



Tawny Owl

Strix aluco

1. INTRODUCTION

Tawny owls are found in wooded habitats throughout Great Britain, with the exception of the Outer Hebrides and the Northern Isles (Gibbons *et al.*, 1993; Petty, 2007b). They are rare on the Isle of Man, and absent from Ireland. In Britain, they are sedentary over most of their breeding range and, once established, will remain in a home range for the rest of their lives (Southern, 1970; Percival, 2002). At the northern edge of their breeding range, in central Norway, tawny owls are partial migrants and females may leave their breeding areas for prolonged periods (Sunde *et al.*, 2001). The background colour of the plumage varies from rufous brown (rufous morph) to greyish brown (grey morph), with the frequency of birds of different colour morphs varying throughout the geographical range. In England, Galeotti (2001) gives relative proportions of 55% rufous, 39% grey and 6% intermediate (n=31); whereas for Britain (n=57) and the Netherlands (n=104), Cramp (1985) reports 65% rufous, 30% intermediate and 13% grey. The colour is independent of age or sex but related to climate, with rufous birds commoner in warm, wet areas and grey birds in a cool dry climate (Galeotti & Cesaris, 1996). Female tawny owls are larger than males but the sexes are not distinguishable in the field by their appearance. Males can be distinguished by their 'ocarina-like' hooting call to which females may respond with a sharp disyllabic 'kewick' (Cramp, 1985; Redpath, 1994); especially in spring, when males and females may duet. Care should be taken, however, as females may make a similar hooting sound to the male (said to be hoarser, less clearly phrased, with a more wailing quality to the last phrase and slightly higher pitched) and males also use the 'kewick' contact call (Mikkola, 1983; Southern, 1970; Galeotti, 2001). The main prey of tawny owls is small mammals, particularly wood mice and bank voles (Southern, 1970) in woodlands or field

Annual cycle

Breeding Activity	Peak Period	Range	Duration (days)
Occupation of home range		All year	
Territorial display	October to December	August to April	
Courtship	March	December to early April	
Egg laying	Mid-March to early April	February to mid-April	2 to 4
Incubation	Mid-March to early May	February to mid-May	28 to 30
Hatching	Mid-April to early May	March to mid-May	
Young in nest	Mid-April to late May	Mid-April to late June	
Fledging	Mid-May to mid June	April to late June	At 28 to 37 days old
Juvenile dispersal		July to late September	

voles (Petty, 1999) in open grassy habitats. These prey species exhibit large annual variations in abundance which influence the breeding performance of the owls. Unlike more mobile rodent specialists (such as the short-eared owl), British tawny owls do not leave their home range when food is scarce, but rather, they do not breed (Southern, 1970; Petty, 1999). Tawny owls can breed at one year old but do so more frequently at two or three years (Cramp, 1985).

2. HABITAT, HOME RANGE, NESTS AND BREEDING

2.1 Habitat

Tawny owls are predominantly woodland birds (Cramp, 1985). They are most abundant in broadleaved woods but also occupy coniferous plantations, gardens and parks, and even urban areas (König & Weick, 2008). Tawny owls also occur in open habitats that have some tree cover, such as farmland with small copses or hedges (Hardy, 1992; Redpath, 1995).

2.2 Home range

Tawny owls occupy more-or-less exclusive home ranges all year round and are strongly territorial. Established pairs defend a territory year round, the size of which varies with habitat and is generally smaller in dense woodland. Various studies have found territory sizes of about 20 ha or less in continuous, mainly deciduous woodland, increasing to 545 ha in coniferous woodland and more open habitats (Hardy, 1992; Mikkola, 1983; Cramp, 1985; Redpath, 1992; Coles *et al.*, 2000). In Aberdeenshire farmland with less than 5% woodland, Hardy (1992) found that tawny owls had home ranges of up to 186 ha but utilised only 17-40% of the area for hunting. In coniferous woodland in Northumberland, home ranges varied in size from 16-545 ha (Coles *et al.*, 2000). The size of woodland fragments is important in terms of the likely presence of owls; Redpath (1995) found that all woods over 4 ha in size held breeding tawny owls compared with only 45% of woods smaller than 4 ha.

2.3 Nest sites

Tawny owls breed in woodland, copses, or isolated trees in hedges, parks or gardens. They prefer to use holes in trees or nest boxes for breeding. They will also use the old nests of other birds (crow, magpie, sparrowhawk, buzzard, jay, woodpigeon) or an old squirrel drey, old buildings or cavities in crags. In the absence of other suitable nesting sites, they will breed on the ground at the base of a tree, especially in coniferous woods (Mikkola, 1983). A variety of nest boxes is used by tawny owls, but the most usual is the 'chimney' box that simulates the stump of a broken off, thick hollow branch of a tree (du Feu, 2003). Tawny owls with access to good natural sites (large dry cavities in trees and crags) may be reluctant to move into nest boxes, but if tree holes or crags are lacking, the entire territorial population is likely to move into boxes over a few years (Petty *et al.*, 1994). Nest boxes should have about 10 cm of litter (wood chips, conifer needles or leaf mould from the forest floor) in the bottom, so that the female can form a scrape for her eggs. This litter should be refreshed after the young fledge. Nest boxes allow the reliable and consistent sampling of breeding performance in any given study area from year to year, although the results may not be representative of populations breeding in natural sites (See Section 6.6 of Introduction).

2.4 Nests

Tawny owls do not build a nest. The female makes a scrape in soft substrates in which she will lay eggs. No extra material is added to the scrape, although old pellets may break up to form a nest lining.

2.5 Clutch size and incubation

Tawny owls lay 1–6 eggs, usually 2–3, but occasionally up to eight (Mikkola, 1983), generally at intervals of 48 hours. The BTO Nest Record Scheme gives an average clutch size of 2.6, ($n=2,727$). Incubation starts with the first or second egg (Southern, 1970; Cramp, 1985), and lasts 28–30 days. Only the female incubates, being fed entirely by the male (2–4 food items delivered per night; Cramp, 1985). Males will bring less prey to the incubating female when small mammals are scarce or when the weather is wet. Females are then less attentive at nests, and eggs can become chilled and fail to hatch (Hirons, 1982).

2.6 Brood size and fledging

Tawny owl eggs hatch asynchronously. The young are brooded by the female for up to 15 days after hatching while food is delivered by the male. The female will then leave the young to hunt at night but normally remains close to the nest during the day. Most feeding visits by the male and female are at night, although some food may be delivered during daylight hours, for example during midsummer at high latitudes (Mikkola, 1983). The young fledge at 28–37 days and may leave the nest before they can fly, especially if the nest site is open (Mikkola, 1983; Coles & Petty, 1997). They may spend a few days on the ground, where they are vulnerable to predators, but soon become adept at climbing and move up into the surrounding trees and bushes (Mikkola, 1983). After fledging, the young are dependent on their parents for approximately three months (Southern *et al.*, 1954; Coles *et al.*, 2000). The number of young fledging increases with the abundance of small mammals (Southern, 1970; Wendland, 1984; Petty, 1999), and mortality can be high in some years (Petty, 1992; Overskaug *et al.*, 1999; Petty & Thomas, 2003).

3. SURVEY TECHNIQUES

CAUTION Nest inspections can cause desertion in tawny owls (Petty, 1992). The risk is greatest during egg laying and early incubation, and can be reduced by:

- i) obtaining data on clutch size only during the latter part of the incubation period;
- ii) avoiding visits to pairs with a history of desertion during incubation;
- iii) minimising further nest visits if a nest is visited during laying or incubation by measuring egg density (Section 3.6 below) to determine if the clutch is complete and to estimate the timing of hatching and any necessary visit to ring chicks;
- iv) timing nest visits close to or after sunset, so that females can return to the nest after dark; and
- v) avoiding visiting nests in isolated trees during the day, as some owls are reluctant to return to the nest across open ground.

Female tawny owls can be aggressive towards intruders when nests contain chicks, and some people have been blinded by such attacks. It is essential that fieldworkers wear goggles and head protection when approaching a nest with chicks. Avoid hard hats, however, as these may injure the birds. If chicks are to be ringed, they should be taken well away from the nest to be processed. Appropriate health and safety precautions should be taken if working at night and if nest inspection visits require climbing (see Section 7.10 of Introduction).

3.1 Breeding season visit schedule

The minimum number of visits required for monitoring occupancy and breeding is two: one in late winter/early spring (Visit 1) to establish occupancy and one in summer (Visit 4) to confirm fledging. Multiple visits between late summer/autumn and winter/early spring (Visit 1) are

preferable to map territories or confirm that birds are not present. The other two recommended visits (2 and 3) are required for surveillance of breeding performance. Tawny owls are largely nocturnal, except when they have large young in the nest, when they may be active from early evening. Suitable habitats can be surveyed through a combination of listening for calls after dusk and searching for pellets, roost locations, nest sites, fledged broods and moulted feathers.

Visit 1 (Several visits will be needed at this time if the aim is to map territories accurately)	Mid-August to March	To check for occupancy by locating territorial calling males
Visit 2	Late March to April	To locate active nests (note <i>CAUTION</i> about desertion above)
Visit 3	May to mid June	To locate nests with young (note <i>CAUTION</i> : requirements for head protection and goggles if nest visits are carried out)
Visit 4	Late June to July	To check for fledged young

3.2 Signs of occupancy

3.2.1 Locating home ranges

Tawny owl territories can be located by visiting suitable habitats in the winter and early spring and listening for calls. Initial survey visits should be made shortly after sunset on dry, still nights between mid-August and April. The aerial display flight is probably quite common but rarely observed (Cramp, 1985) and hence not generally of use for surveying purposes.

Tawny owls respond well to the playback of the male's territorial 'hoot' (Redpath, 1994; Freeman *et al.*, 2006). To census an area, a series of transect lines or a grid should be set up across it. The transects should be no more than 1 km apart in woodland, and 2.5 km apart in open farmland (corresponding to the distances at which responses can be heard in these two habitat types), with census points no more than 0.5 km apart along a transect line or grid. Fluorescent tape can be used to aid the location of broadcast points at night. At each census point, the fieldworker should play male territorial calls for approximately one minute and then listen for a response for five minutes, repeating this process for up to 30 minutes. Two studies (Redpath, 1994; Freeman *et al.*, 2006) found that over 90% of owls responded during this time (although no response might occasionally be obtained from areas of woodland where evidence obtained on other visits (pellets, feathers, sightings) indicated that owls were present). Call censusing should be carried out from dusk on dry, still, moonless nights, as owls call less frequently on wet nights and when the moon is full (Ruggieri, 1995; Lengagne & Slater, 2002). The positions of any calling owls should be plotted on a map by taking a compass bearing and estimating the distance from the census point. In addition the type of response ('hoot', 'kewick' or other call) and sex (if distinguishable from calls) should be recorded. The accuracy of location is enhanced if fixes are obtained from 2 different places.

Repeat visits to an areas to map the locations of calling tawny owls are recommended, although Redpath (1994) suggested no more than three visits per winter as the birds may habituate to playback. During surveys in the eastern Highlands of Scotland, owls were found to respond well on one night, yet on another there would be no response; these differences were apparently not related to variation in the weather conditions. The owls' responses also varied during the night with the best responses around dusk. Using male territorial calls is most likely to elicit responses

from males (although females may respond to male calls; Appleby *et al.*, 1999) so this method estimates the size of the territorial male population. Confirmation of pairing can be obtained either from records of female calls or by finding an active nest or fledged young in the breeding season. Records of males calling simultaneously can be used to estimate the location of territorial boundaries. Individual males have different calls (identified by sonogram by Appleby & Redpath, 1997; individual variation may be identifiable to the human ear, Southern, 1970; Cramp, 1985) and tawny owls respond with greater intensity to the playbacks of strange owls rather than to those of their neighbours (Galeotti & Pavan, 1991).

If call playback is not used, call surveys for 30 minutes at census points are only likely to reveal about half the birds that are present (Freeman *et al.*, 2006). At least three repeat visits are recommended to increase the chances of detecting occupied territories.

3.2.2 Locating roosts

The roosts of tawny owls can be located by searching woodland or groups of mature trees for signs (e.g. pellets below perches). Hollow trees are sometimes used for roosting outside the breeding season but only in open, exposed woodland. Tawny owls prefer to roost in coniferous rather than broadleaved trees. Roosts should be recorded as those of tawny owl only if an owl is seen or additional signs (e.g. moulted feathers) are found.

3.2.3 Recognition of signs

Tawny owl pellets are generally grey in colour when dry and tapered at one end. They consist mainly of small mammal remains with some bird and invertebrate material and may be irregular in shape with protruding bone fragments (Thomas & Shields, 2008). The size range, based on several accounts, is 20–84 mm long and 10–30 mm in diameter (Mikkola, 1983; Cramp, 1985; Brown *et al.*, 2003). Tawny owl pellets are similar to those of long-eared owls and pellets of these two species can be separated only with difficulty. Identification should be confirmed by collection at nests or confirmed roosts.

3.2.4 Evidence of occupancy

The location of a territorial calling male on at least two visits or of an occupied roost provides evidence for occupancy of a home range. Working with a population of tawny owls breeding in nest boxes, Petty & Thomas (2003) classified a territory as occupied if a fresh scrape with feathers was found in at least one nest site within the territory between mid-March and mid-April. This method was checked against records of occupancy from call playback and found to be more effective (call playback identified just over 90% of occupied territories determined by nest signs).

3.3 Evidence for breeding

3.3.1 Locating active nests

All hollow trees within the home range (and nest boxes if present) should be checked. In the absence of these, all old crow, jay, sparrowhawk, buzzard and woodpigeon nests should be checked, as well as any other nests of similar size, squirrel dreys, old buildings and cavities in crags. Nests in conifers may be difficult to locate, and nests in cavities in trees or crags, or in buildings may be inaccessible. Ground nests may also occur, often at the base of trees, especially in coniferous woods.

Listening for calls between males and females at dusk or during the night may be used to locate a nest. Once a nest site is selected, the female usually roosts close by and the

male about 40 m away, and at dusk they may duet. During egg-laying, incubation and the brooding of small young, when the female spends much time in the nest, her response to the male is said to change. At this time, when he arrives near the nest while she is inside and unable to see him, she may utter a tremulous hoot (in contrast to her coarser hooting call). Listening for this 'pu-pu-pu' call from a female responding to the male's arrival may be used to pinpoint the location of a cavity nest during the incubation or brooding periods. Note that this call is also produced, apparently by either sex, at other times of the year. 'Bill clicking' by adult tawny owls may also indicate that a nest is close. A detailed discussion of the diverse repertoire of calls of male and female tawny owls, along with interpretations, is given in Galeotti (2001). Females roost near to nests with well grown young and their presence may be betrayed by mobbing songbirds.

3.3.2 Evidence for fledging

Chicks can be located by their calls just before and after fledging. Counts of large young with well developed flight feathers (around 21 days old) in a nest give the best estimate of brood size at fledging. Fledged young in small broods can be counted by listening to their food begging calls but it can be difficult to separate calling young in larger broods (Wendland, 1984; Sunde & Markussen, 2005).

3.4 Evidence for non-breeding

As is the case with other raptor species, it is difficult to distinguish early breeding failure from non-breeding. If a territorial pair is located but subsequent detailed searching does not reveal an active nest, then non-breeding is likely. To help to confirm this, visits should be made in the early evening in early May to mid-June when the begging calls of young should be heard if they are present.

If nest boxes are used, tawny owls will visit them for up to a month before laying and flecks of down or small body feathers will be found around the entrance hole (Petty, 1992; Petty & Fawkes, 1997). Closer to laying, a deep scrape is formed in the debris at the bottom of the box. Owls that do not lay may still go through this process, so that non-laying can be confirmed if eggs are not laid in the nest box. To ensure that the owls have not moved to another nest, any possible alternatives within the nesting territory should be checked, and re-checked later in the season (Visit 4), to listen for fledged young, before it is concluded that breeding has not taken place.

3.5 Ageing and sexing young

Although female tawny owls are larger, it is impossible to separate males from females with a range of ages in a brood. Growth curves showing changes in body mass, wing length and head-and-bill length have been produced for British tawny owls (Percival, 1992; Figure 40). These measurements can be used in combination to give at least an approximate estimate of the age of young. Changes in the body mass of chicks probably vary in relation to a number of factors, including the foraging conditions for the parents, brood size, how recently a chick has been fed and the time of day, so that mass alone should not be used to give a precise indication of age. Tawny owl chicks can also be aged approximately by their stage of feather development (Cramp, 1985).

3.6 Use of egg density measurements

Published information is available on changes in the density of British tawny owl eggs which can be used to estimate hatching dates (Percival, 1992; Figure 41; see Section 6.5.1 of Introduction). Further data collection is likely to be required to enhance precision, but egg measurements taken in the field (Section 7.8.7 of Introduction) can be used to calculate egg

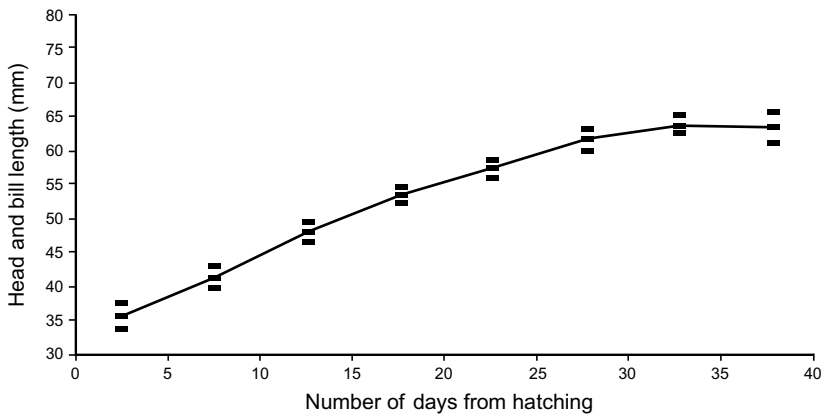
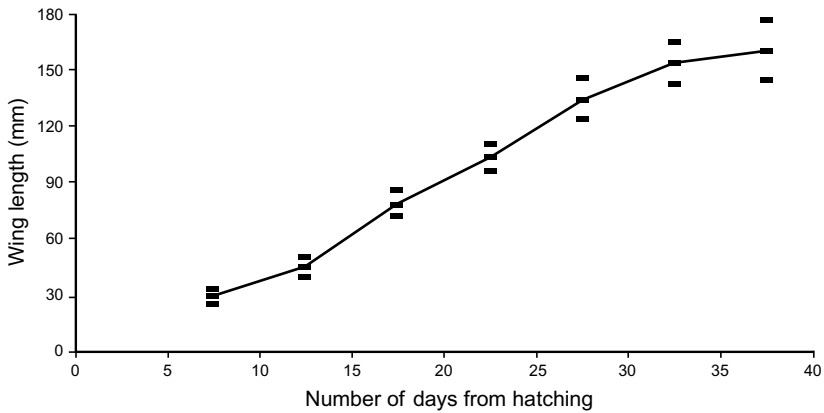
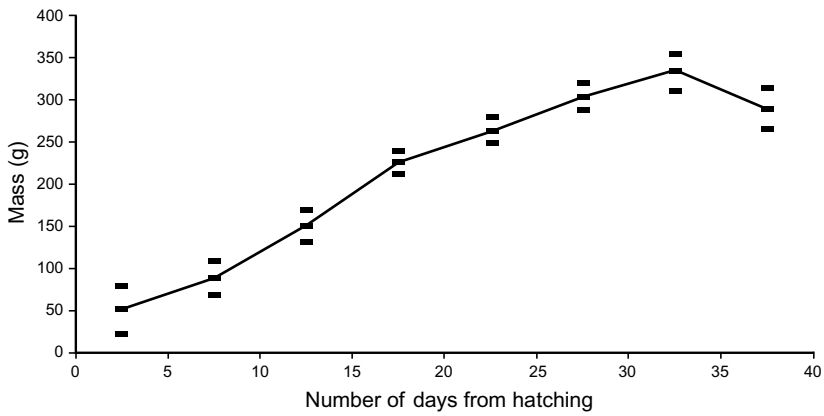


Figure 40. The relationships between chick measurements and age for the tawny owl. The data are plotted as 5-day means with 95% confidence limits. (From Percival 1992; reproduced with kind permission of JNCC).

density (see legend to figure 41) and estimate hatching dates (Figure 41). This can be used to determine the appropriate timing of visit(s) to check on young.

For tawny owls, an index of egg density can also be used as a guide to clutch completeness (Petty, 1992 and pers. comm.). The density index (DI) for each egg is calculated as follows:

$$DI = \frac{W}{(L B)} \quad (vi)$$

where L is egg length (mm), B is breadth (mm), and W is weight (grams). The density index decreases as eggs lose water (and hence weight) during incubation (Furness & Furness, 1981). Any clutch with a DI of more than 0.540 for any egg may be incomplete and an additional visit is then advisable to establish final clutch size. Clutches where all the eggs have DIs of less than 0.540 may be considered to be complete. This method should be used as a guide, however, because the density of freshly laid eggs varies somewhat between individual females, but more data are required before this variation can be quantified.

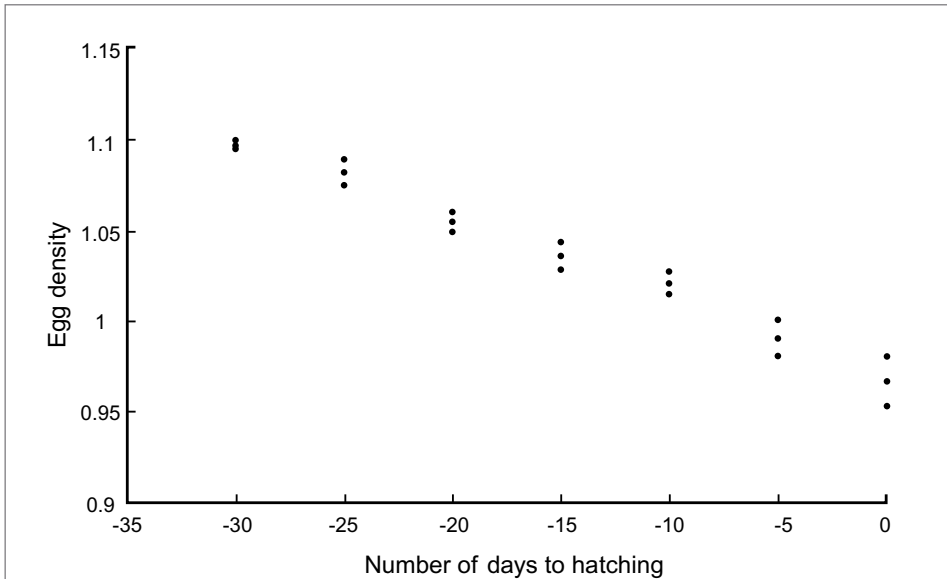


Figure 41. The relationship between egg density and hatching date for the tawny owl, showing how egg measurements can be used to estimate hatching date (where egg density = weight/(0.507 x (breadth)² x length). The data are 5-day means with the 95% confidence limits shown. (From Percival 1992; reproduced with kind permission of JNCC).

4. SURVEYS OUTSIDE THE BREEDING SEASON

In Britain, most tawny owls are thought to occupy and defend their home ranges throughout the year. As indicated above, they can be censused by locating and mapping these ranges outside as well as within the breeding season. The 1998 survey of tawny owls in Britain (Percival, 1990), repeated in 2005, involved a single 10 minute visit to each of a sample of tetrads (2 x 2 km squares) between mid-August and October. At this time territorial birds are most vocal as they defend their territories against prospecting juveniles from that year's breeding season. Observers recorded the number of calling birds and details of habitat.