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Movements of British Hen Harriers *Circus cyaneus* outside the breeding season

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Hen Harrier chicks were wing-tagged in four regions in Scotland and in North Wales between 1990 and 1995, and resighted or recovered dead as fully grown birds during the non-breeding season (August to April) throughout Britain and Ireland, and on the Continent, until April 1997. Results were analysed in terms of the percentages of birds that carried out long-distance movements (over 25 km) and the extent of the long-distance movements. The percentages of first-year birds undertaking long-distance movements were related to natal area, sex and season. A higher percentage of first-year males in the East Highlands undertook long-distance movements than females. For first-year birds that made long-distance movements, there were significant effects of season and natal area, and interactions. Thus, longer movements occurred in winter and spring, and males from the North Highlands made the longest movements. Records on the Continent referred mainly to first-year males. For all age classes, the percentage of birds undertaking long-distance movements was related only to sex; males making a higher percentage than females. For those that made long-distance movements, there were effects of season, age and sex, and interactions. In autumn, the most distant sightings and recoveries were of first-year males, and the shortest were of adult males. The lengths and directions of movements taken by males and females from different natal areas were interpreted as due to the locations of upland natal areas relative to lowland wintering areas, and food availability in lowland and upland habitats affecting the sexes differently.

The Hen Harrier *Circus cyaneus* is a rare breeding raptor of the uplands of northern and western Britain. It was once widespread throughout Britain but, in common with other predatory birds, it was heavily persecuted on sporting estates and became virtually extinct on mainland Britain, leaving remnant populations on Orkney and in the Hebrides (Watson 1977). During the 20th century, numbers increased and it spread back to many upland areas on the mainland (Gibbons *et al* 1993). The population size in Scotland during 1988–89 was estimated at 570 breeding pairs, and there were 60 pairs in England and Wales (Bibby & Etheridge 1993). A later estimate of 570 territorial pairs in the UK and Isle of Man during 1998 (Sim *et al* 2001) indicated that the population was not increasing or expanding despite the availability of suitable habitat (Potts 1998). However, a 41% increase to 806 territorial pairs occurred by 2004, though there were local decreases in south and east Scotland and England where there are grouse moors (Sim, I.M.W., Dillon, I.A., Eaton, M.A., Etheridge, B., Lindley, P., Riley, H., Saunders, R., Sharpe, C. & Tickner, M. unpublished manuscript). Ongoing persecution on grouse moors was considered the primary cause (Etheridge *et al* 1997, Sim *et al* unpublished manuscript). Studies on the breeding grounds have described movements (natal dispersal and site fidelity) associated with breeding but less is known about movements outside the breeding season. Such information may help in our overall understanding of factors that may be affecting the population dynamics of the species.

In winter, Hen Harriers are more widespread than in summer and can be found in the lowlands as well as uplands (Clarke, in Lack 1986), indicating movements to lower ground. Given that male and female Hen Harriers differ in size, they differ in prey choice. This in turn may lead to ecological segregation and perhaps different migration patterns (Marquiss 1980). However, there have been several studies of the movements of British Hen Harriers (Thomson 1958, Mead 1973, Watson 1977). These studies were based largely on ring recoveries of birds marked on Orkney where a long-term ringing study was carried out. Since then, however, the population on the Scottish mainland has expanded and that on Orkney declined so that the Orkney birds now comprise only around 12% of the Scottish population (Sim *et al* unpublished manuscript).

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In 1990, the RSPB initiated a study of the population dynamics of Hen Harriers (Etheridge *et al* 1997). It involved marking large numbers of nestlings with wing tags. This paper describes the sightings and recoveries of these marked birds outside the breeding season.

METHODS

Study design

Nestling Hen Harriers were marked with patagial wing tags when 21–28 days old. At this age, body growth is nearing completion (based on mass), body feathers are well grown and the young can be sexed using eye colour (males have a greyish iris and females dark brown; Balfour 1970) and from relationships between wing length and mass with age, derived from five broods followed from hatching (B Etheridge, unpublished data). Birds were marked on five study areas in Britain (Figs 1 & 2). These comprised the North Highlands (southeast Sutherland, east Ross-shire and east Inverness-shire), East Highlands (Moray, Aberdeenshire and Perthshire), West Highlands (Islay, north and mid Argyll including the Cowal Peninsula but excluding the Kintyre Peninsula), Southwest Uplands (southwest Scotland west of the A74 trunk road) and North Wales.

The patagial wing tags were made from PVC-covered nylon fabric, 0.5 mm thick. They were flexible and rectangular in shape (75 x 35 mm) with a letter or number 50 mm long stencilled on the upper surface using either black or white PVC ink to contrast with the tag colour. The tags were attached by means of a 1.5 mm diameter nylon pin pushed through the patagium and held in place with nylon washers above and below the wing. Heat applied to the ends of the pin caused them to melt and form a ball, which hardened on cooling, thus holding the washers in place.

The tags attached to the right wing were of a unique colour depending on the area in which they were applied. The colour of the left wing tag identified the sex of the chick, and was changed annually, so that on the basis of only the tag colours being seen, a bird could be attributed to a given area, sex and year. The additional reading of the letter or number on the tag identified the individual bird. In the event of a marked bird being found dead or injured, a contact telephone number was written on the underside of each tag. This ensured minimum delay in retrieving information about

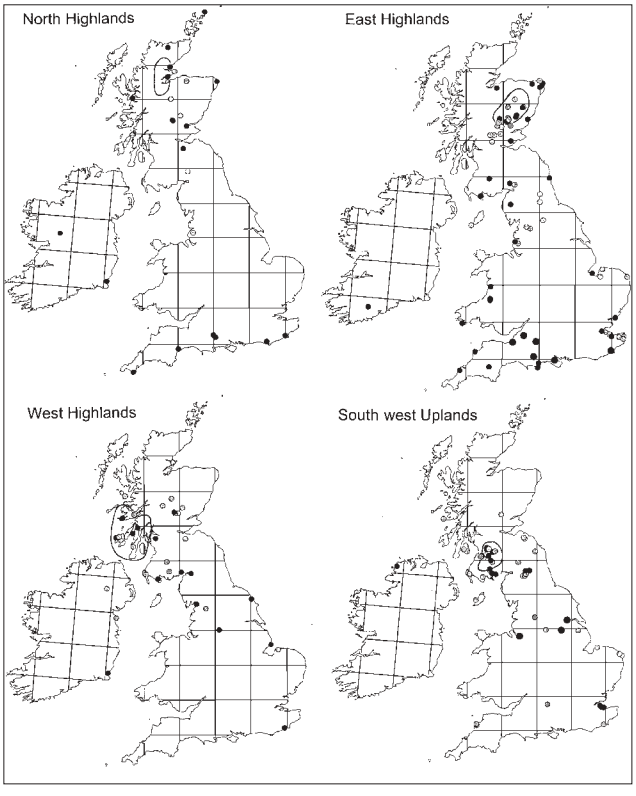

Figure 1. Localities where first-year Hen Harriers were sighted or recovered in winter (November–January) after tagging as chicks in different study areas (circled) in Scotland: ● males, ○ females.

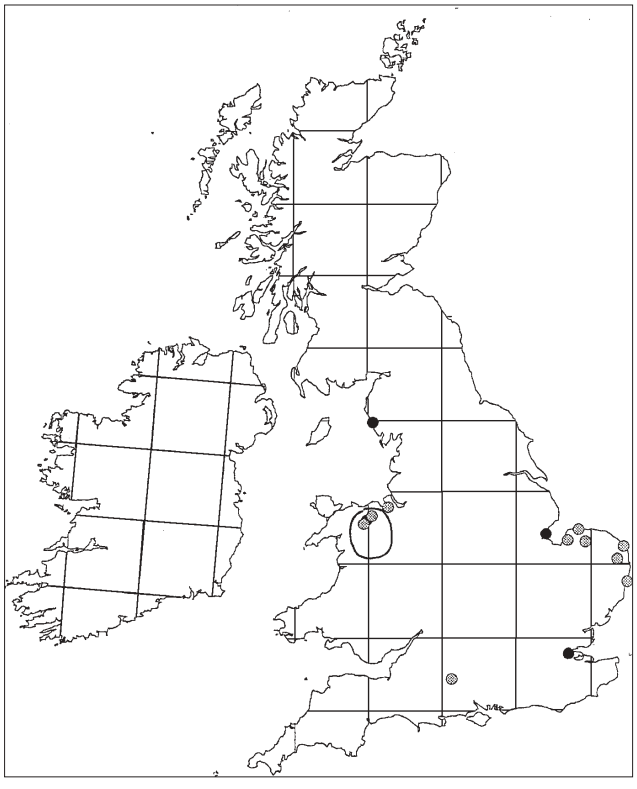

Figure 2. Localities where first-year Hen Harriers were sighted or recovered in winter (November–January) after tagging as chicks in North Wales (circled): ● males, ○ females.

birds. In addition, all tagged young were fitted with British Trust for Ornithology leg rings.

The project was given widespread publicity in local, national and some foreign (France, Spain, The Netherlands) bird journals, and observers were asked to report sightings. Most observers (77%) were unable to read the letters/numbers on the tags so the analysis of these records refers to movements from natal areas rather than nests. Thus, if one of these birds was marked and resighted in a given natal area, we could not tell how far it had moved within that area. Given that the radii of the natal areas were approximately 25 km on average, we have treated all movements within a marking area as 'short-distance' movements and combined them with all other movements known to be less than 25 km. Movements over 25 km were regarded as 'long-distance' movements. The distance of a long-distance movement was measured from the centre of the natal area to the location of the sighting, except for identified individuals, in which case the distance was exact. If a bird with given colour tags (and numbers and letters were not recorded) was sighted more than once at a given locality, this was treated as only a single record within a season. This meant that two birds with the same colours of tags would be regarded as one record, but that a bird staying at a locality over two seasons would be regarded as two records.

Birds that were reported between August of their first year and 30 June of the following calendar year were classed as 'first-year', whilst birds in their second year (from 1 July to 30 June) were classed as 'second-year'. Older birds were classed as 'adult'.

Analyses

Reports of wing-tagged Hen Harriers in the period 1 August 1990 to 30 April 1997 were used in this analysis. The year was divided into three-month periods (seasons); August–October (autumn), November–January (winter), and February–April (spring). Only reports of wing-tagged harriers in the period 1 August to 30 April were considered and records during the breeding season were excluded. Most breeding-season records of tagged birds were at known breeding sites in Britain, and these have been published elsewhere (Etheridge *et al* 1997).

Initially, the data for probability of observing short- (less than or equal to 25 km) and long-distance movements (greater than 25 km) was modelled as a function of age, sex, natal area and season in logistic models. The distance class was regarded as a binary dependent variable (short-distance = 0, long-distance = 1), with age, sex, season and natal area as explanatory factors. These analyses were carried out using GLIM4 (Francis *et al* 1993). Further analyses using SYSTAT (Wilkinson 1990) were carried out only on the long-distance movements in ANOVAs, testing the effects of age, sex, natal area and season on the distance travelled. The distances were log-transformed (natural logarithms) before analysis.

There were sufficient data from first-year birds to analyse movements from the four different study areas in Scotland. However, comparisons among the different age classes (first-year, second-year and adult) could only be carried out by combining all the Scottish data. The limited data from Wales were treated separately.

Maps were drawn using DMAP (Alan Morton, Windsor, Berkshire).

RESULTS

In the six-year period 1990–95, 1,639 nestling Hen Harriers were wing-tagged, comprising 835 (51%) males and 804 (49%) females (Table 1). No birds were tagged in one area during the last two years due to lack of ringers. There were 911 sightings of tagged birds and 211 (23%) were identified as individuals (letter or number noted).

Table 1. Numbers of nestling Hen Harriers wing-tagged in each study area during 1990–95.

Study area	1990	1991	1992	1993	1994	1995	Total
North Highlands	36	63	63	43	33	60	298
East Highlands	72	98	117	106	83	53	529
West Highland	100	118	153	100	0	0	471
Southwest Uplands	21	35	44	33	23	29	185
North Wales	11	27	51	37	15	15	156
Total	240	341	428	319	154	157	1639

Table 2. The percentages of long-distance movements (greater than 25 km) by first-year Hen Harriers marked as chicks in different parts of Scotland.

Natal area	Males		Females	
Season	Percentage	Sample size	Percentage	Sample size
North Highlands				
August–October	53.8	26	62.1	29
November–January	89.5	19	88.9	9
February–April	81.3	16	88.9	9
East Highlands				
August–October	85.9	64	64.9	37
November–January	91.8	49	66.7	39
February–April	86.4	22	75.0	24
West Highlands				
August–October	54.2	24	72.0	25
November–January	77.8	18	77.4	31
February–April	50.0	10	93.3	15
Southwest Uplands				
August–October	67.6	34	47.6	21
November–January	60.0	25	62.8	43
February–April	69.2	13	55.0	20

Significant effects

Natal area: $\chi^2 = 14.8$, df = 3, $P < 0.01$

Sex: $\chi^2 = 4.2$, df = 1, $P < 0.05$

Season: $\chi^2 = 7.3$, df = 2, $P < 0.05$

Natal area x sex: $\chi^2 = 17.7$, df = 3, $P < 0.001$

First-year birds

Scotland

There was a significant effect of natal area, sex and season on the percentages of first-year birds making long-distance movements (Table 2). There was also a significant interaction between natal area and sex showing that the sexes behaved differently in the different areas. Thus, by winter, a higher percentage of birds (about 90%) from the North Highlands and males from the East Highlands had carried out long-distance movements compared with birds from the West Highlands and Southwest Uplands.

For those first-year Hen Harriers that made long-distance movements, there were significant effects of season, natal area and interactions between sex and natal area, and between sex and season on the distances moved (Table 3). Generally, the most distant sightings were in winter and spring. Birds from the North Highlands made the longest movements, and those from the Southwest Uplands the shortest. Males were sighted at greater distances than females in winter (particularly those from the North Highlands), though this sex difference was not apparent in autumn and spring when birds were presumably on migration.

Sightings of Scottish birds in autumn suggest a migration route through the Southern Uplands and into England, following the Pennine Hills or the Irish Sea coast. There were no sightings between Lothian and Yorkshire. Some birds continued down to southwest England and there were several sightings of tagged first-year males between Dorset and the Scilly Isles in winter (Fig 1). Many were seen at coastal headlands suggesting imminent departure across the English Channel, including the longer crossing from Devon to Brittany. The overseas sightings and recoveries were from France, Portugal, Spain and The Netherlands (Table 4). There were also 14 reports from Ireland, mostly of first-year birds. Many were seen on the coast, at wetlands, headlands or islands (Fig 1, Table 4).

The main directions moved by first-year birds (regardless of sex) were south, southeast or east (Table 5). The birds from the North and East Highlands tended to have southerly movements, whilst those from the West Highlands moved southeast or east, and those from the Southwest Uplands moved mainly southeast.

North Wales

The number of sightings of Hen Harriers marked in North Wales was too small to be included in the statistical analysis of the Scottish data. However, there were sufficient records to show that first-year birds, particularly females, wintered mainly in East Anglia, or remained in North Wales (Fig 2). Two males were reported in November of their first year in France and Portugal (Table 4).

Table 3. Average long-distance (greater than 25 km) movements (km) of first-year Hen Harriers marked as chicks in different parts of Scotland. n = sample size.

Natal area	Males				Females			
Season	Geometric mean	95% CL	Min–Max	n	Geometric mean	95% CL	Min–Max	n
North Highlands								
August–October	206	123–345	38–1047	14	122	82–182	30–710	18
November–January	365	238–558	73–1047	17	172	91–325	65–810	8
February–April	255	156–417	55–835	13	249	139–444	80–730	8
East Highlands								
August–October	140	106–184	30–787	55	236	153–362	28–720	24
November–January	284	212–379	32–1588	45	199	131–301	28–725	26
February–April	256	175–374	57–730	19	271	178–413	28–725	18
West Highlands								
August–October	291	170–502	65–915	13	144	98–212	30–877	18
November–January	200	129–310	44–720	14	134	109–164	48–550	24
February–April	146	59–360	30–460	5	166	97–283	29–615	14
Southwest Uplands								
August–October	94	62–144	31–630	23	163	108–245	60–430	10
November–January	198	127–308	32–560	15	154	111–213	33–590	27
February–April	152	77–299	32–560	9	165	95–289	40–590	11

ANOVA on log-transformed distances

Source of variation	df	Mean square	*F*	*P*
Season	2	3.724	4.21	0.015
Natal area	3	3.174	3.59	0.014
Sex	1	2.440	2.76	0.097
Sex x natal area	3	2.917	3.30	0.020
Sex x season	2	3.571	4.04	0.018
Error	436	0.884		

All age classes

When all age classes were combined, there was only an effect of sex on the proportion of birds making long-distance movements (Table 6). By winter, a higher percentage of males than females had made long-distance movements.

When the long-distance movements were analysed, there were significant effects of season and age, and significant interactions between sex and age and between sex and season (Table 7, Fig 3). Thus, by winter, the longer movements seen in first-year birds (especially males) were not seen in second-year and adult birds. However, by spring, males regardless of age class were seen at greater distances than females. The other trend was that first-year and second-year birds were seen at greater distances than adults when compared for each season.

The directions moved by second-year birds and adults from Scotland were mainly south or southeast, similar to first-year birds (Tables 5 & 8). There were no significant effects of age or sex.

DISCUSSION

The previous studies of the movements of Hen Harriers in Britain were by Thomson (1958), Mead (1973) and Watson (1977). Much of the early ringing was in Orkney, restricting the data to this locality. In Thomson's (1958) review of 43 recoveries, 39 were from Orkney, comprising 24 local recoveries and 15 movements to the eastern half of mainland Scotland, from Caithness to the border counties. Mead (1973) reviewed 128 ring recoveries, again based largely on ringing on Orkney. He found that most movements were southerly into eastern and central Scotland, and some reached Ireland and England, as far south as the Wash and East Anglia in winter. Few birds travelled more than 500 km. Overseas movements were to France, The Netherlands, Denmark, Sweden and northern Norway. Reciprocal movements of Continental birds occurring in Britain included birds from Finland, Belgium and The Netherlands. There were many recoveries within Orkney outside the breeding season indicating that some birds were resident. Watson's (1977) review included observations of migrating birds as well as ring recoveries, allowing a more comprehensive description of movements. He noted that most Hen Harriers left the vicinity of the breeding areas about a month after the young fledged, and from September onwards there was widespread evidence of migration or arrival at wintering areas.

Table 4. Details of overseas recoveries of Hen Harriers wing-tagged as chicks in Scotland and North Wales. F – female, M – male. Months in brackets give reporting date.

Study area	Sex	Year of recovery	Place where seen/recovered	Method of recovery	Month of sighting/recovery
Scotland	M	Third year	Co Londonderry, N Ireland	Seen	October
North Highlands	M	First year	Co Wexford, Ireland	Seen	November
East Highlands	F	First year	Co Cork, Ireland	Seen	October
East Highlands	M	First year	Co Cork, Ireland	Found dead	(November)
West Highlands	?	First year	Co Kildare, Ireland	Seen	October
West Highlands	M	First year	Co Wexford, Ireland	Seen	October
West Highlands	F	First year	Co Offaly, Ireland	Found dead	October
West Highlands	F	First year	Co Louth, Ireland	Seen	November
West Highlands	F	First year	Co Tyrone, N Ireland	Found dead	December
West Highlands	F	Second year	Co Clare, Ireland	Seen	December
West Highlands	F	First year	Co Wexford, Ireland	Seen	February
West Highlands	M	First year	Co Donegal, Ireland	Seen	March
West Highlands	F	First year	Co Wexford, Ireland	Seen	March
West Highlands	F	First year	Co Wexford, Ireland	Seen	March
West Highlands	M	First year	Co Londonderry, N Ireland	Seen	April
West Highlands	F	Second year	Co Wexford, Ireland	Seen	April
West Highlands	F	Fifth year	Co Wexford, Ireland	Seen	April
Southwest Uplands	M	First year	Co Donegal, Ireland	Found dead	(November)
East Highlands	M	First year	St Agnes, Scilly Isles	Seen	October
West Highlands	F	First year	Jersey, Channel Islands	Seen	October
North Highlands	M	First year	Finisterre, France	Seen	October
West Highlands	M	First year	Brittany, France	Seen	October
West Highlands	M	Second year	Finisterre, France	Seen	November
Wales	M	First year	Calais, France	Found dead	November
East Highlands	M	First year	Galicia, Spain	Shot	January
North Wales	M	First year	Lisboa, Portugal	Seen	November
North Highlands	M	First year	IJmuiden, The Netherlands	Shot	October

Table 5. Directions (percentages in each 45˚ arc of the compass) of long-distance movements of first-year Hen Harriers marked as chicks in different parts of Scotland, and based on winter (November–January) records.

	North Highlands		East Highlands		West Highlands		Southwest Uplands	
Direction	Male	Female	Male	Female	Male	Female	Male	Female
North	5.9	0.0	2.2	0.0	7.1	4.2	0.0	11.5
Northeast	5.9	12.5	15.7	11.5	0.0	16.7	0.0	11.5
East	5.9	0.0	11.1	0.0	21.4	33.3	6.7	0.0
Southeast	11.8	0.0	13.3	30.8	64.3	25.0	66.7	46.2
South	58.8	75.0	55.6	50.0	7.1	12.5	13.3	19.2
Southwest	5.9	12.5	2.2	7.7	0.0	4.2	6.7	0.0
West	5.9	0.0	0.0	0.0	0.0	0.0	6.7	7.7
Northwest	0.0	0.0	0.0	0.0	0.0	4.2	0.0	3.9
Sample size	17	8	45	26	14	24	15	26

Statistical analysis

Region: $\chi^2 = 68.9$, df = 21, $P < 0.001$ (with sexes combined)

Sex: $\chi^2 = 4.6$, df = 7, $P = 0.71$ (with regions combined)

Table 6. The percentages of long-distance movements (greater than 25 km) by different age classes of Hen Harriers marked as chicks in Scotland.

Age class	Males		Females	
Season	Percentage	Sample size	Percentage	Sample size
First-year				
August–October	70.9	148	62.5	112
November–January	81.3	112	69.7	122
February–April	75.4	61	75.0	68
Second-year				
August–October	63.6	22	73.7	19
November–January	78.9	19	60.0	25
February–April	60.0	10	66.7	21
Adult				
August–October	87.5	8	83.3	24
November–January	88.9	9	55.2	29
February–April	60.0	5	57.9	19

Significant effects

Sex: $\chi^2 = 5.6$, df = 1, $P < 0.02$

Table 7. Average long-distance (greater than 25 km) movements (km) of different ages of Hen Harriers marked as chicks in Scotland. n = sample size.

Age class	Males				Females			
Season	Geometric mean	95% CL	Min–Max	n	Geometric mean	95% CL	Min–Max	n
First-year								
August–October	148	121–182	30–1047	105	166	134–207	28–877	70
November–January	266	219–322	32–1588	91	162	135–194	28–810	85
February–April	217	166–284	30–835	46	210	162–272	28–730	51
Second-year								
August–October	152	88–263	27–560	14	168	111–254	68–890	14
November–January	188	110–321	33–980	15	206	138–310	80–725	15
February–April	255	95–684	37–675	6	179	107–300	26–760	14
Adult								
August–October	43	32–59	31–85	7	136	98–189	35–568	20
November–January	101	46–218	31–710	8	158	120–210	40–362	16
February–April	174	38–790	50–710	3	143	97–213	75–435	11

ANOVA on log-transformed distances

Source of variation	df	Mean square	*F*	*P*
Season	2	6.259	7.12	0.001
Age	2	7.282	8.28	<0.001
Sex	1	1.253	1.42	0.233
Sex x age	2	3.458	3.93	0.020
Sex x season	2	3.906	4.44	0.012
Error	576	0.880		

Table 8. Directions (percentages in each 45° arc of the compass) of long-distance movements (greater than 25 km) of different age-classes of Hen Harriers marked in Scotland, and based on winter (November–January) records.

	First-year		Second-year		Adult	
Direction	Male	Female	Male	Female	Male	Female
North	3.3	4.8	13.3	6.7	0.0	12.5
Northeast	8.8	13.1	6.7	13.3	0.0	37.5
East	11.0	9.5	0.0	6.7	0.0	0.0
Southeast	29.7	31.0	40.0	46.7	85.7	18.8
South	41.8	32.1	40.0	13.3	0.0	12.5
Southwest	3.3	4.8	0.0	6.7	14.3	12.5
West	2.2	2.4	0.0	6.7	0.0	0.0
Northwest	0.0	2.4	0.0	0.0	0.0	6.3
Sample size	91	84	15	15	7	16

Statistical analysis

Age: $\chi^2 = 23.3$, df = 14, $P = 0.06$ (with sexes combined)

Sex: $\chi^2 = 10.3$, df = 7, $P = 0.17$ (with ages combined)

However, few reached southern England before October (Watson 1977).

Our study did not include birds tagged in Orkney, but there were many similarities between our results and the earlier studies. However, because the present study was based on a larger sample spread over a greater area, it allowed more insights into the movements of birds from different natal areas, and the effects of age and sex. To a degree, the patterns of movements from the different parts of Scotland can be interpreted in terms of geography and food availability in different habitats in winter. Thus, the longer movements by birds from the North Highlands reflect the greater distance they must fly to vacate upland areas, whereas Hen Harriers breeding in southern Scotland need fly only a short distance. The directions flown also reflect geography: the long-distance movements of first-year birds from the North Highlands and East Highlands were mainly south, whilst those movements from the West Highlands and Southwest Uplands tended to be southeast (Table 5).

Ireland appears to be an important wintering area for both sexes of Hen Harriers, particularly for birds from the West Highlands. One female was in her fifth year when sighted in Co Wexford. Several records were obtained from the Continent (France, The Netherlands,

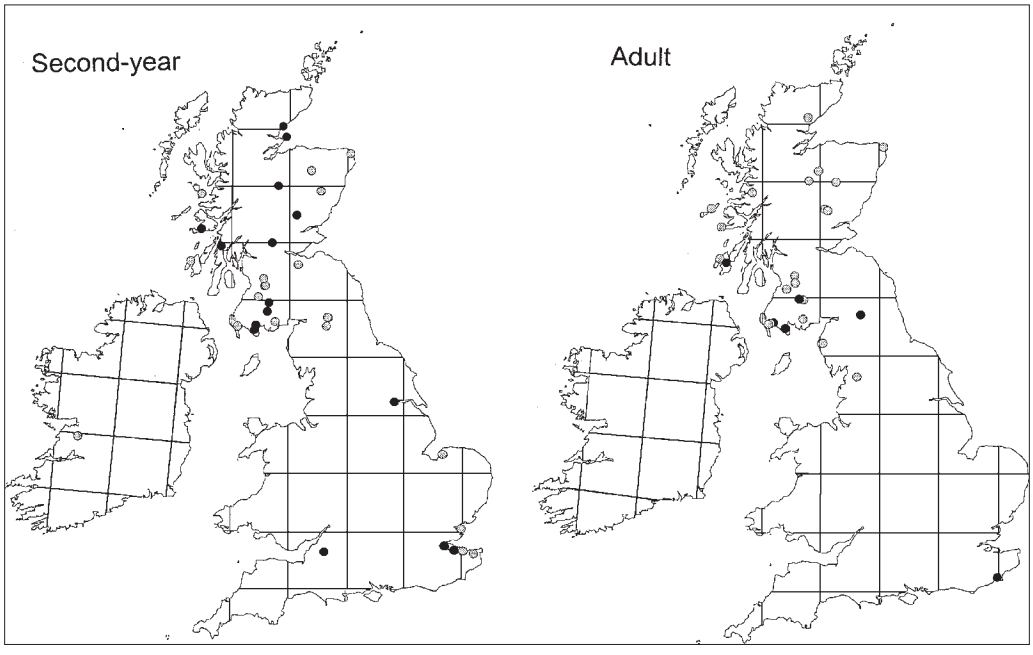

Figure 3. Localities where second-year and adult Hen Harriers were sighted or recovered in winter (November-January) after tagging as chicks in Scotland. ● males, O females.

Spain and Portugal). These records plus ring recoveries show that British Hen Harriers winter as far as Iberia (Etheridge, in Wernham *et al* 2002). However, we do not know the percentage of birds that do this, but it appears to be mainly young males (Table 4).

Hen Harriers are sexually dimorphic with respect to size, and this is reflected in their diets, and consequently their movements and wintering areas. Whilst both sexes take a range of small mammals and birds, such as voles and pipits, the larger females can take prey up to the size of Rabbits *Oryctolagus cuniculus,* hares *Lepus* spp and Red Grouse *Lagopus lagopus* (Cramp & Simmons 1980, Marquiss 1980). Many small birds, such as Meadow Pipits *Anthus pratensis* and Skylarks *Alauda arvensis,* are important quarry for males in summer but these passerines migrate from the moors (Dougall, in Wernham *et al* 2002). Thus, greater movements made by male Hen Harriers could be due to the reduction in the numbers of small passerines present in the uplands in winter (Marquiss 1980), leading to contrasting sex ratios in different wintering areas. In winter, males are outnumbered by females in upland moorland, whilst the reverse is the case in the lowland parts of Britain (Watson 1977). By moving to low ground outside the breeding season, males presumably avoid competition with the larger females over a diminished food resource (Newton 1979). The sexual difference is most clearly seen in the wintering distribution of first-year birds from the East Highlands (Fig 1), with most females either remaining on the grouse moors of their natal areas or moving to the Pennines, whilst most males move to the lowlands. The pattern is less clear for Hen Harriers breeding in the West Highlands where there are few grouse moors. Here, the prey availability for females will also be low, and this is reflected by movements of females onto the grouse moors of eastern and southwest Scotland, and to Ireland (Fig 1). By remaining on the grouse moors outside the breeding season, females will continue to be at risk from persecution.

Watson (1977, p 155) found that the proportions of first-year birds and older birds making long-distance movements were similar, making them different to other raptors, such as the Kestrel *Falco tinnunculus* and Merlin *F columbarius,* where young birds tend to be more migratory. Likewise, we found that older birds from Scotland were just as likely as first-year birds to make long-distance movements in winter (Table 6). However, when only the long-distance movements are considered, then movements by older birds were shorter than those of first- and second-year birds (Table 7), showing that there are some similarities with other raptors.

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