



Hen Harrier

Circus cyaneus

1. INTRODUCTION

The hen harrier (northern harrier) breeds mainly in the north and west of Great Britain, in Ireland and on the Isle of Man (Gibbons *et al.*, 1993; Sim *et al.*, 2001, 2007; Norriss *et al.*, 2002). Recent surveys have indicated increases in breeding populations in many areas of Britain and Ireland, although numbers decreased in south and east Scotland and England (Norriss *et al.*, 2002; Sim *et al.*, 2007; Barton *et al.*, 2006). The increases may be associated with the growing use of non-moorland habitats such as mature conifer plantations, second rotation forestry and scrub/brash (Norriss *et al.*, 2002; Sim *et al.*, 2007; Barton *et al.*, 2006). Regional declines may be associated with continued illegal persecution (Sim *et al.*, 2007; Natural England, 2008).

Hen harriers that breed in Britain are regarded as partial migrants (Etheridge, 2002; Etheridge & Summers, 2006). Many birds remain on or near their breeding grounds but some, mainly first-winter males, move into southwest Europe or Ireland in the winter. Irish breeders are probably largely sedentary (Etheridge, 2002). Northern European populations are completely migratory, with some wintering as far south as the Mediterranean shores of North Africa. Many of the hen harriers wintering in southern Britain are believed to originate from the Continent (Clarke & Watson, 1997).

The grey and white adult male hen harriers can be distinguished easily from the brown 'ringtails' (females and immature birds). Separation of juvenile and immature birds from adult

Annual cycle

Breeding Activity	Peak Period	Range	Duration (days)
Site occupation and territorial display	Early April to early May	Late February to late May	
Nest building		April to late May	
Egg laying	Late April to mid-May	Mid-April to late June	5 to 12
Incubation	Late April to mid-June	Mid-April to late July	29 to 31
Hatching	Late May to mid-June	Mid-May to late July	
Young in nest	Late May to mid-July	Mid-May to late August	28 to 39
Fledging	Late June to mid-July	Mid-June to Late August	
Juvenile dispersal		August to September	

females is more difficult; adult females tend to have paler underparts but there is considerable variation. Young brown males are smaller and less bulky in appearance; they begin to moult into grey adult plumage in the spring/summer of their first calendar year, during which time they will appear parti-coloured until the moult is completed by the autumn of the same year. After the post-juvenile moult the plumage is generally like an adult male but has a darker area on the back (mantle and scapulars) and a brownish nape (hindneck) patch; these feathers may not completely disappear until birds are four or five years old (Watson, 1977). The plumage of immature females cannot be distinguished in the field from that of adult females (Cramp & Simmons, 1980). Most female hen harriers breed in their first year. Fewer first-year males breed, and those that do tend to be less successful than adults.

For further information on the biology and ecology of this species, Watson (1977) provides a comprehensive account.

2. HABITAT, HOME RANGE, NESTS AND BREEDING

2.1 Habitat

Hen harriers require open terrain for hunting. Overall, in Britain and Ireland, the majority of pairs nest in heather moorland and forestry plantations (Bibby & Etheridge, 1993; Sim *et al.*, 2001; Sim *et al.*, 2007). In Ireland, second rotation pre-thicket coniferous forest was recently shown to be the most frequently used habitat, followed by new pre-thicket forestry (Norriss *et al.*, 2002; Barton *et al.*, 2006; Wilson *et al.*, 2009). In western Scotland a significant proportion of hen harriers are now breeding in woodland habitats including mature and second rotation conifer plantations, newly planted native woodland and regenerating woodland and scrub (Haworth & Fielding, 2009). Use of woodland habitats for nesting may be dependent on the presence of suitable open areas for hunting nearby. Nests tend to be below 600 m a.s.l.. On the Continent, hen harriers will also breed in cereal crops. In the winter, they occur in open country throughout Britain and Ireland, with low-lying coastal areas in south and east England and in southwest Scotland being particularly favoured (Lack, 1986). In Scotland, females tend to winter on higher ground (above 200m a.s.l.) than males (below 100m a.s.l.) (Etheridge, 2002).

2.2 Home range

In the breeding season, hen harriers defend their nesting territory and hunt over a larger home range, which they share with other harriers. Males have larger home ranges than females (average respective home range areas of 7.3 km² and 3.6 km² in Scotland; Arroyo *et al.*, 2005, 2006), and may feed as far as 10 km from the nest. Females were found to hunt mainly within 300–500 m of the nest (Arroyo *et al.*, 2009).

Hen harriers are sometimes polygynous, normally with two, but up to six, females associating with one male. The incidence of polygyny varies between populations and, in Britain and Ireland, is most frequent in Orkney (Balfour & Cadbury, 1975, 1979; Watson, 1977; Picozzi, 1984; Amar & Redpath, 2002). Polygyny may increase with the abundance of voles, a principal prey species (Hamerstrom *et al.*, 1985). The dominant (alpha) female lays first and will generally rear a larger brood than the second (beta) and other females. In southwest Scotland, there was no difference in breeding success between polygynous and monogamous females, despite the delivery of fewer food items to polygynous nests, as females and males compensated by delivering larger food items (Redpath *et al.*, 2006). A case of polyandry in Northern Ireland was ascribed to a lack of females in the population (Scott & Hipkiss, 2006).

2.3 Nest sites

Most hen harriers nest on the ground in a dry, well-drained location; wet sites are avoided in Britain and Ireland, although they are used elsewhere. Analysis of ground nest characteristics in four areas of western Scotland (Redpath *et al.*, 1998) showed that hen harriers preferred to nest in rank (tall) but not degenerate (old and woody) heather with an average height of 46 cm (approximately knee-deep). Nests tended to be nearer streams than expected by chance and there was also an indication of preference for northwest facing slopes (Redpath *et al.*, 1998). As well as heather, nests in Britain and Ireland have been recorded in: rushes; bracken; willow; purple moor grass; mature bog myrtle with regenerating willow and birch; forestry brash with rosebay willowherb; open and closed canopy forestry plantations (amongst rank vegetation in clearings or rides); and restocked forestry (Watson, 1977; Petty & Anderson, 1986; Norriss *et al.*, 2002). Nests within forestry plantations can be difficult to locate because the birds often fly along rides below tree height to reach them.

2.4 Nests

The foundation of a ground nest is built of dead vegetation, usually heather, but it may include birch, rushes or other vegetation. The nest is lined with finer vegetation, with a 5 cm-deep cup. The material is gathered by both sexes, although primarily by the female, between 40-150 m from the nest, and is carried in the bill or feet (Cramp & Simmons, 1980; Watson, 1977). Nest building may continue during incubation. Male hen harriers will add small pieces of material to a nest if a female dies or disappears; the loose pieces lie on top of the eggs or nest cup and will not be incorporated into the nest, and this indicates nest failure.

Hen harriers have recently been recorded nesting in trees in mature closed-canopy spruce plantations in Northern Ireland (Scott *et al.*, 1993; Scott, 2000). Nests are built 2–13 m above the ground, in trees with flattened crowns. Tree nests are less successful than ground nests (Scott & Clarke, 2007). Although tree nesting has not been recorded elsewhere in Britain and Ireland, fieldworkers should be aware of the possibility that birds observed either displaying over, or carrying food into, mature forest may be nesting in trees.

Male or female hen harriers may also build small, incomplete 'cock' nests, which are not used for breeding but may be built up and used in a subsequent year.

2.5 Clutch size and incubation

Egg laying begins in mid-April, with most clutches started in early May, although the mean first egg date varies significantly between years (Etheridge *et al.*, 1997). Hen harriers normally lay 3-7 eggs (Cramp & Simmons, 1980) at 48 hour intervals, with an average clutch size of five eggs (Etheridge *et al.*, 1997). The BTO Nest Records Scheme gives an average clutch size of 4.6 eggs ($n = 399$) but includes a large amount of data from Orkney, where polygyny is associated with smaller clutch sizes. Exceptional clutches of up to 12 eggs have been recorded but these are believed to have been laid by two females (Watson, 1977). Incubation lasts for 29-31 days per egg and 29–39 days per clutch (Cramp & Simmons, 1980). It usually begins with the second- or third-last egg, although it can start with the first egg. Only the female incubates. Hen harriers are single brooded but the female may relay if the first clutch is lost early in incubation. In a large scale study in Scotland (1,459 nests located between 1988-95), Etheridge *et al.*, (1997) identified 15 clutches as likely replacements; these were within 0.03–1.4 km of an earlier nest that had failed at the egg stage. Replacement clutches tend to be smaller than the original clutch and are normally started within 10-21 days of failure.

2.6 Brood size and fledging

The eggs hatch asynchronously. In bad weather or if there is a lack of food, the youngest and weakest chicks will die. In Wales, an increase in breeding success has been linked to warmer weather and reduced human interference (Whitfield *et al.*, 2008c). The young are fed by the female, who broods them periodically until they are 14-21 days old. The male initially provides all the food, but the female starts to forage once the young are about 11 days old and may provide more than 50% of the food when the young are more than 20 days old (Watson, 1977). In southwest Scotland, average prey delivery rates at different stages of the nesting cycle were: prelaying, 0.39 prey deliveries per hour; incubation, 0.50, nestling, 0.67 and post-fledging, 0.70 (Dickson, 1995a). Higher prey delivery rates during the nestling period have been recorded elsewhere in Scotland (Balfour & MacDonald, 1970; Watson, 1977; Picozzi, 1978; Redpath & Thirgood 1997) and lower rates during the prelaying and incubation periods on Orkney (Amar *et al.*, 2003). Well-fed male chicks fledge at 28 days and well-fed female chicks at 32 days. Fledging can be delayed for up to 7 days in poor weather or if feeding conditions are poor. The young are dependent on parental feeding for around 14 days after fledging. If undisturbed, they will remain close to the nest for some time. The average length of the dispersal period is not known: some juveniles have been observed 30 km away from the nest three weeks after fledging, while others were still near the nest site five weeks after fledging.

3. SURVEY TECHNIQUES

CAUTION *To minimise the risk of disturbance it is recommended that nesting areas are viewed from distances of 500-700m (Ruddock & Whitfield, 2007; Whitfield *et al.*, 2008b). Special care should be taken to minimise disturbance to hen harriers while they are laying, as nests containing one or two eggs may be deserted. Nests should not be disturbed in cold or wet weather around the time of hatching or when small young are present. Incubating or brooding females flushed from nests may dislodge eggs or small young from the nest cup. Any such eggs or young should be carefully put back in the nest. Appropriate care should be taken if nest visits involve tree climbing (see Section 7.10 of introduction). Some females and occasionally males can be aggressive towards people at the nest, even striking an intruder's head with feet and claws. Head protection is therefore recommended.*

3.1 Breeding season visit schedule

The species is listed on Schedule 1 in Great Britain, Northern Ireland and the Isle of Man, and on Schedule II in the Republic of Ireland (see Section 7.1.1 of Introduction). Hen harriers are most obvious between March and May, before they lay, and again in late June or July, when successful nests have large or fledged young. To establish occupancy and the presence of a breeding pair, it is recommended that all four visits are made (as detailed below). However, if time is limited and a home range appears to be unoccupied on the basis of the first two visits, then further visits to that home range can be omitted. The methods given below are based on those used for recent national surveys of the UK, Isle of Man and Republic of Ireland (Sim *et al.*, 2001; Norriss *et al.*, 2002; Sim *et al.*, 2007; Barton *et al.*, 2006). Note that breeding attempts that fail at the egg stage are likely to be under-recorded by these survey methods. In some parts of their range hen harriers are persecuted and surveyors should be mindful of this.

Visit 1	March to mid-April	To check for occupancy.
Visit 2	Mid-April to late May	To locate incubating females. It is important to locate nests as early as possible as some pairs may fail soon after laying. Exceptionally, some birds may not lay until early June
Visit 3	Late May to late June	To check for young or for evidence of breeding if no nest/other signs were found on previous visits
Visit 4	Late June to late August	To check for fledged young. Most visits should be made by mid-July, as young from early nests may start to disperse thereafter

3.2 Signs of occupancy

3.2.1 Locating home ranges

During the first visit to an area, all areas of suitable habitat should be checked on foot, ensuring that the whole area is covered and passing within 250 m of every location with restricted visibility. Watches should be carried out from suitable vantage points for 2.5-4 hours. All unsuitable breeding areas should be marked on a map and can be omitted from repeat visits; these tend to include: land above 600m; improved pasture and arable land; extensive areas of degraded land with no heather cover and low vegetation; the vicinity of cliffs, rocky outcrops, boulder fields and scree; and areas within 100 m of hill farms and occupied dwellings.

Early observations of displaying birds are essential, as many breeding attempts fail before nests are found. Both males and females display, individually or as a pair. Hen harriers commonly perform both solo and mutual high-circling displays over their nesting areas, particularly early in the breeding cycle. Males in particular carry out flight-play manoeuvres, often while calling, and females may flight-roll and present talons in response (Cramp & Simmons, 1980). Solo high-circling by males may lead to sky-dancing, ranging from a simple series of undulating flights at about 30-150 m above the ground, through a version with steeper undulations closer to the ground, to full sky-dancing accompanied by calling. Females have been recorded sky-dancing, particularly making the 'switch-back' flight close to the ground, and mutual sky-dancing also occurs. Displaying brown 'ringtails' may be females or immature (first year) males. Careful observation is required to distinguish the smaller, slimmer male from the female. If several birds display together, the number of females and males involved should be noted. Several females associating with a single male may provide an indication of polygyny but not all of these females will necessarily nest.

Male hen harriers make food-flights, where they fly over and around the nesting territory carrying prey or another object (e.g. heather stick, clod of earth) in one foot. Full food presentation to the female begins intermittently prior to laying and continues as full provisioning of the female through to early chick rearing. Aerial food passes are made within the nesting territory, normally very close to the nest: the female usually calls on seeing the approaching male and may fly up to meet him. However, in the early stages of nesting, food may be passed to the female on the ground or even left near the nest for her to collect. During display, or when hungry during incubation or brooding, the female will 'food beg' if the male is present; these loud calls can be clearly heard and can help to locate nests.

Hen harriers may display over a large area before laying. Displaying birds that are first seen in an area late in the season may be birds that have failed and moved on. As hen harriers can occupy nesting territories close together, care must be taken to distinguish between neighbouring birds.

3.2.2 Locating roosts

If the fieldworker is visiting a known nesting range early in the season, old nests should be checked. Hen harriers frequently roost in these, and fresh faecal droppings and pellets may be found. Searches for roosts during the breeding season are not recommended because of the disturbance that this can cause.

3.2.3 Recognition of signs

Remains of kills and faecal droppings can be used to support field observations. The remains of kills are difficult to locate, however, as hen harriers use a different plucking site for each feed. These may be found on open ground, on a burnt heather patch or in tussocks, where the female feeds after a food pass. Hen harrier pellets are not easily distinguishable from those of other raptors and should only be used to support direct evidence of occupancy.

3.2.4 Evidence of occupancy

The criteria for 'probable' breeding attempts used for the interpretation of data from national hen harrier surveys can be used as evidence of occupancy (see below). Sightings of birds in the same area on more than one occasion provide stronger evidence for occupancy.

3.3 Evidence of breeding

The following criteria were used during recent national surveys of the UK and Isle of Man to classify observations of hen harriers recorded during surveys as proven, probable or possible breeding attempts (Sim *et al.*, 2001; Sim *et al.*, 2007):

PROVEN BREEDING	<ul style="list-style-type: none">• food pass between two adults• adult carrying prey• used nest or eggshells, nest with eggs or young found• recently fledged young
PROBABLE BREEDING	<ul style="list-style-type: none">• a pair seen in breeding season in possible breeding habitat*• a bird or pair apparently holding territory• courtship/display/agitated behaviour• bird(s) nest building• bird(s) visiting probable nest site
POSSIBLE BREEDING	<ul style="list-style-type: none">• a single bird seen in breeding season in possible breeding habitat

* Classed as a 'possible' breeding attempt for the purposes of surveys of the Republic of Ireland 1998–2000 (Norriss *et al.*, 2002).

These criteria were designed for use in surveys covering extensive areas of habitat with only 2-3 visits to each area per season, and population estimates were recorded as the total number of proven and probable breeding attempts (territorial pairs) recorded. Raptor fieldworkers carrying out more intensive studies, involving more repeat visits to survey areas, may record population estimates as the total of proven breeding attempts only.

The latest national survey of hen harrier in the Republic of Ireland, based on three survey visits to each area, used a modified version of the above criteria to distinguish between confirmed

and possible territorial pairs (Barton *et al.*, 2006). Confirmed territorial pairs were defined as for proven breeding above, but with the addition of: agitated behaviour or calls given by adults; courtship or display behaviour involving both a male and female and/or a pair seen visiting a probable nest site noted on two visits separated by at least a week. A possible territorial pair was recorded if courtship and display involving a male and female were noted on only one visit, or if only one displaying bird was ever seen (e.g. a displaying male seen twice but no female); if a pair were seen visiting a probable nest site on only one visit, or if a pair or female were seen in possible nesting habitat between mid-May and the end of June. The requirement for observations of territorial behaviour on two occasions was introduced to reduce the possibility of double-counting of displaying birds which may have moved between survey visits (Barton *et al.*, 2006).

3.3.1 Locating active nests

Hen harriers can show strong site fidelity and may build a new nest each year in the same heather bank or within a few hundred metres of the previous year's nest. They will move as the heather changes with age or burning. If it is suspected that breeding is taking place in the same patch of heather as in previous years, a search for the nest is feasible. This should be stopped if a female alarms from the air or from a ground perch as the bird may have slipped off the nest unseen. The fieldworker should then leave the immediate area and watch the site from a vantage point at a suitable distance (that does not result in alarm calls from the bird). In Northern Ireland, some tree nests have been re-used for up to four years.

If information on nest locations is not available from previous years, watches should be carried out from suitable vantage points during Visits 2 and 3. The aim is to identify the locations of active nests by watching for females leaving and returning to nests (during incubation and brooding) or adults bringing food to young. Before full incubation begins, females may leave nests for long periods of time, particularly on warm days, and neighbouring females may fly in the vicinity of each other's nests early in the season. Females will be observed most frequently leaving nests to receive food from the male, usually via an aerial food pass. During incubation, the female will normally feed away from the nest after a food pass, and the location of the nest can be identified by watching for her to return (she may gather nesting material before doing so). Females brooding chicks will usually return straight to the nest after a food pass. Incubating and brooding females may also leave the nest to defecate, or to mob potential predators, so special attention should be paid to any interactions with other raptors and corvids. Indeed, it is well worth watching corvids active on a moor in order to catch sight of a female slipping off the nest to attack them.

Vantage point watches during the incubation period may need to last for four to six hours, as males can take up to six hours to bring food to the female, although most feeds are less than four hours apart. If the nest site is not identified after observing a food pass during the incubation period, the fieldworker might consider moving to check a different nesting area, as there is unlikely to be a further food pass for several hours.

Once the female stops brooding, the male and female may visit the nest every one to two hours to bring food to chicks, so it may take less time to identify a nest location. Watches should be carried out in the morning (06:00h or earlier to midday) or evening (16:00 to 20:00h) as the male may not visit the female during the afternoon (midday until 16:00h). Some published information suggests that hen harriers are not active early in the morning, but observations in Scotland have shown that they may begin to hunt within one hour of dawn. In an analysis of daily food provisioning in south Scotland, the first recorded delivery was at 05:30h and the last at 20:45h. Provisioning rates increased up to 07:00h, then remained fairly constant,

with slight peaks in the late afternoon and early evening (Redpath & Thirgood, 1997). Males brought similar amounts of prey items irrespective of brood size and nestling age, and always provided more food than females; whereas females brought more prey and bigger items to larger and older broods (Leckie et al., 2008).

Once a bird is seen visiting a nest, a sketch map should be drawn and/or a digital photograph taken (see Section 7.7.1 of Introduction) to show its location in relation to any recognisable features (boulders, small trees, patches of distinct heather, muirburn). The position of the vantage point should also be noted along with a compass bearing to the nest location.

If visits are made to nests to record the contents, a fieldworker should deliberately make a noise on approach to alert the bird of his/her presence. Females may sit tight in late incubation or early brooding, and only flush from about a metre away. Some females may leave the nesting area while others may swoop aggressively and repeatedly on a fieldworker. Some fieldworkers record whether female and male harriers are 'bold' or 'timid' in their response to nest visits on the basis that this may affect the success of the breeding attempt. Birds that defend the nest vigorously may be more active in deterring predators such as foxes, but may potentially be more at risk of illegal persecution if they swoop close to people who approach the nest. Nest visits should be as brief as possible, especially if it is suspected that the clutch is incomplete. If a male is seen to display to more than one female, or polygyny is suspected for some other reason, observers should not approach the first nest that is located during a watch, but should instead make further observations to assess whether a male brings food to another nest close by.

3.3.2 Evidence for fledging

Because of the high risk of predation of ground nests (Green & Etheridge, 1999), young can only be assumed to have fledged if they are observed and counted when capable of flight. If possible, the nest and surrounding area should be checked carefully a week before the estimated fledging date, and a two hour watch carried out within the next week to check for the presence of fledged young. If there is insufficient time to carry out this final watch, then the number of fully feathered young in the nest can be used as an estimate of the number that will fledge. Once the young are fully feathered, the female no longer removes uneaten prey remains (legs, pelvic girdles and so on), and the presence of such remains in an empty nest is indicative of successful fledging. Predation risk increases as the young mature. If a predator has taken large young, evidence (bitten off feather quills, trails of down feathers) can often be found. There may be no signs to indicate that smaller young have been taken by a predator, however. If a nest is found empty, the surrounding area should be checked carefully for dead chicks or any signs of human intervention.

Tree nests in Northern Ireland are often unstable and young may be lost if they fall to the ground. A case of probable predation by buzzard has been recorded (Scott, 2000).

3.4 Evidence for non-breeding

The number of apparently single hen harriers recorded during the 1998 survey of the UK and Isle of Man, considered by the authors to be mostly birds that did not attempt to breed in that year, averaged 0.28 per territorial pair (Sim *et al.*, 2001). Hen harriers may occupy a nesting range early in the season and not breed there, although they may move elsewhere to breed. If a pair occupies a nesting range but does not breed, the male may display into late May and bring food to the female, but she will not be observed returning to a nest. This behaviour will also be seen after nest failure, however, making non-breeding difficult to prove, except by very frequent watches of known nesting areas throughout the breeding season.

3.5 Ageing and sexing young

Young hen harriers can be aged approximately by measuring wing length (Figure 14; Bijlsma, 1997). Care must be exercised, however, as many broods contain a 'runt'. These runt chicks are smaller than would be expected for their age because their growth is retarded through receiving less food than their larger siblings. Wing length should not be used to sex young because there is a considerable overlap in length between male and female chicks whilst they are still in the nest. Young can be sexed from day 20 onwards (wing >158 mm) after which there appears to be no overlap in claw span measurements of the two sexes (Bijlsma, 1997); males have a claw span of $\leq 60\text{mm}$ and females $\geq 62\text{mm}$. Chicks weighing more than 450g are likely to be female, and those less than 400g, male. Well-feathered male chicks tend to have a grey tinge to the iris, while that of the larger female is brown (Picozzi, 1981; see Plate 80). After day 20, if both sexes are present in the nest, a visual comparison of tarsus length and thickness, and foot size, can also be used to separate the smaller males from females, without the need for measurements.

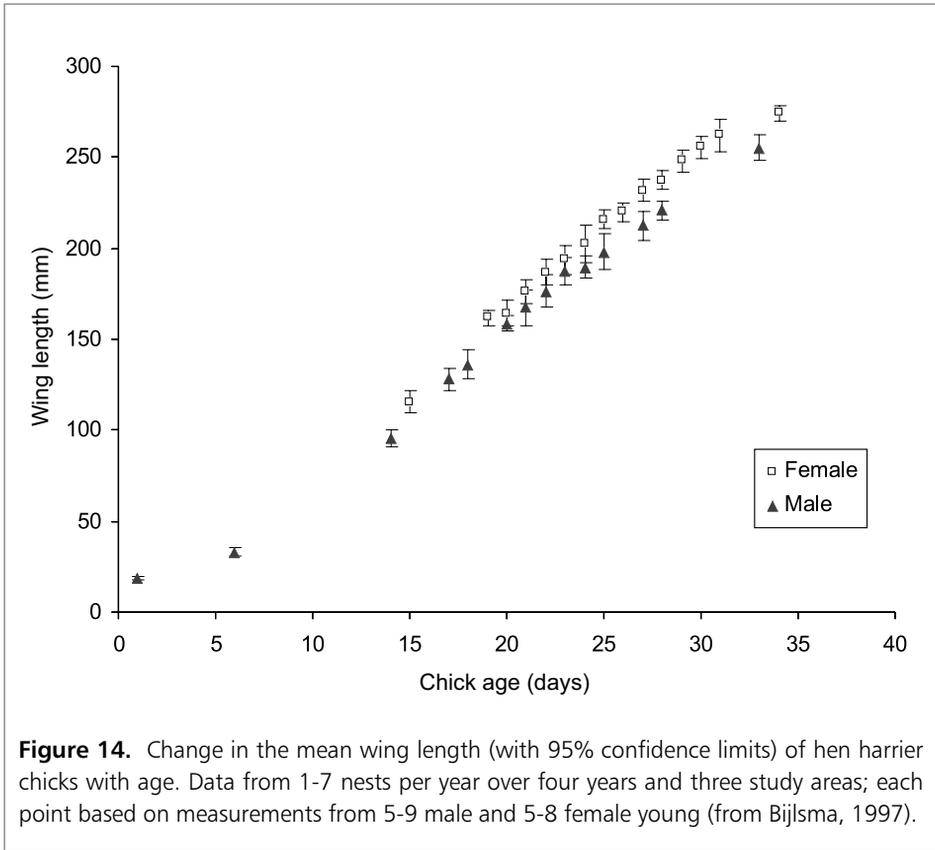


Figure 14. Change in the mean wing length (with 95% confidence limits) of hen harrier chicks with age. Data from 1-7 nests per year over four years and three study areas; each point based on measurements from 5-9 male and 5-8 female young (from Bijlsma, 1997).

4. SURVEYS OUTSIDE THE BREEDING SEASON

Hen harriers may roost communally in winter, generally in rank ground vegetation (Clarke & Watson, 1990, 1997). They build roosting platforms (approximately 1 m across) by splaying out plant stems and tussocks. These platforms are often surrounded by faecal droppings and, sometimes, by pellets. The birds also use natural gaps in the vegetation. Most roosts

have been found in lowland marshes or mosses, or in heather moors. In Northern Ireland, some birds roost in tree nests in the winter and others may gather in communal roosts in coniferous trees. Roosts can be located by observing hen harriers in the late afternoon and watching them back to the roost. To count the birds, a roost should be watched from a suitable vantage point from late afternoon until dusk (1.5 hours before sunset to half an hour after sunset or until it becomes too dark to see; Gilbert *et al.*, 1998). From the vantage point, the fieldworker should record any harriers entering the roost, noting the time as well as sex and age if possible. If distinguishable, it is helpful to note the location of the roosting spot used by each individual bird. Roost counts can also be carried out as birds leave in the morning, in which case observers should be in position at a vantage point at first light. Gilbert *et al.* (1998) give further details of the methodology and annual timings of visits for surveys of wintering hen harriers in Britain (Clarke & Watson, 1990; Clarke & Watson, 1997). Care should be taken not to draw attention to the location, as instances of persecution are known to have occurred at roosts. Harriers counted at roosts in Britain and Ireland are generally of unknown breeding origin, and counts at roosts do not give any indication of the geographical areas used for foraging.

Hen harriers will also roost individually on old nests in breeding areas in the autumn (August to October) or in the late winter/early spring (February to April). These birds tend to be females and such roosts can be found by checking old nests for fresh faecal droppings and pellets.

Foot or road surveys could be used to provide indices of abundance of and information on habitat use by hen harriers in winter. In Britain and Ireland, because of the partially migrant nature of the breeding populations and the likely presence of immigrants from continental Europe, such surveys would record individual birds of mixed breeding origins.