



Osprey

Pandion haliaetus

1. INTRODUCTION

The osprey (western osprey) is generally considered to have recolonised Scotland in 1954, after ceasing to breed about 1916 (Thom, 1986). Recently, however, it has been suggested, from a re-examination of historical records, that individuals were present almost every summer in the intervening period, and that occasional breeding occurred (Dennis, 2007, 2008). Between 1954 and the early 1990s, the Scottish population grew exponentially, as would be expected with an establishing population; since then the growth rate has declined slightly, suggesting that limiting factors have begun to operate (Dennis & McPhie, 2003). Ospreys are now widely distributed in Scotland (Etheridge, 2005; Etheridge *et al.*, 2006) and have expanded into northern England (Ogilvie & RBBP, 2004). Ospreys from Scotland have also been successfully reintroduced into central England and have bred there and also in Wales (Appleton *et al.*, 1997; www.ospreys.org.uk). Ospreys occur only as passage migrants in Ireland and are likely to have become extinct as a breeding species by the 1800s when most of the country had been deforested (www.goldeneagle.ie). Ospreys are migratory, leaving Britain and northern Europe in the autumn to winter in west Africa, or, in the case of a few birds in recent decades, Iberia (Dennis, 2002, 2007), and returning in March and April. Male ospreys can be separated from females in the field; males are smaller and have lighter breast bands, head patterns and outer tail feathers. Adult ospreys may also be identified individually in the field by variation in their pattern of markings on the head and breast (e.g. Bretagnolle *et al.*, 1994), as well as calls and behaviour. Plumage markings change slightly from year to year in individual birds but still often allow individual identification. Young birds can be distinguished from adults by the light edges to the feathers on their upperparts but generally they gain full adult plumage after 18 months (Dennis, 1997). Ospreys start breeding at 3–4 years old.

Annual cycle

Breeding Activity	Peak Period	Range	Duration (days)
Site occupation and territorial display	Early April	Mid-March to early May	
Nest building		Late March to late May	
Egg laying	Late April	Early April to mid-May	
Incubation	Late April to late May	Mid-April to late June	35 to 43
Hatching	Late May	Mid-May to late June	
Young in nest	Late May to early July	Mid-May to late August	40 to 59
Fledging	Mid-July	Mid-July to late August	
Juvenile dispersal		Late August to late September	

For further information on the biology and ecology of this species, Poole (1989) and Dennis (2008) provide comprehensive accounts.

2. HABITAT, HOME RANGE, NESTS AND BREEDING

2.1 Habitat

Ospreys are dependent on adequate supplies of medium-sized fish. They breed near marine bays, estuaries, lochs or rivers (Cramp & Simmons, 1980). The lochs used for foraging are generally shallow and eutrophic or mesotrophic (nutrient rich or medium levels of nutrients); oligotrophic (nutrient poor) lochs do not normally support sufficient fish for ospreys. Birds often frequent fisheries and trout farms. The most suitable breeding areas are in lowland agricultural or forested areas (Poole, 1989; Thiollay & Wahl, 1998; Lohmus, 2001) but breeding ospreys can also be found in upland valleys.

2.2 Home range

Ospreys do not defend a home range. They forage over a wide area and may share productive fishing sites with other ospreys, although a hierarchy of males may exist. Male ospreys regularly hunt up to 10 km from the nest, and some individual males have been known to make regular flights of around 20 km. Non-colonial (see below) ospreys defend a nesting territory against other ospreys of the same sex and from potential predators. Male ospreys are particularly active in defending the nest site, and their female, during courtship, and spend more time at the nest site when it is close to other occupied nests (Mougeot *et al.*, 2002) in order to prevent extra-pair copulations. The Scottish osprey population has increased in distinct sub-populations that have built up around an original pair in each area (Dennis, 1995; Dennis & McPhie, 2003). In some parts of central and northern Europe (and on other continents), and more recently in Scotland, ospreys form small nesting groups or colonies in which active nests may be very close together (e.g. 60–70 m apart in one North American colony; Cramp & Simmons, 1980).

2.3 Nest sites

When selecting a nest site, ospreys usually choose an open position (giving clear access from above when landing) within 10 km of foraging areas (lochs, rivers or estuaries). Ospreys in northern Europe normally nest in large, mature trees (alive or dead) with flat tops (5–40 m from the ground), often selecting trees that are prominent within their surroundings. In Scotland, Scots pine is favoured, with exotic conifers and deciduous trees also used (Dennis, 1987). Ospreys will also nest on electricity pylons, and historic nest sites in Scotland include ruined buildings and rocky islands in lochs (St. John, 1863; Baxter & Rintoul, 1953). In southern Europe, ospreys nest on sea cliffs. The same nest is often used for many years (Cramp & Simmons, 1980): for example, the Loch Garten nesting range in Strathspey has been occupied for more than 50 years with three different nests being used. If eggs are lost from a nest (e.g. through illegal egg collection), ospreys normally build a 'frustration eyrie' within 2 km of the original nest, which may be used the following year. If eggs fail to hatch or the young die, the pair usually stays with the nest and may build it up before departure.

2.4 Nests

The nest is large and requires a sizeable and firm platform for a base. It is built by both sexes from branches (of lengths up to c. 50 cm), the male bringing larger sticks than the female (Green, 1976). New nests have an average diameter of 120–150 cm and a height of 50–60 cm, but the height increases to 70–80 cm or much more after several years use. The nest cup is lined by the female with mosses, lichens or grass. Artificial nests have been built for ospreys in Scotland since 1959 and have been readily accepted (Dennis, 1983, 1987). The

provision of artificial nests is also used regularly for osprey conservation in other countries (Poole, 1989; Saurola, 1997).

2.5 Clutch size and incubation

In Scotland, ospreys lay between mid-April and mid-May (Dennis, 1983), and can relay if the first clutch is lost early in incubation (Postupalsky, 1989). Females breeding for the first or second time tend to lay later than older birds. Earlier clutches are more likely to fledge young and are generally more productive. Clutch size varies from 1–4 eggs, laid at intervals of 1–2 days. Three eggs are normally laid in Scotland, with young females generally laying two eggs in their first breeding season (Dennis, 1983). Egg size within a clutch declines as laying progresses, with the third egg, on average, 94% of the size of the first. Incubation starts with the first egg, so chicks hatching from later eggs have less chance of surviving, as they are younger and lighter than their siblings (Poole, 1989). Incubation lasts between 34–43 days (Green, 1976; Poole, 1989; Dennis, 1997) and is carried out by both sexes, with the female taking the larger share and incubating at night. Males in Scotland were observed to take 5–6 stints per day, lasting between 205–441 minutes (Green, 1976). Courtship feeding of the female by the male begins before laying and during incubation the male also forages and feeds the female 2–3 fish per day (Green, 1976; Bustamante, 1995). The male generally eats the front half of the fish and then gives the rest to the female, incubating after he has passed the food to her. The amount of time that he spends incubating increases later in the incubation period (Green, 1976).

2.6 Brood size and fledging

The young hatch asynchronously. After hatching, the male increases his food delivery rate, bringing an average of five fish per day during the nesting period (Bustamante, 1995). Green (1976) describes increasing fish delivery rates of about four per day in the first 10 days, 4–5 between days 10 and 20, and 5–7 until fledging. The female tears up the fish and feeds the chicks, even after they have fledged. The female broods the young continuously for the first 10 days, and then decreasingly until the young are around 28 days old and well-feathered. She then guards them from a nearby perch (Cramp & Simmons, 1980). Older osprey chicks are not aggressive to younger siblings if well fed but, if food is short, they will prevent younger siblings from feeding, leading to their death (Poole, 1989). Some males appear to be poor providers and young regularly die in their nests. In Scotland, young ospreys fledge at 40–59 days (Bustamante, 1995), depending on food supply and brood size. Poole (1989) gives a fledging period of 50–55 days for migratory osprey populations, noting that non-migratory populations fledge later. After fledging, the young generally stay near the nest site for at least a month, receiving fish from their parents (3–4 per day, delivered mainly by the male) until becoming independent at 18–46 days after fledging (Bustamante, 1995). Larger broods tend to have shorter post-fledging dependence periods but generally fledge later. The female may leave the nesting area before the young, while the male continues to supply the fledglings with fish at the nest. The oldest chick tends to leave first, with the male leaving after the youngest chick.

3. SURVEY TECHNIQUES

CAUTION *Disturbance should be avoided while ospreys are displaying, incubating or brooding small young. To minimise the risk of disturbance nests should be viewed from distances of 500–750 m (Ruddock & Whitfield, 2007; Whitfield et al., 2008b). Fieldworkers must ensure they are visible to adult birds when approaching and leaving a nest. Appropriate health and safety precautions should be taken if nest inspection requires climbing (see Section 7.10 of Introduction).*

3.1 Breeding season visit schedule

The species is listed on Schedule 1 in Great Britain, Northern Ireland and the Isle of Man (see Section 7.1.1 of Introduction). Osprey is also listed on Schedule ZA1 of the Natural Environment and Rural Communities Act 2006 (England and Wales) which gives year-round protection to nest sites. 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 nesting territory appears to be unoccupied on the basis of the first two visits, then further visits can be omitted.

For over 50 years the growth and spread of ospreys in Scotland (and more recently in England and Wales) has been closely monitored and coverage approaching 100% has been achieved annually. With the population in Scotland now approaching 200 pairs, this level of coverage is now difficult to maintain (Etheridge *et al.*, 2008).

Visit 1	April	To check for occupancy
Visit 2	May	To locate incubating females
Visit 3	June	To check for young in the nest
Visit 4	July to early August	To check for, and count, fledged young

3.2 Signs of occupancy

3.2.1 Locating home ranges

As male ospreys feed the females during courtship, occupied nesting territories can be located by recording the flight line taken by males carrying fish. The male may take the fish to a nearby perch after catching it, and may eat part of his catch before flying to the nest. A compass bearing can be taken along the flight path, plotted on a map, and the area in the flight path checked for the nest.

Some ospreys will display over their nest site after they return from migration. The pair may 'high-circle' together, and the male may chase the female. More elaborate 'fish-flight' displays occur, such as the 'undulating sky-dance', in which the male carries a fish (or nest material), gives a high-pitched call repeatedly, rises steeply with pronounced wing beats, hovers briefly displaying the item in his talons and dives with wings flexed (Cramp & Simmons, 1980). Such displays may be repeated several times and are most frequent on clear, sunny days near to the nest site before the onset of incubation. They have, however, also been recorded over feeding sites and directed at intruders (e.g. people). Most males in established pairs in Scotland do not perform aerial displays but new pairs, particularly in newly colonised areas, may engage in spectacular flights. Young non-breeding males display regularly into early August. Watches to observe such display flights should be carried out in areas where ospreys are believed to be breeding or are considered likely to breed from the availability of suitable foraging and nesting habitat. Information from local sources (farmers, foresters, gamekeepers, estate workers, local birdwatchers) may be helpful in identifying such areas. Ospreys can also be observed nest building, collecting branches from the ground or breaking them off trees and carrying them to the nest.

3.2.2 Locating roosts

During the breeding season, the male and female roost near the nest before eggs are laid and the female roosts on the nest from laying until the late nesting period; the male also perches for

long periods near the nest during the day (Cramp & Simmons, 1980). Searching for roost sites away from nests is not considered a priority when carrying out surveys of breeding ospreys.

3.2.3 *Recognition of signs*

Ospreys eat fish, generally to the exclusion of most other prey (Cramp & Simmons, 1980). Osprey perches located in woodland will have the remains of fish below them, as well as fresh faecal droppings and moulted feathers. Such signs can be used as supporting evidence for occupancy.

3.2.4 *Evidence for occupancy*

Sightings of an osprey, or pair of ospreys, on more than two occasions, or sightings of birds building, rebuilding or using a nest, provide evidence of occupancy. Proof of occupancy by a pair requires sightings of two ospreys together at an eyrie on more than one occasion separated by a week, or incubation by one adult, or parent(s) feeding chicks (Gilbert *et al.*, 1998).

3.3 Evidence of breeding

3.3.1 *Locating active nests*

Nests can be located by cold searching suitable trees (in woods, small groups or single) at any time of the year. Searches should be systematic to ensure that the whole area is checked, as ospreys can nest within 100 m of each other. Nests in large woods are more difficult to find, and a combination of search methods is often most effective (such as cold searching plus watches to observe flight lines used for the delivery of nest material or prey). Once a nest is located, a description and, preferably, a sketch map of the site should be recorded along with the location (at least a six figure grid reference), including: the tree species (or other structure) in which the nest is located; its setting (in a wood, isolated tree and so on); and the height and position of the nest. Where marking schemes exist, all adult ospreys should be checked for engraved colour rings and a note made of the colour, inscription and location of any marks.

Osprey nests can also be located by systematic aerial searches (Henny *et al.*, 1977) from a plane, helicopter or microlight. Counts for measuring occupation by locating active nest sites should be made early in the season (mid-May), while counts to assess the number of chicks in a nest should be made in mid-July. Ewins & Miller (1995) found that helicopters were more effective than planes for counting young. Both helicopters and planes have been used successfully to find nests in Scotland but require clear weather conditions (no rain). Evening or morning light conditions are most suitable.

When checking nests for incubating birds (Visit 2), initial observations should be made from a distance with a telescope. If an osprey is flushed from a nest, the fieldworker(s) should leave the site via an open area if at all possible, so that the birds can see them leaving; trying to sneak away through woods or other cover may cause nests to fail. The adult ospreys are likely to 'escort' the fieldworker(s) away from the nest site. Some individual birds may leave their nests when people approach to around 500 m but birds breeding in areas with higher human populations may continue to incubate when people approach to less than 100 m. A later nest check (Visit 3) should also be carried out from a distance if possible to check for the presence of young (to prove hatching) and to estimate the correct time to climb to the nest, if there is a requirement to ring large chicks (taking appropriate health and safety precautions; see Section 7.10 of Introduction).

3.3.2 *Evidence for fledging*

Counts of large feathered young in the nest, either during nest visits or from a vantage point, provide the most reliable measure of breeding success. If counts are made from a vantage point,

then this is best done when young are standing on the nest, for example when they are being fed. Several such counts should be made, if time allows, to confirm the number present, in case one or more of the chicks are lying in the nest out of sight. Young can also be counted soon after they have fledged, as they remain near the nest for about four weeks before dispersing.

3.4 Evidence for non-breeding

Not all pairs that occupy nesting ranges breed every year, and non-breeding is thought to be more prevalent amongst younger birds (Dennis & McPhie, 2003). If a pair or single bird is recorded in and/or displaying over a nesting range on more than two occasions but an active nest is not found, despite the appropriate number of survey visits, this provides evidence for non-breeding.

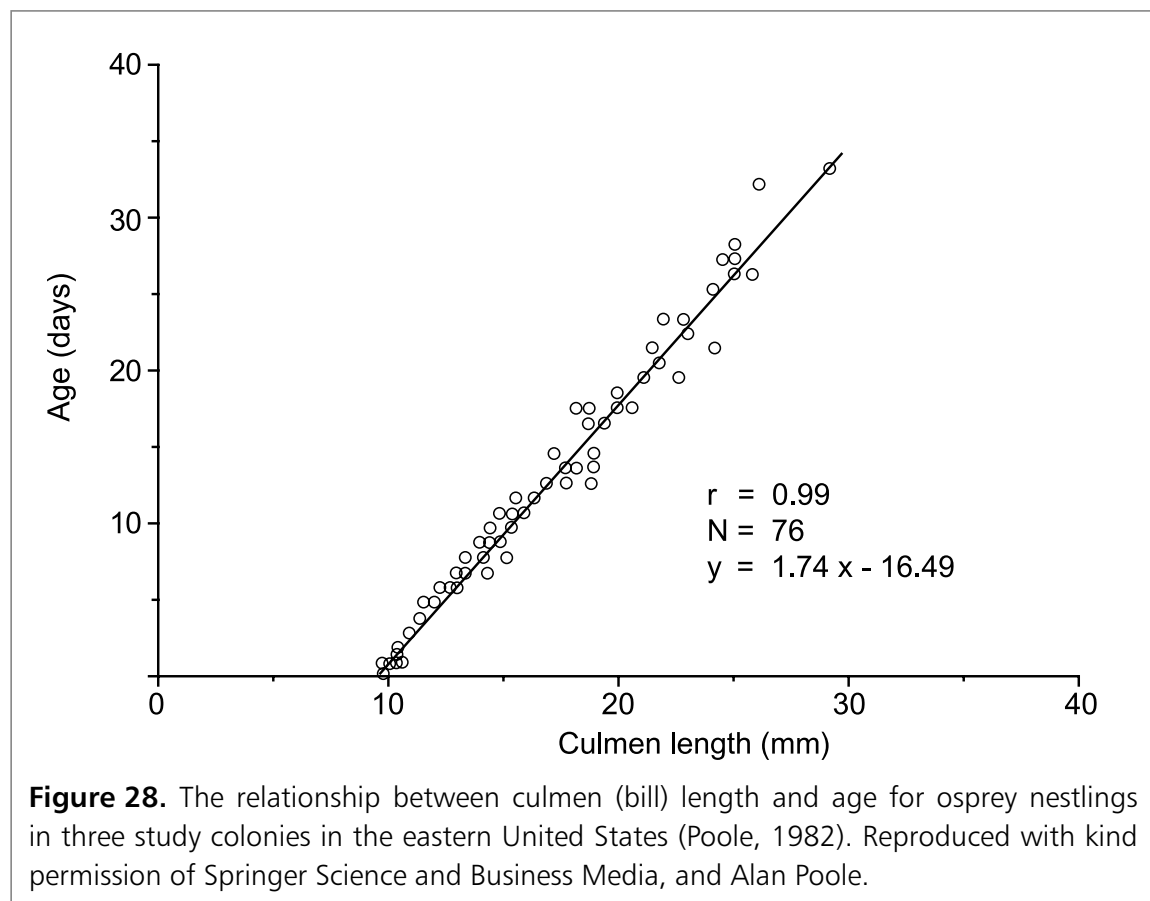
3.5 Ageing and sexing young

Based on data from the United States, the length of the culmen (bill) of young increases in a predictable manner with age, irrespective of sex (Poole, 1982; Figure 28), so that chicks up to 30 days old can be aged from bill length using the equation:

$$\text{Age (days)} = 1.74 (\text{culmen length (mm)}) - 16.49 \quad (\text{iv})$$

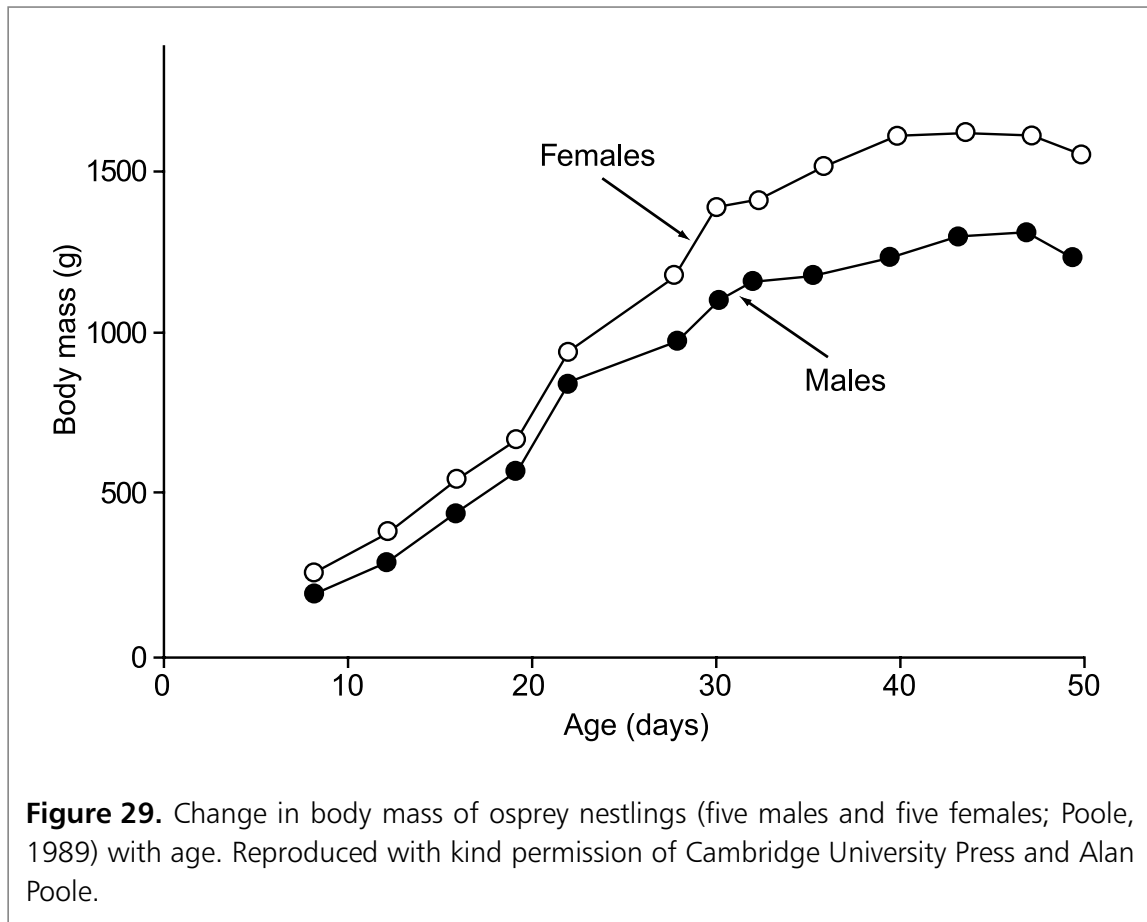
Ageing of young older than 30 days is not reliable by this measurement.

Also based on ospreys in the United States, female chicks can be separated from males by mass after the age of about 35 days, when females are heavier than males (Poole, 1989; Figure 29); male ospreys mature faster.



In Scotland, chicks ringed at about five weeks are sexed through a combination of weight, wing length and tarsus thickness. Females are generally well over 1,400 g (males usually less than 1,450 g), with longer wings and a thicker tarsus. As a rule of thumb, if the osprey 'K' ring fits snugly it is a female and if it is loose it is a male!

It should be remembered, however, that the growth rate of young ospreys can vary widely, relative to the age of young, both within a brood and between broods, dependent on the food supply. For these reasons, further measurements to record the growth of young in Britain are needed to allow more reliable ageing and sexing.



4. SURVEYS OUTSIDE THE BREEDING SEASON

The species does not occur in Britain or Ireland during the winter.