



Merlin

Falco columbarius

1. INTRODUCTION

The merlin is a widespread and locally abundant breeding bird in upland areas of Britain and Ireland (Gibbons *et al.*, 1993). Populations in Britain appear to be stable (Rebecca & Bainbridge, 1998; Ewing *et al.*, 2011) but with local declines, particularly in northern England (Ewing *et al.*, 2011). In Britain and Ireland, merlins are short-distance migrants; many disperse to lower altitudes after breeding, normally within 100 km of their breeding area, and smaller numbers move south into France and Iberia (Heavisides, 2002). Northern populations in Iceland and Fennoscandia are migratory, and Icelandic breeders winter mainly in Britain and Ireland. Adult males, with their blue-grey upperparts, dark-streaked rusty underparts and smaller size, are easily separated from females and immatures (Cramp & Simmons, 1980). The brown immatures and females are difficult to separate in the field but one year-old males can sometimes be identified by their small size. Although most merlins do not breed until two years old, a small proportion (10-20%) breed at one year (Lieske *et al.*, 1997; Newton *et al.*, 1986).

There is no monograph for this species which covers the whole of Britain and Ireland. In Ireland, the merlin population in County Wicklow has been studied regularly since 1987 (McElheron, 2005), and Wright (2005) describes a 30-year study of merlins in the Yorkshire Dales.

Annual cycle

Breeding Activity	Peak Period	Range	Duration (days)
Site occupation		Late February to late April	
Courtship display		Late March to late April	
Egg laying	Early May to mid-May	Late April to early June	4 to 8
Incubation	Early May to mid-June	Late April to early July	28 to 32
Hatching	Early June to mid-June	Late May to early July	
Young in nest	Early June to mid-July	Late May to early August	23 to 32 (young from ground nests may disperse into surrounding vegetation from 23 days)
Fledging		Late June to early August	At 28 to 32 days old
Juvenile dispersal		Early July to early September	

2. HABITAT, HOME RANGE, NESTS AND BREEDING

2.1 Habitat

Within Britain and Ireland, merlins commonly nest on open, upland moors, at altitudes varying from 75 m to over 700 m a.s.l, commonly between 150-600 m a.s.l., the altitudinal range in which most of the suitable habitat lies (Williams, 1981; Rebecca *et al.*, 1992; Wright, 1997; Dickson, 2000; McElheron, 2005). Merlins favour heather moorland but will breed in trees in copses and windbreaks in any open country with suitable populations of small passerines. They tend to avoid the centre of dense forests but will nest in trees within forests, usually less than 1 km from open hunting ground (Newton *et al.*, 1978; Parr, 1991; Little & Davidson, 1992; Petty, 1995). Merlins do not breed in alpine habitats, bare or very steep areas (Heavisides, 2002). In winter, merlins move to lower altitudes and occupy arable farmland, rough pasture (marginal ground), estuaries, sand-dune systems and low lying heaths (Dickson, 1988).

2.2 Home range

Breeding merlins do not hold an exclusive home range for hunting but defend only their immediate nesting territory. They will attack intruding merlins, other raptors, and corvids for about 0.8 km from an active nest (Dickson, 1992; Trimble, 1975). Individual birds vary in their response, with some being less aggressive and more tolerant of intrusion. Nests of neighbouring pairs may be 0.5–4.5 km apart and nesting territories tend to be regularly spaced in areas with many potential nest sites; nesting densities vary from 5–10 nests per 100 km² in areas of open habitat (Cramp & Simmons, 1980). The distance between neighbouring pairs is greater in the north of Britain than in the south, perhaps linked to the variation in productivity of the habitat. Evidence that merlins defend home ranges in winter is lacking.

2.3 Nest Sites

Merlins nest on the ground, on ledges on crags, on heather-clad boulders, and in the old tree nests of other birds, especially crows. They will also use man-made nest baskets or trays (Rebecca *et al.*, 1991; Bauer & Cormack, 1995). A number of studies have reported varying proportions of nests in different locations (e.g. Northumberland, Newton *et al.*, 1986; northwest Sutherland, Thompson *et al.*, 1989; northeast Scotland, Rebecca *et al.*, 1992; southwest Scotland, Dickson, 2000), with the majority of nests in most areas located on the ground, followed by trees and then crags/ledges and boulders. In a 3,000 ha study area in northwest Sutherland, however, all nests were on cliffs or boulders, and ground or tree sites were apparently not used although they were available (Thompson *et al.*, 1989). On the Western Isles, some nests occur on small islands in lochs. Considering the results of the 1983-84 survey of Britain, Bibby & Natrass (1986) noted that merlins in afforested and grass dominated areas generally nested in trees and on heather moors they nested mainly on the ground; they found that ground nesting was proportionately more frequent in 10 km squares with more merlins and concluded that, in general, the best places for merlins are heather dominated, while tree nesting is more frequent in less favoured habitats. In Northumberland, tree nests (10-25% of nests recorded annually) were found to be significantly more successful than ground or crag nests; a difference attributed to the decreased vulnerability of tree nests to predation, especially by foxes (Newton *et al.*, 1978, 1986). Other studies have reported no differences in breeding success in nests in different locations (Bibby, 1986; Bibby & Natrass, 1986; Rebecca *et al.*, 1992). Many merlins breed within 300 m of the previous year's nest and a few may re-use it. Pairs may also alternate between different parts of a moor, so that nesting areas can be up to 3.5 km apart (Rebecca *et al.*, 1992; Dickson, 2000).

In Britain and Ireland, ground nests are generally in heather of 30-70 cm in height (Rebecca *et al.*, 1992; Wright, 1997; Dickson, 2000); and on slopes (normally on inclines of 20-45°, although they are also found on flat ground; Newton *et al.*, 1978). Many nests are close to prominent features, such as small trees or stumps, fence posts or boulders in the heather (Rebecca *et al.*, 1992). The aspect of the nesting slope appears not to be influential but a good view from the nest site may be important (Rowan, 1921-22). In areas used traditionally for nesting, ground nests may be found in young forestry plantations (Newton *et al.*, 1978; Rebecca *et al.*, 1992), until they are excluded by the growing trees. Merlins will nest in dense vegetation on top of large boulders (Newton *et al.*, 1978) or on large heather-covered hummocks about 1.5 m high. Crag nests are either found in the vegetation on top of the crag (on smaller crags) or on open, heathery ledges (on larger crags). They tend to be more exposed than ground nests, as the heather on ledges can be sparser (the average height of the heather around nests on crags was 10 cm, Rebecca *et al.*, 1992). Crags used by Merlins are usually between 10-30 m high, ranging from a few metres high (Newton *et al.*, 1978) up to 100 m.

Competition with peregrines, which can kill merlins, may exclude merlins from some crags. Merlins will nest close to hen harriers, short-eared owls and kestrels, and the association may generally benefit each species by giving increased awareness of and defence against predators. Short-eared owls and hen harriers have, however, also been seen attacking merlins or their young. Merlins are vulnerable to predation by a wide range of other predators, including golden eagle, goshawk, red fox, mink, stoat and wildcat, and predation may be a major cause of breeding failure (Newton *et al.*, 1986; Rebecca *et al.*, 1992). In heather, adders may make use of merlin nests for shelter in the long heather and, when disturbed, may strike and kill chicks and possibly also adult merlins (Shaw, 1994).

Merlins also breed in trees in the old nests of crows, and occasionally in those of buzzards or ravens (Newton *et al.*, 1978; Rebecca *et al.*, 1992). The trees are generally either isolated or in small copses or open woodland on moorland or recently afforested ground, near the edge of forestry plantations (Parr, 1991; Little & Davidson, 1992; McElheron, 2005) or along the banks of streams. Merlins using the same home range may breed in trees in one year and then in a ground nest in a subsequent year. Little & Davidson (1992) found that most of the tree nests in Kielder Forest, Northumberland were up to 1 km (and a few up to 5 km) from the forest/moorland boundary; these nests were associated with unplanted areas within the forest. Merlins do not generally breed for more than one year in old corvid nests in sitka spruce but they may re-use nests in birch, rowan or Scots pine for several years.

2.4 Nests

Merlins do not build a nest but simply scrape a small depression in the chosen nest site. In ground or crag nests, the scrape is usually in bare ground under a dense canopy of heather or other vegetation. It may accumulate a considerable amount of dead vegetation (Rebecca *et al.*, 1992), such as small heather twigs, bracken and other material, which is plucked by the female from within 1 m of the nest (Cramp & Simmons, 1980). Tree nests are also scraped and the eggs laid on bare twigs or the remaining lining of an old nest.

2.5 Clutch size and incubation

Merlins lay clutches of 1-6 eggs, although the normal clutch is four or five eggs, and recorded clutches of one or two eggs may have been incomplete (Crick, 1993). The BTO Nest Record Scheme gives an average clutch size of 4.2 (n=1,405). Average clutch sizes from regional studies in north England, northeast Scotland and southwest Scotland have been higher

(Newton *et al.*, 1978; Newton *et al.*, 1986; Rebecca *et al.*, 1992; Dickson, 2000). Eggs are laid at 2-day intervals, sometimes with a longer interval for the last egg. Incubation usually starts with the final egg (Rowan, 1921-22; Orchel, 1992) and lasts 28-32 days (Cramp & Simmons, 1980). Most of the incubation (up to two-thirds) is carried out by the female but the male may sit for 1-2 hours at a time (Newton *et al.*, 1978). Hatching occurs 48-50 hours after the eggs begin to pip on the 28th day (Orchel, 1992). Merlins may relay if breeding failure occurs early in the season.

2.6 Brood size and fledging

For the first 10 days after hatching, merlin young are brooded and fed mostly by the female. The male hunts, bringing 3–8 prey items per day (Cramp & Simmons, 1980; Orchel, 1992). In southwest Scotland, average rates of food delivery to the nest varied from 0.19 per hour during the prelaying and brooding stages to 0.51 per hour during the nesting and post fledging periods, with no significant diurnal variation in feeding rates (Dickson, 1995b). Elsewhere it has been reported that most feeds are delivered early in the morning and in the late afternoon or evening. The young fledge at 28–32 days (Newton *et al.*, 1978). Those from ground nests may leave the nest and scatter into the heather after 23 days, well before they can fly (Dickson, 2003). After fledging, the young disperse from the nest site within 2-4 weeks (Rebecca *et al.*, 1992; Orchel, 1992).

3. SURVEY TECHNIQUES

CAUTION Care should be taken during visits in late March and April to avoid disturbance of merlins at occupied nesting ranges, as this may cause the birds to move. Visits during incubation or when the young are being brooded should be brief and merlins should not be disturbed from active nests in bad weather. Always leave the area quickly after examining the nest and do not attempt to watch the nest from nearby, as this may inhibit the return of the adults. To minimise the risk of disturbance it is recommended that nesting areas are viewed from distances of 300–500 m (Ruddock & Whitfield, 2007; Whitfield *et al.*, 2008b). Be aware also that adults flushed from nests may dislodge small young and any such young should be put back when the nest is checked. If nest inspection visits require climbing, then appropriate health and safety precautions should be taken (see Section 7.10 of Introduction). No attempt should be made to climb to nests that could have large young (20 days or older) because they may 'spook' and fledge prematurely.

3.1 Breeding season visit schedule

The species is listed on Schedule 1 in Great Britain and Northern Ireland, and Schedule II in the Republic of Ireland (see Section 7.1.1 of Introduction). 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.

Visit 1	Late March to April	To check for occupancy and locate potential breeding areas
Visit 2	Early May to early June	To locate active nests and a further check for occupancy
Visit 3	Mid- to Late June	To check for young
Visit 4	July to early August	To check for fledged young

3.2 Signs of occupancy

3.2.1 *Locating home ranges*

The field methods described here are based on those used in the survey of breeding merlins in Britain in 1993–1994 (Rebecca & Bainbridge, 1998) which covered a stratified sample of 10 km National Grid squares within the known breeding range of merlins. Parts of a survey area that do not require searching (open water, towns, villages, enclosed pasture, arable farmland and land above 700 m) should be identified and marked on a 1:25,000 OS map. Any known merlin nest sites from previous years should also be noted on the map. All suitable land within the survey area should then be visited between late March and mid-April and searched for sightings and signs of occupancy by merlins by passing within 500 m of all potential nesting habitat (including grass or heather moorland, bracken, young forestry plantations, the edges of mature forestry plantations and rides within 100 m of the plantation boundary, open areas within afforested blocks and open birch, pine and alder woods). Any old nests (crow, raven, buzzard) found should be mapped. Areas of grassy moorland that are found to have no potential merlin nest sites (trees, crags, steep stream banks) should also be marked on the map as unsuitable breeding habitat. Fence lines, isolated posts, stone dykes, grouse butts, hummocks, boulders, stream banks, crags, trees and recently burnt areas on heather moors should all be checked for faecal droppings, pellets, the plucked remains of kills and moulted merlin feathers (Section 3.2.3) and the locations of any signs found should be mapped. Prey remains, pellets and feathers should be removed so that any new signs can be recorded on the next visit. Watches should also be carried out over all suitable areas for periods of at least two hours, in order to locate merlins displaying, carrying food or hunting, or attacking corvids, other raptors or grey herons.

Displaying birds may be seen or heard; female merlins in particular can be very vocal and their calls can be heard at a distance of up to 1 km. Merlins may also utter a very quiet 'tic' call when displaying which is similar to the call given by the female when feeding young. The display flights themselves can be quite inconspicuous but are most noticeable early in the breeding cycle on warm, sunny days (Cramp & Simmons, 1980). They may involve both birds of the pair circling high over the nest site and shivering their wings (the male may also change to using very slow wing beats for periods), accompanied by calling. The male may also perform short, fluttering flights between perches within the nesting territory, including low flights in the direction of the nest (also accompanied by calling). Aerial chasing and 'play' occur between the members of a pair but may also involve immature birds and take place after the breeding season or at communal roosts (Cramp & Simmons, 1980).

Areas where merlins are observed or where fresh signs are found should be visited on at least two occasions to confirm occupation. Care must be taken to avoid disturbing the birds, especially during April, as this may cause them to move sites.

3.2.2 *Locating roosts*

Breeding merlins roost on the ground in deep vegetation, in trees or on crags close to the nest site. Tree and crag roosts can be recognised by the presence of fresh faecal droppings, down and moulted feathers and the presence of merlins at such sites can be established during checks of the nesting area. Active searches for roosts on the ground are not recommended, however, because of the potential for disturbance.

3.2.3 *Recognition of signs*

Merlin plucks are found on prominent features (fence posts, hummocks, boulders, trees) and on the ground in patches of short vegetation. They consist mainly of the feathers of moorland

passerines (Brown *et al.*, 2003; Cramp & Simmons, 1980). In central Scotland, merlins may hunt emperor and northern egg moth, and collections of the discarded wings of these moths in suitable nesting habitat can also provide signs of occupation. Merlin pellets are similar to those of other small falcons, although they are generally smaller than kestrel pellets and contain small feathers and some hollow bird bones, whereas kestrel pellets are composed predominantly of mammal fur. However, definite identification is difficult unless pellets are collected in association with other signs (particularly moulted feathers).

3.2.4 Evidence of occupancy

Nesting ranges are occupied if a pair or single merlin is seen or heard, or if unambiguous fresh signs are found on at least two visits (freshly plucked kills, moulted merlin feathers, faecal droppings or merlin pellets; Rebecca *et al.*, 1992; Rebecca & Bainbridge, 1998; Gilbert *et al.*, 1998).

3.3 Evidence of breeding

During the 1993-94 national survey of Britain (Rebecca & Bainbridge, 1998), breeding pairs were recorded if adults were seen returning to a nest, if eggs or young were found, if adults were repeatedly alarm calling at the appropriate time, or if signs of occupation indicated that a pair had probably bred and failed. Rebecca *et al.* (1992) also considered courtship display, including the feeding of the female by the male, copulation or nest scraping (Feldsine & Oliphant, 1985), as evidence of breeding.

3.3.1 Locating active nests

Visits to all suitable breeding habitats within the study area to locate pairs before laying are important as merlins are much more difficult to locate once incubation starts. Occupied nesting ranges should be visited again in May or, at the latest, early June to locate nests with eggs.

To locate nests on the ground, a watch should be carried out from a suitable vantage point over the nesting area. If the merlins alarm or appear disturbed this suggests that the watch point is too close to the nest and the fieldworker should move further away. Each watch should last 4-6 hours, as it may take three hours for a bird to return to the site and change over with the incubating partner. Watches should be carried out in the morning (preferably before 10:00h and certainly before 12:00h) or in the evening (after 16:00h), especially on hot days. Merlins will normally call when they change over during incubation. Changeovers generally occur after a food pass, when the male brings food to the female. The food pass usually takes place on a low perch or on the ground, not at the nest itself. During the watch, particular attention should be paid to the male, as once he has passed food to the female, he will slip onto the nest to incubate the eggs.

If a fieldworker wishes to check a nest during the incubation period, some observers prefer not to approach the nest while the male is known to be covering the eggs. Males may take off when a fieldworker is still some distance from a nest, making it harder to find. They may also take a long time to return to a nest after disturbance, during which time the eggs are at risk of chilling. A precautionary approach is to wait until the female returns to the nest, allow her about 30 minutes to settle and then approach the nest. Females may be less likely to leave the nest for long periods after disturbance.

Once located, a sketch map should be drawn and/or a digital photograph taken of the nest location in relation to any nearby features (e.g. differences in the heather or slope, the presence of rushes, ferns or other plants, or the proximity of boulders or posts). The position of the observer should also be noted. If a nest visit is undertaken the nest should be approached carefully and the fieldworker should deliberately make a noise when close so as to alert the

sitting bird. Moving carefully up to the nest once the bird has flushed, preferably from lower down a slope, will help to avoid trampling the eggs or young. Down or feathers stuck in the heather are a good indication of the proximity of a merlin nest.

Merlins may move on from a nest site early in the season. If no signs are seen at a site which was apparently occupied on a previous visit, all known alternative sites and areas of suitable habitat should be checked in case a pair has moved.

Some fieldworkers prefer to cold-search established sites and check all old nest scrapes before watching, as this can prevent the need for long watches. Searches should be carefully timed to avoid laying and early incubation, and this method is recommended only for experienced fieldworkers with local knowledge who are able to predict possible nest locations from the positions of plucks and other signs. Nests that usually occur on crags, in particular, can normally be located in May or June by searching the crag top and all the ledges. Only if this fails to locate a nest does the fieldworker need to watch the site.

Nests with small young (early to mid-June) can be easier to find, as visits by the male with food are more frequent from this time and on warm days the female may leave the nest to drink or dust-bathe. Watches to find nests with large young are more difficult, however, as the fieldworker must be hidden further away to avoid disturbing the adults.

Observations of interactions between merlins, other raptors and corvids can be helpful with respect to the location of nests by watching adult merlins back to the nest when the aerial attack is over. When merlins and hen harriers nest together, there may be many interactions early in the season which can help to locate the nests of either species.

As described above (Section 3.2.1), potential nests in isolated trees or small copses can be located during searches in late March and April by checking for old crow, raven or buzzard nests. On return visits, all such nests should be approached to check for incubating birds or young, and/or fresh signs. Nests with young will have down and droppings around and below them. If a nest is not located but fresh signs are found, the fieldworker should watch the area for 4-6 hours from a suitable vantage point.

Forest-nesting merlins pose a greater challenge. Plantations used for breeding are usually at least 15 years old, although merlins will fly over immature plantations to reach the edge of more mature forest. Tree nests are seldom directly visible in this habitat and searches must concentrate on signs. The open edges of the forest, especially those next to unenclosed grass or heather moorland, should be walked in April or early May and all elevated features (e.g. fence posts, large boulders) within 100m of the forest edge should be checked for signs. Once these are found, the fieldworker should watch the area from a look-out point for 4-6 hours. Before laying, or when the young are no longer being brooded, the female merlin often perches on a tree crown close to her nest; and locating the nest is easier when it contains young and feeding visits are frequent. Once the approximate position of the nest has been established, that part of the wood can be searched. The nesting tree should have signs (droppings, moulted feathers) below it. Sitting concealed in the wood and listening for the young calling may also help locate the nest which will probably not be visible so the exact position might only be found by climbing the tree. Nesting trees should be clearly marked on a map with directions from any nearby features.

The technique of broadcasting merlin calls to locate nests or breeding pairs has been little used. In one study in Britain, alarm calls failed to elicit any response from sitting birds

during May, but the method has not been tested thoroughly and may have potential at other times.

In habitats where nests are difficult to locate by watches and cold searches during the breeding season (e.g. forestry, gullies), they may be found after the breeding season when the entire area can be searched for nests or other signs of occupation with no risk of disturbance. This method is also useful if a probable nest has been missed because the nesting area could not be visited during the breeding season, or if a report of breeding merlins is received after the breeding season ends. The data gathered is minimal but occupation and successful fledging can generally be confirmed (see Section 3.3.2). Several new nesting areas have been found in this way in northeast Scotland.

Retaining records of new crow or raven nests within a study area can be useful for fieldwork in the next breeding season.

3.3.2 Evidence for fledging

Successful fledging can only be assumed if young are fully feathered and capable of flight. This can be difficult to assess as older young may leave the immediate area of the nest before they can fly; and, once on the wing they may remain in the immediate vicinity of the nest for only a short time before moving up to 1 km to an area where there is an abundance of prey. Successful fledging can be assumed if a large number of plucks are found close to a ground or crag nest site at the appropriate date, together with down trails, the latter made by young merlins as they leave the nest and their down attaches to the heather and other vegetation. Young may be counted by searching the heather around ground or crag nests and/or watching from a distance. Accurate counts of brood size at fledging may be impossible in forestry plantations, as the young may only be heard.

Because of the difficulties associated with counting fledged young, brood size at fledging can be estimated from the number of young of ringing age (14-21 days old). Losses of chicks can occur after this however (from ground, crag or tree nests) and a visit to confirm that the young have fledged should always be made if possible. Any recorded brood sizes should therefore be accompanied by details of the approximate age of young when counted.

3.4 Evidence for non-breeding

If a breeding territory and all potential nest sites within the hunting range of a pair are apparently not occupied despite several visits, a visit late in the season should be made to confirm that merlins are not present. If occupancy by a pair is confirmed but no active nest is found after the appropriate visits, and the birds are not known to have moved to a different site within the nesting range, then this provides evidence for non-breeding. As with all raptors, non-breeding is difficult to separate from early breeding failure. Both members of a pair may remain on site for a few days after failing, they may display and the male may still bring in food to the female. It may take a watch of several hours to determine if birds have failed if a nest site has not previously been found. Fresh signs at the site will not persist when the birds move away.

3.5 Ageing and sexing

Measurements of a small number ($n=17$) of merlin chicks in Orkney (Picozzi, 1983) suggest that young can be sexed from about 13 days old by measuring wing length and weight (Figure 33). Nine female chicks grew more rapidly and attained a greater weight (in excess of 235 g) than eight male chicks (less than 210 g). Females were clearly larger than males with respect to tarsus length, width and depth, bill (culmen) length, the length of the hind claw and the length of the middle toe (Picozzi, 1983; Table 6). Although European merlins tend to

decrease in size from north to south, Picozzi (1983) concluded that differences in wing length of birds breeding from Shetland to Northumberland were sufficiently small that his results should be generally applicable.

Dickson (2003) used a similar method for merlins in Galloway, based on a sample of seven broods from 1971 to 1977.

Table 6. Measurements of hind claw, culmen, tarsus and middle toe of eight male and nine female merlin chicks in Orkney within five days of fledging (from Picozzi, 1983; reproduced with kind permission of Blackwell Publishing).

	Male			Female		
	Min (mm)	Max (mm)	Mean (\pm SD)	Min (mm)	Max (mm)	Mean (\pm SD)
Hind claw	9.7	10.8	10.4 (\pm 0.39)	11.0	11.8	11.4 (\pm 0.23)
Culmen	10.8	11.8	11.4 (\pm 0.32)	12.3	13.5	12.7 (\pm 0.37)
Tarsus length	32.5	36.5	35.1 (\pm 1.25)	37.0	40.5	38.0 (\pm 1.15)
Tarsus width	3.2	3.6	3.4 (\pm 0.14)	3.7	4.2	3.9 (\pm 0.16)
Tarsus depth	4.8	5.3	5.0 (\pm 0.17)	5.2	5.9	5.6 (\pm 0.2)
Middle toe length	32.5	36.0	34.3 (\pm 1.1)	36.0	39.0	37.4 (\pm 0.92)

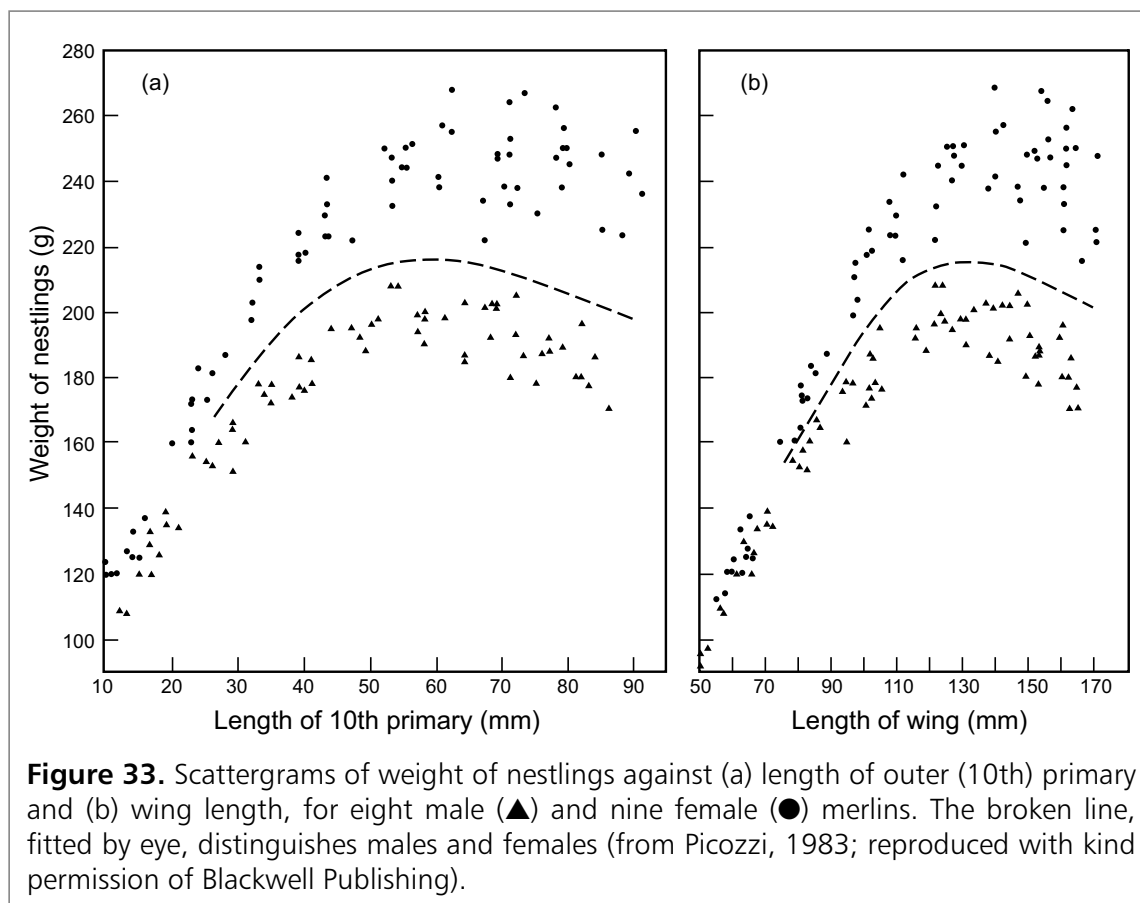


Figure 33. Scattergrams of weight of nestlings against (a) length of outer (10th) primary and (b) wing length, for eight male (\blacktriangle) and nine female (\bullet) merlins. The broken line, fitted by eye, distinguishes males and females (from Picozzi, 1983; reproduced with kind permission of Blackwell Publishing).

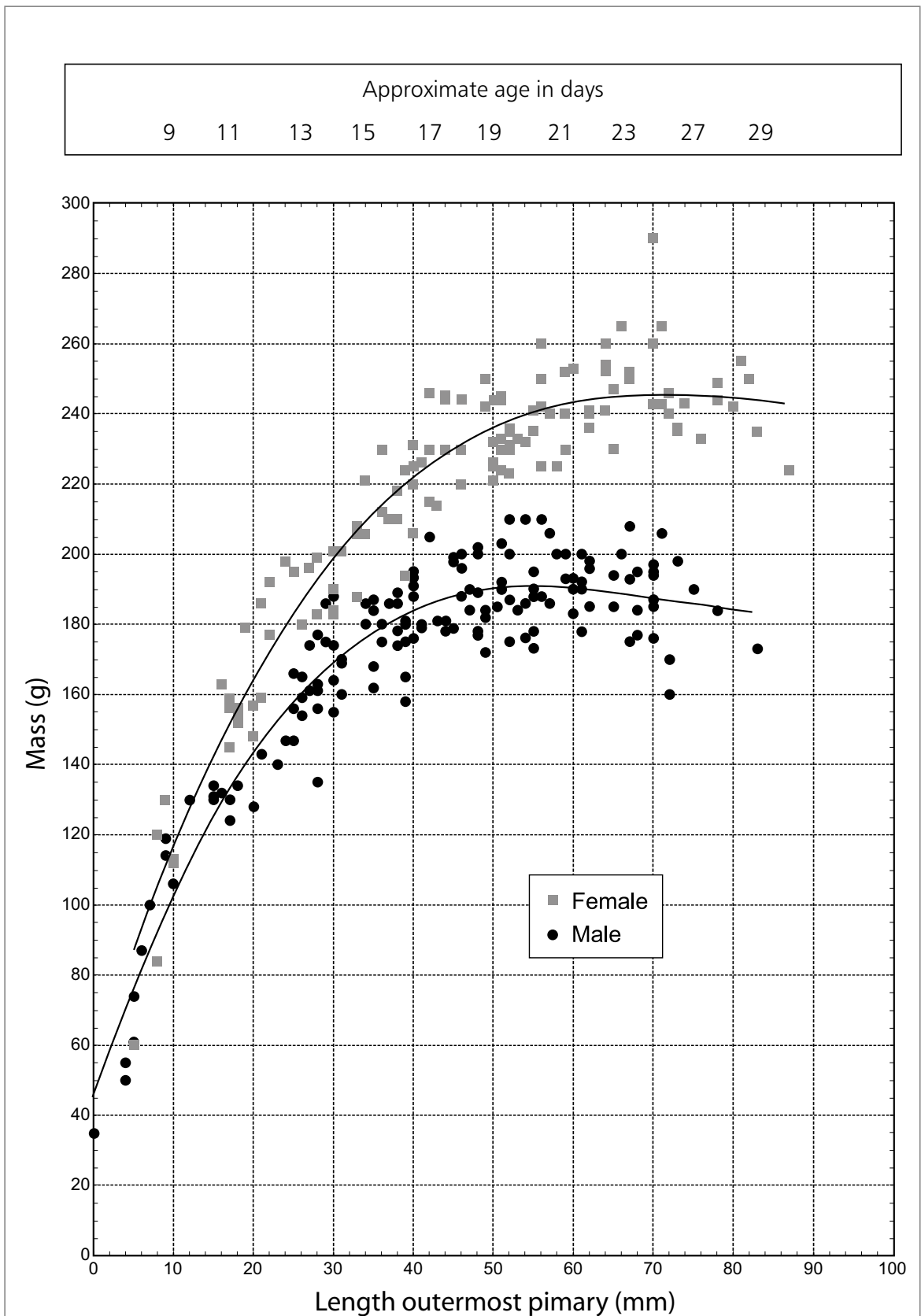


Figure 34. Scattergram for use in determining the sex and approximate age of merlin chicks. Based on measurements of approximately 70 broods over 15 years in the Southern Uplands (mainly the Lammermuir Hills), Scotland (154 male and 125 female young). Age data based on 55 young of known age (Ian Poxton & Alan Heavisides, unpublished data).

More recently, Ian Poxton & Alan Heavisides (unpublished data) have compiled measurements from a large sample of nestlings from the Southern Uplands of Scotland (mainly the Lammermuir Hills) since 1984. The length of the outermost primary feather (in mm) should be measured from its tip to where it emerges from the skin. Using these data (Figure 34), chicks can be aged approximately and the sexes separated with relative confidence after the age of around 18 days. Following the conclusions of Picozzi (1983) regarding size differences, there is no reason why measurements of merlin young from the Southern Uplands should not be generally applicable in Britain and Ireland.

The development of merlin chicks is illustrated in plates 64 to 69.

4. SURVEYS OUTSIDE THE BREEDING SEASON

Merlins are elusive outside the breeding season and methods of assessing their abundance at this time have not been established. They may enter the communal roosts of hen harriers (Dickson, 1988) and can be counted in this situation (see species account for hen harrier). The majority of merlins probably roost individually however.

Due to the fleeting nature of merlin hunting behaviour, methods to provide indices of abundance in winter (e.g. via foot surveys) are likely to be difficult to implement.