTES

Raven nest on hydro-electric dam

The Raven *Corvus corax* is known to nest on buildings, usually ruined, but there is only one record of a nest on a dam. This was on Glascarnoch Dam, Ross-shire, in the years 1970-73 (Ratcliffe D 1997, *The Raven*, Poyser, London). In late April 1996, I was told by the local landowner that a pair of Ravens had become very aggressive towards larger birds, such as Buzzards *Buteo buteo* and Common Gulls *Larus canus* flying over Errochty Dam, Perthshire and very vocal when people were walking the roadway surmounting the dam.

Investigation of the down stream side of the dam showed the ends of a few sticks projecting from the recesses of a ledge close to the top of the dam, and just below the roadway. Apparently identical ledges are found between

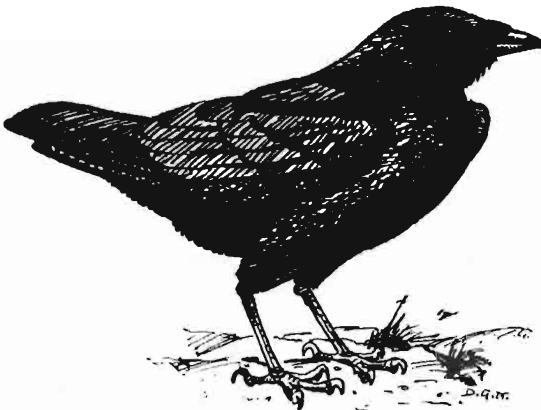
the buttresses across the face of the dam, apart from the central over spill facility. Each ledge is widest at the buttress, narrowing to virtually no ledge at the centre of the inter buttress space. The particular ledge used by the Ravens was not the highest. The height of the dam decreases markedly towards the ends, as the dammed valley is steep sided. The ledge was just above the level of the tops of conifers growing on the slope below the dam. The parent birds perched on the tops of these trees, or on the dam parapet, calling loudly, while I was in the vicinity. I estimated the ledge to be 25-30m above ground level, and 2-3m below the parapet. It was impossible to see the actual nest, due to the lie of the land below the dam.

The Ravens raised 3 young in 1996. They used the site again in 1997, but the result is not known.

I thank Wendy Mattingley and Dr Mick Marquiss for helpful comments on an earlier draft of this note.

Euan D Cameron, 3 Stormont Place, Scone, Perth, PH2 6SR

Accepted March 1997



Juvenile Raven

David Mitchell

Last breeding by native Red Kites in Scotland

The Red Kite *Milvus milvus* was found throughout much of Scotland during the first half of the Nineteenth Century, being present in all of Buchanan White's faunal districts except for the north and west coast archipelagos and east Dumbarton (Holloway 1995, *Historical Atlas of Breeding Birds in Britain and Ireland 1875-1900*, Poyser). It suffered heavily from persecution by both game preserving interests and collectors and, by the 1860s, it was confined to Inverness-shire, Perthshire and Aberdeenshire as a regular breeding bird (Gary 1871, *The Birds of the West of Scotland*, Murray), although still present in Ross-shire at this time, where Harvie-Brown and MacPherson (1904, *A Fauna of North-West Highlands and Skye*, David Douglas) had a record of a gamekeeper taking a clutch of eggs in 1883 and another record from 1881. The last proven breeding in Scotland was in Caithness in 1884; after this date it may have bred in Skye until 1886 although there is a very dubious record from Glen Garry (Inverness-shire) in 1917, where it had been seen in 1882 (Baxter & Rintoul, 1953, *The Birds of Scotland* Oliver & Boyd).

Major William Stirling of Fairburn (1858-1914) put together a substantial egg collection between 1895 and 1910, the eggs coming mainly from his own estate in Easter Ross and from neighbouring districts. In 1983, Captain Roderick Stirling, the collector's grandson, generously donated the substantial collection and documentation to Inverness Museum and Art Gallery. The collection has previously been referred to in McGhie 1994 (*Discovery of the first British clutch of Slavonian Grebe eggs in a museum collection*, *Scottish Birds* 17: 166-167), and McGhie and Moran 1996 (*Probable first breeding record*

of Brambling in Britain represented in a museum collection. *Scottish Birds* 18: 248-249).

In the course of work on the Stirling collection we came across a clutch of 2 eggs with a slip of paper which contained the following information:

"Locality and Situation of the Fish tailed Glede On a summit in the Corry Done Craig, Kintail, Ross Shire. Date April 16th 1898".

The eggs measure 56.20 x 47.65mm and 54.45 x 46.60mm and agree well with descriptions of Red Kite eggs and other specimens in the collections; Fish tailed Glede is an alternative name for the Red Kite. The name Corry Done Craig cannot be traced with certainty, but there is a Choire Dhomdain (NG9915) in Kintail which is spelt Coire Dhuinnid on a 1905 OS map. The clutch size and date are in agreement with observations from Wales (*Birds of the Western Palearctic*). The species was at the least extremely rare by the time of the 1904 *Fauna* and Harvie-Brown thought it extinct; this clutch of eggs therefore represent, the last proven breeding record of Red Kite in Scotland. The last records Harvie-Brown had for the west Highlands were from 1883: a note stating '3 eggs. Nest placed on a rock called, Ross-shire 16th May 1883', and a note from Buckley of a pair supposedly nesting on an inaccessible rock in the Loch Carron district in 1881. Kintail is adjacent to the Loch Carron district, and either of these 2 records may even refer to 'Corry Done Craig'. Nesting on crags was certainly more unusual than nesting in trees but Harvie-Brown and Buckley (1895, *A Fauna of the Moray Basin*, David Douglas) record 2 instances other than those already mentioned: Harvie-Brown supposed that they nested on a rock at the outflow of Loch Garry and records that Booth had a record of birds

nesting on a crag in Rothiemurchus. Harvie-Brown, writing in 1895, did not know of any Red Kites anywhere in Scotland and was saddened by the relentless persecution which they had suffered, particularly at the hands of collectors.

We thank Captain Roderick Stirling for reading a draft of this short note and for his donation of his grandfather's important collection to Inverness Museum and Art Gallery.

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Black Guillemot nesting on an operational car ferry

Black Guillemots *Cephus grylle* breed in a range of natural sites. In addition, they have taken to a wide variety of artificial sites, including holes in breakwaters, harbour walls, piers, wharf buildings, under fish boxes and other debris (Harris & Birkhead 1985, Breeding Ecology of the Atlantic Alcidae, in *The Atlantic Alcidae*, Academic Press, Cramp 1985, *Birds of the Western Palearctic* Vol. 4). Harris and Birkhead consider that they "virtually always accept artificial sites if those are offered".

On 5 June 1992 while on the relatively short ferry crossing from Tayinloan, Kintyre to the Isle of Gigha in Argyll, I observed a Black Guillemot flying close to the car ferry *MV Bruernish*. The bird completed one circuit of the ferry, then approached the left side from the rear and landed on the moving ship, through a hole that carries the anchor chain, close to the bow. The bird remained on board until the ship approached the slipway on

Gigha; when about 300m away, it flew off and to the rear, landing on the sea some 500m offshore. While the ferry was returning to Tayinloan, the Black Guillemot was observed flying around the ferry once it had left the slipway and had reached c300m offshore. As before, once the bird had flown around the ferry it landed through the same hole as previously. On 2 further occasions, when the ferry approached and left the Gigha slipway, this pattern of behaviour was repeated. The continued attraction of the ferry to an individual Black Guillemot raised the possibility of nesting on board.

On the return crossing, I examined the area close to the anchor chain hole and discovered a nest with 2 eggs under a green pvc cover amongst a range of winching machinery.

Before disembarking, I alerted the crew to the presence of the nest. They were already aware of the nest and told me that the birds had nested in the same place for the previous 2 or 3 seasons but had always been unsuccessful in hatching the eggs. I learned

later that the 1992 nesting attempt was also unsuccessful. During its normal operating hours (07.20-18.00hrs), the ferry undertakes 59 return trips each week. It is probable that in any one 20 minute sailing only 15 minutes were available for incubation, and that during the ferry's turn around period of c15 min the birds were unable to incubate. On the 6 operational days per week, this would limit incubation to a maximum of 4.5 hours between 07.20-18.00hrs, losing 25% of available incubating time during the entire incubation period ie incubation would be limited to a maximum of 75% of the available time. This compares with the incubation taking 84% of available time (Preston 1968 cited in Cramp 1985). However, in this case, either the limitation of time or the frequency of disturbance, or a combination of both, appears to have prevented the eggs from hatching.

At the end of the 1992 summer season the operators replaced the *Bruernish* with another, larger ferry of a different design. In subsequent years, the birds have not attempted to nest on the new ferry.

While this car ferry represents an extraordinary nesting site, it does not appear to be unique. Thom (1986, *Birds in Scotland*, Poyser) records "a niche on an inter island ferry in Shetland" and Tulloch (1992, *A Guide to Shetland's Birds*, Shetland Times, Lerwick). comments "It has even been recorded nesting under a life raft on the stem of a regularly used ferry boat" [The comment was made by Bobby Tulloch]

I would be interested to see further information on these records.

Chris M Waltho, 73 Stewart Street. Carluke, Lanarkshire, ML8 5BY

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Hen Harriers cacheing and retrieving prey

Many raptors regularly and purposively store avian prey for later use in the breeding season (Cramp & Simmons 1980, *The Birds of the Western Palearctic* Vol 2 Oxford). Information on Hen Harriers *Circus cyaneus* cacheing prey is generally lacking and, despite intensive studies of harriers since 1963, I have only 2 instances of it.

On 14 July 1974 at 0957 hours I watched a female Hen Harrier return to its breeding area in Wigtownshire carrying a young Curlew *Numenius arquata*. She landed on a heathery knove 100-200m from her nest, and emerged without the prey. She landed briefly at the nest, which contained 3 young about 18-24 days old, before taking off and landing on the moor well below the nest site. Thirty nine minutes later, the female harrier flew back to where she had deposited her prey. She circled there with lowered talons, flew back to her

nest and hovered above it. She flew back to the cached prey, retrieved it and brought it back to the nest at 1040hrs, leaving with the remains 24 minutes later.

On 17 July 1974 at 1800hrs the same female stood on the moor below the nest. She flew to the heather knowe, dropped her talons and again retrieved small to medium sized prey from the heather and flew back to the nest with it. Despite several later visits this behaviour was not seen again.

Purposeful storage of 'surplus' prey by raptors is usually of prey brought by the male to the female who usually stores it. Interestingly, it was a large prey item, apparently caught by the female herself and then purposely stored by her. Cacheing behaviour becomes more advantageous if the food is less likely to spoil (Heinrich 1990, *Ravens in winter*, London). In one of the instances the prey was used quickly (within 43 minutes of storage) and in the other it may have been used quickly too.

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Ravens nesting successfully on a specially provided platform

In June 1996 I received a report that a pair of Ravens *Corvus corax* had attempted to nest in the barn of a ruined croft in the West Mainland of Orkney. The croft was situated in an area of grassland used for cattle and sheep grazing. I visited the barn and found the semblance of a nest lying across a roof beam at a height of about 4 metres. The structure consisted of sticks, lengths of barbed wire, part of a lamb skeleton and pieces of wool. The beam was only 5cms wide and the materials were draped over it. It would have been impossible for such a narrow beam to have supported a complete Raven's nest. It then occurred to me that a platform placed

across 2 of the roof beams, which were 1.5 metres apart, would make a suitable base for a nest.

I contacted the farmer who owned the barn suggesting that a platform could be put in the roof and he was delighted with the idea and of possibly having a pair of Ravens nesting successfully on his land. The covering of the roof consisted of sheets of rather rusty corrugated iron, many of which were missing and several others were loose. It was decided to delay putting the platform in position until after the winter, in case more sheets were lost or the platform blown away. Unfortunately, it was not actually in place until 8 March, 1997, which was rather late for the Raven's nesting season. However, on returning to the

barn 2 months later it was found that the foundation of a nest had been built on the platform but the lining had not been completed.

I next visited the barn on 9 April 1998 and, as I entered the building, flushed a Raven from a fairly substantial nest that was on the platform. The bird flew around calling agitatedly so I left as quickly as possible without examining the nest any further. On 5 May 1998 there were 4 full grown young standing on the nest and a week later the young were seen perched on the roof of the barn.

Ravens had been observed in the vicinity of this croft several times in the breeding season over the past 10 years and I had been to the site on 2 previous occasions but had not found any evidence of nesting. A pair of Ravens have nested successfully for a number of years, including 1998, on a ruined building 3.5 kms from this croft.

I am very grateful to Bob Adam for his help with the building and placing of the platform in position and to Steven Harvey for allowing access to his barn.

C J Booth, 34 High Street, Kirkwall, Orkney, KW15 1AZ

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Proposals to extend the range of the Crested Tit in Scotland, 1945-1955

Historical research has revealed some interesting observations on early proposed nature conservation practices in relation to the Crested Tit *Parus cristatus scoticus* in Scotland, more particularly in Strathspey. It is apparent from the archives of the Nature Conservancy (NC) Scottish Committee which begin in April 1949, that an application was put before the committee on 7 December 1954 to transplant Crested Tits out of the Highlands to other parts of Scotland. The proposal was conceived by JMD 'nestbox' Mackenzie, a Forestry Commission employee, who was known for his nestbox work with ducks and flycatchers (P Sandeman *pers comm*). He sought to transplant the birds caught in Strathspey to 'suitable pine forests in Perthshire, Angus and Fife'. Mackenzie's declared aim was to extend the

bird's range as a nature conservation strategy. The NC Scottish Committee seemed confused by this request, and decided to relay it to the Advisory Committee on the Protection of Birds (SRO:SNH 1-1, Minutes of meeting of Nature Conservancy – Scottish Committee, Edinburgh, 7 December 1954).

However, the issue remained alive, and the NC Scottish Committee returned to it at a later meeting in March 1955. This was the first committee meeting attended by JP Grant of Rothiemurchus, and he was keenly interested in a proposal that could see the transplantation of some of the tits from his own estate. The laird was against transplantation as a nature conservation practice, but saw some merit in the 'laudable' scheme 'of spreading the risk'. He praised Mackenzie's vision that could have guaranteed 'more areas that this rare bird frequented', thus ensuring there was less

'chance of it being wiped out by localised disturbances'. The feeling of the Scottish Committee was that this application could not be supported, but no firm reason was given (SRO:SNH 1-1, Minutes of meeting of Nature Conservation – Scottish Committee, Edinburgh, 3 March 1955). This episode is made all the more interesting by the fact the original application was probably drafted in Autumn 1954, just a matter of weeks before the new Protection of Birds Act passed into law on 1 December 1954. This was a powerful piece of new bird protection legislation that repealed 15 previous Acts and offered full protection to all wild birds, their eggs and nests, with some limited exception relating to game and vermin species. This discussion also came just after the declaration of the Cairngorms NNR on 9 July 1954, within which Rothiemurchus Estate, and thus its Crested Tits, was a key component. Information taken from other archives regarding the Crested Tit in the 1940s provides some background to this 1950s debate. The second half of the 1940s saw an intensification of the Cairngorms National Park and/or Nature Reserve debate, and the Crested Tit had a role to play in that. Baxter and Rintoul wrote in December 1945 to Joseph Westwood, the Secretary of State for Scotland, urging him to support the Nature Reserve ideal, adding that the Crested Tit demanded 'special care' because it was 'so typically Scottish and so very local in their breeding area' (SRO: FC9/3, Letter, dated 12 December 1945). The body that preceded the NC Scottish Committee, the Scottish Wild Life Conservation Committee (SWLCC) of 1946-

1949, confronted issues surrounding the protection of the Crested Tit on a number of occasions. The most controversial event took place in 1946, when the SWLCC became angered on hearing that PA Clancey had been collecting Crested Tits in Strathspey, and was then taking them away 'for research purposes' (SRO:FC9/2, Minutes of meeting of SWLCC, Edinburgh, 30 September 1946). This was Philip Clancey, a worker in the museum service in Scotland and later in Durban, South Africa, who was known to have done taxonomic work on the races of some passerines (RH Dennis *pers comm*). This perhaps explains his interest in the Crested Tit, which we must assume he was taking away to skin and/or stuff. Clancey later built up a large collection of African birds in Durban museum. A year later, James Ritchie reported to the SWLCC that some felling of pinewoods at Rothiemurchus was continuing, and that 'adequate provision must be made for the protection of the Crested Tit' (SRO:FC9/3, Minutes of meeting of SWLCC, Edinburgh, 29 September 1947). The harsh winter of 1947 then adversely affected the Scottish tit population, although in the 1950s the Crested Tit did expand its range into Culbin Forest.

Primary sources

SRO: SNH are the archives of the Nature Conservancy and Nature Conservancy Council in Scotland, held in the Scottish Record Office, Edinburgh.

SRO: FC are the archives of the Forestry Commission in Scotland, held in the Scottish Record Office, Edinburgh.

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LETTERS

Numbers of Turnstones and Purple Sandpipers on the East Lothian Coast

In H E M Dott's paper on declines in Turnstones and Purple Sandpipers in S E Scotland (*Scottish Birds* 19:101-14), there is a table with the maximum counts of the latter

species at Gullane Point – Hummel Rocks in East Lothian. For the record, Keith Macgregor and I had peak counts at this site of 20 in 1952-53; 24 in 1953-54; and 20 in 1954-55. These counts are much in line with the last 8 winters on Table 2 (p 103), made between 1987-88 and 1994-95. It is nice to know we were not just enjoying ourselves in the 1950s.

Frank Hamilton, 23 Campbell Road, Longniddry, East Lothian EH32 0NP

Received February 1998

Comment by H E M Dott

On 31 January 1998, a further low tide count was made of all shore birds from Gullane Point to the Scotland/England border; the same coast with the same methods and by mainly the same people described in Dott 1997 (*Scottish Birds* 19: 101-104). Results obtained for the species concerned were:

Turnstone 264

(East Lothian - 233, Borders - 31)

Purple Sandpiper 81

(East Lothian - 66, Borders - 15)

This again shows continuing very low numbers in the 1990s compared to the much higher numbers in the 1970s and 1980s, as previously described.

H E M Dott, 114 Comiston Road, Edinburgh EH10 5QL

Received July 1998

OBITUARIES

Valerie MacLaren Thom

1929-1998

Valerie Thom made a massive contribution to natural history in Scotland. She will be best remembered, probably, for her *Birds in Scotland*; recognition tends to go to major publications of that kind, as it also does to large personalities and high profile projects and research.

But the remarkable extent to which the amateur (and professional) study of wildlife in Scotland has expanded and flourished since the War could simply not have happened without the largely unseen and wholly unsung infrastructure of committees, councils, record keeping, policy making, financial accounting, journal editing, collating of information, and organising of volunteers. It is in all of this that she had an outstanding role, and made perhaps her largest contribution.

Born in Tynemouth, Northumberland in 1929, Valerie graduated BSc in Agriculture at Edinburgh University in 1949, taking the first year medal. She went to work in the East of Scotland College of Agriculture and earned high professional respect for her work connected with the quality of milk.

In 1969 she changed direction and joined the newly established Countryside Commission for Scotland where she worked for a dozen years before taking early retirement. Here she was involved in pioneering work in countryside interpretation in a team led by Don Aldridge who defined it as 'the art of explaining the significance of a site to the people who visit it, with a view to pointing a conservation message'.

Though taken for granted nowadays, this was then a novel concept, originating in America, combining information, enjoyment and a homily. It involved educating not only the public but also the agencies, local authorities and voluntary bodies providing much of that education. Valerie worked tirelessly to set and raise standards of presentation in texts and pictures, and especially in the spoken word of the new ranger services, at a time when visitor centres and other facilities were springing up all over the country, not always ideally located or focussed.

The experience she gained in this was invaluable to the fledgling Scottish Wildlife Trust of which she chaired the Perth branch, and which was setting up interpretive services at its reserves at the Falls of Clyde and at the Loch of Lowes with its second most famous pair of Ospreys. Not that she ignored the most famous pair, lending a hand during a number of summers at the Royal Society for the Protection of Birds Loch Garten reserve, relishing the sights and sounds of the neighbouring ancient pine forests.

She helped the RSPB in other ways too, serving on its Scottish Committee with advice which her colleagues remember as always wise and carefully thought through. This thoroughness also served well the bureaucratic complexities of the Secretary of State for Scotland's Advisory Committee on Birds, and the wide-ranging collaborative research projects overseen by the Council of the British Trust for Ornithology, on both of which she sat in the 1970s.

Earlier, she had been Secretary and Chairman of the Ornithological Section of the Perthshire Society of Natural Science from 1965 to 1972 and had found, or made, time to be the

Wildfowl Count organiser for Scotland for the Wildfowl and Wetlands Trust from 1963 to 1970. This involved the pleasure, keenly felt, of counting the geese on a frosty, clear winter day at her local Dupplin Loch near Perth, but also carrying through the counts in foul weather as well, and meticulously correlating the efforts of many others. They soon learned that she was stickler for detail. Everything had to be *right*.

As it had to be, too, in her work for the Fair Isle Bird Observatory Trust. To use her own word she became 'addicted' to the island when she worked there for a season in 1955 as the observatory's first assistant warden. For 23 years from 1970 she was one of its Trustees and for six of them, from 1986 to 1992, its Honorary Secretary. What a deal of work there was in that, and what a valuable job she did in acting as a link between a scattered Board of Trustees and the observatory staff, with her great knowledge of the island she loved and its community. She was able to make good use of this knowledge in drawing together the work started by George and Irene Waterston in gathering material for a history of Fair Isle and which she completed in *Fair Isle, An Island Saga*, published in 1989.

Throughout all these years, Valerie was an extremely active member of the Scottish Ornithologists' Club, serving on and chairing several of its committees, and in 1978 she was elected its President. These were good years for the SOC with flourishing branches, revenue surpluses, bookshop sales rising by 25% or more a year, and no hint yet of the maintenance problems at 21 Regent Terrace. In her crisp and business-like way Valerie chaired Council meetings which galvanised the Scottish Bird Report (running three years late when she took over) and pondered such

issues and threats to bird life as the Torness power lines and the Lurchers Gully skiing development.

In her last year as President, Council took the decision to go ahead with a new book on the status of the birds of Scotland, which she volunteered to write. Thirty years after *The Birds of Scotland* by Dr Baxter and Miss Rintoul (to this day scarcely anyone refers to their first names) the 'good ladies' mantle would be handed down to Valerie Thom in a wholly appropriate way. The new book was partly financed by the entire remaining funds in the Baxter and Rintoul Trusts.

It was an enormous task to undertake and it took five years. During almost all of this time Valerie also edited both *Scottish Birds* and *Scottish Bird News*, a formidable and unenviable combination. The new book drew on the willing assistance of many members of the Club, both in providing and dealing with material; some 150 of them are listed in the acknowledgements. So it was a collaborative venture from the start, but at centre it was Valerie's achievement. *Birds in Scotland* was published in 1986 and is her enduring memorial. In that same year she was elected Honorary President of the SOC.

These were some of her public achievements, but Valerie was a very private person, reserved and not easy to get to know. She was impatient of small talk and could be nippit with people whose standards of commitment and performance were less exacting than those she set for herself. Some people found her slightly daunting.

She was, though, a deeply compassionate and caring person, drawing strength and conviction from her Christian faith. Her minister in Perth recalls her saying to him:

"I've been given this gift of faith. I know I have certain talents. I have the energy. I want to do things for my Lord." Ordained as an elder in the Church of Scotland, she took a two year theological course and cared faithfully and patiently for the people in her district and also cared, in different ways, for fellow believers in the former Soviet bloc countries. She devoted a great deal of time to Manna House in Perth, a coffee house and meeting place whose Christian witness proclaims the Gospel in the market place, and to establishing a pastoral care group.

She had a great love for the Scottish countryside, its wild places and its birds. Perhaps both her joy in them and her concern for them are summed up in two verses from her poem published in *Birds in Scotland*:

*An eagle soaring high on a thermal,
A peregrine swooping swift to the kill,
Divers walling on lonely lochans –
Such sights and sounds have the
power to thrill.*

*The "everyday" birds such as Wren
and Robin
And the rarities blown here from distant
lands
All have their place in God's great
pattern –
But the future for many will lie in man's
hands.*

John Arnott



Valerie Thom pictured cutting the cake at the launch of *Birds in Scotland* in Glasgow, 1986

John Morton Boyd

1925-1998

Morton Boyd, who died on 25 August 1998 at the age of 73, was one of Scotland's best known ecologists and wildlife conservationists. He was born in Darvel, Ayrshire on 31 January 1925. He attended Kilmarnock Academy and then went to Glasgow University to study engineering. However, after one year he read Frank Fraser Darling's book *A Naturalist on Rona* (1939), and as a result he changed from engineering to zoology. Service in the RAF interrupted his education but he graduated in 1953, obtained a PhD degree in 1957 and a DSc in 1964, followed eventually about 30 years later, again at Glasgow University, by a D Litt, a very rare recognition for a scientist. He was also awarded the Neill prize of the Royal Society of Edinburgh. Morton was a broadly based naturalist and, though his main interests were birds and mammals, he studied earthworms on Tiree for his PhD, the start of a long affection for this island. The great diversity of his interests established a fervour for ecology and land use of the Western Highlands and Islands. In all these topics he was a great communicator; to the end, however, Morton hadn't quite mastered the art of sharing conversation and seldom used one word when 10 would do.

He was a long standing member of the Scottish Ornithologists' Club. He made a substantial contribution to our knowledge of the birds of Scotland, notably by his studies on St Kilda. The report *Birds of St Kilda* (Harris & Murray 1977) lists 11 papers of which Morton was author, including 2 important papers on seabirds. These were *Distribution and numbers of kittiwakes and guillemots* (*British Birds* 1960) and *The gannetry of St Kilda* (*Journal of Animal Ecology* 1961). Fieldwork

for it began in May 1955 when Morton, in a motor drifter, sailed close by Stac Lee and Boreray, allowing him his first impression of the immense scale of the cliffs and the great numbers of birds there. He returned the following year with an expedition from Glasgow University. On 13 May 1959 the RAF photographed the entire gannetry from the air, with Morton together with Derek Ratcliffe and David Boddington watching from the top of Stac an Armin. Thereafter, Morton's task was to count the Gannets on the photographs, and he did this 4 times! Then he divided the gannetry into 672 sections, assessed the overlaps between pictures and concluded that the population was 44,500 pairs. Diagrams of the main counting areas and the details of the actual counts are given in the paper which became a benchmark. It was almost 30 years before the St Kilda Gannets were counted for a second time.

Morton was one of the first scientists to be recruited to the Nature Conservancy in Scotland and he was appointed in 1957-68 as regional officer in charge of wildlife conservation in the west of Scotland. He was instrumental in establishing several national nature reserves and will long be associated with the Grey Seals of North Rona as well as the sheep and Gannets of St Kilda. The 1950s and 1960s were happy days for ecologists in Scotland; those on the staff of the Nature Conservancy were able to indulge their interests virtually unhindered. Morton led many expeditions to his favourite islands at home and abroad, and initiated long term studies on the sheep on Soay and Boreray and the seals of the Hebridean Islands, often in very difficult field conditions. With his family, he spent many idyllic holidays on Tiree where, from his deep seated interest in wildlife, land use and social customs, he gained the impetus to write 4 books on the Hebrides, one co authored with his son, Ian. Morton

also worked with Ken Williamson with whom he co authored *St Kilda Summer* (1960). In Morton's obituary in the *West Highland Free Press* (11 September 1998), Brian Wilson records how Morton and Williamson prevented the army, set on making a road, from demolishing the remains of the row of houses on Hirta. This would have been 'an act of almost unbelievable vandalism'.

Morton was supportive of a range of investigations in the north west and notably encouraged Jim Lockie in early work on Pine Martens, Niall Campbell with a study of Sticklebacks and Dick Balharry's studies of Golden Eagle and Pine Martens. Ian Newton remembers with gratitude Morton's encouragement of his early work on Greylag Geese at Loch Druidiebeg. In his appreciation in *The Scotsman* (10 September 1998) John Francis, Morton's successor, mentions the reintroduction of the Sea Eagle as a part of Morton Boyd's legacy. Francis recalls Morton's stories of the early days of the Loch Ewe partnership, and in particular those about a Red Deer stag called Iain which 'are among the richest brand of humour imaginable'. This partnership culminated with the first successful deer management group.

Morton was Assistant Directory (Conservation) of the Nature Conservancy (Scotland) in 1968-70 and became Director of the Nature Conservancy (later Nature Conservancy Council Scotland) from 1971 to 1985. He took over in a period of relative calm but shortly the peace was to be shattered. Suddenly the Nature Conservancy as designed by Max Nicholson, with national headquarters in London, Edinburgh and Bangor and research stations at Monkswod, Merlewood, Furzebrook, Norwich and Banchory, was divided. Hitherto, conservation managers and research workers had shared office accommodation and this synergy

stimulated dialogue and worked well. In 1972, following the Rothschild report on the organisation of government science, the Nature Conservancy Council was formed. The research arm was removed from the Conservancy to the Institute of Terrestrial Ecology and, as a result, Morton lost authority over research staff in Edinburgh. Shortly afterwards, decentralisation from Edinburgh took place with regional officers outposted to local offices. The reorganisation demanded considerable resilience and Morton thrived on it. The implementation of The Wildlife and Countryside Act (1981) closely monitored from NCC's Peterborough HQ and reinforced by voluntary organisations and parliamentary scrutiny, disrupted the non confrontational style that had characterised NCC's relationships in Scotland with the powerful lobbies of landowners, foresters and farmers since the 1950s.

In this new climate, some of Morton's dedicated local staff, supported directly by NCC's largely English based Chief Scientists's Team, were able to achieve significant protection for important wildlife sites in the face of the kind of development pressures before which the NC had caved in during previous decades. The first half of the 1980s saw notable successes for conservation across Scotland: in Islay (with its goose problems); in the Northern Isles; in Speyside (Creag Meagaidh, the Cairngorms northern corries and Abernethy); and in the bird rich Flow Country in Caithness and Sutherland. Many of these victories were achieved in the face of opposition from more traditional sections of the Scottish landowning community and perhaps from the Scottish Office itself. Nothing demonstrates better Morton's character and his commitment to nature conservation than his reluctance to bow to these pressures. His steadfastness and that of his staff in circumstances in which

they were occasionally subjected to personal abuse safeguarded numerous important wildlife sites and secured long term and positive shifts in attitudes to conservation in Scotland.

However, there was a price to pay for the period of conflict that was necessary to secure this legacy. Shortly after Morton's retirement in 1985 and the subsequent 5 year period under the leadership of John Francis, NCC was dismembered as a Great Britain wide body leading, with its amalgamation with the Countryside Commission for Scotland, to the creation of Scottish Natural Heritage which was under Scottish control. SNH is a very different kind of organisation; it espouses access and partnerships, not the strenuous defence of nature conservation interests, and has been known to attack the scientific emphasis of its predecessor. Nonetheless Morton, said by Brian Wilson to be a devolutionist, accepted these political changes and worked positively with his successors for wildlife conservation in Scotland. Morton and John Francis were the last scientific directors of nature conservation in the Berry/Eggeling tradition and, although the organisation which Morton led for 14 years scored major successes in a hostile political environment, it paid a heavy price for its achievements.

Morton travelled widely, both as a professional ecologist in the 1960s and also more recently leading safaris and lecturing on cruises, notably those organised by the National Trust for Scotland to the outer isles and by Swan (Hellenics) Ltd and Serenissima Travel Ltd to the Mediterranean Sea, Indian Ocean, Indonesia and Africa.

After retiring, when his contributions were acknowledged by his CBE, Morton seemed

to live anew. He became ecological consultant to bodies such as North Scotland Hydro Electric and to the Forestry Commission, and worked with the National Trust for Scotland, as councillor for the Royal Zoological Society of Scotland, editorial consultant for Edinburgh University Press and for Mirror Publications Ltd, and became a vice president of the Scottish Wildlife Trust and the Scottish Conservation Projects Trust. He was committed to the Saltire Society and an active committee member of the Royal Society of Edinburgh, and a trustee of the Hebridean Whale and Dolphin Trust. He was accomplished in water colours and, by coincidence, he completed the design of the Colinton Kirk Christmas card on the Saturday before he died.

In spite of all his outside interests, Morton had at heart 2 outstanding passions, his family and the community of Colinton parish kirk. For 40 years he was an elder. He was devoted to his wife, Winifred, who suffers greatly from arthritis in her hips, and he was very proud of his sons, their wives and children and also activities. They were a constant source of support.

In 1997 Morton agreed to be Patron of Dunbar's John Muir Association. Muir and Morton, both sons of Scotland, were 2 of a kind. They were free spirits and expressed with frisson the causes they chose to champion, a course that had its dangers. Few who knew Morton will forget his contributions and his energy, charm and affection, an enduring and endearing testimony.

David Jenkins

The author thanks for their contributions John Forster, Mike Harris, Fred Last, Jim McCarthy, Sarah Wanless and the authors of published obituaries cited in the text.

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 will be 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.

Reference should be made to the most recent issues of *Scottish Birds* for guidance on style of presentation, use of capitals, form of references, etc. **Papers should be typed on one side of the paper only, double spaced and with wide margins and of good quality; 2 copies are required and the author should also retain one.** We are happy to accept papers on computer discs; however, please state the type of word processing programme

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Tables, maps and diagrams should be designed to fit either a single column or the full page width. Tables should be self explanatory and headings should be kept as simple as possible, with footnotes used to provide extra details where necessary. Each table should be on a separate sheet. Maps and diagrams should be either good quality computer print outs in black and white (please do not use greyscale shading) or in black ink and be camera ready, but drawn so as to permit reduction from their original size.

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