

# POPULATION STATUS OF THE PEREGRINE *FALCO PEREGRINUS* ON LUNDY

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## INTRODUCTION

The Peregrine *Falco peregrinus* has a long association with Lundy and has bred regularly on the island for over 750 years (Ratcliffe 1993, Davis & Jones 2007). They are the dominant terrestrial predator on the island and the only regular breeding raptor species. From 1875 to 1990, one to two pairs bred regularly or occupied nest territories with various levels of breeding success (Davis & Jones 2007). In 1991, three pairs of adults were occupying breeding territories and by 2002 that number had risen to six adult pairs. Considering the size of Lundy (5 km long and 1 km wide), this represents one of the densest breeding populations in the UK. This phenomenon is not restricted to Lundy. Many other small offshore islands in the British Isles have dense populations of breeding Peregrines. Skomer off the Pembrokeshire coast had four pairs in 2003 (D. Corley pers. comm.), St Kilda, 70 km west of Harris, once held at least four breeding pairs (Ratcliffe 1993) and Rathlin Island off the coast of Antrim had up to six breeding pairs in 1991 (Ratcliffe 1993).

Lundy offers a unique opportunity to study Peregrine population dynamics within a maritime environment and their interactions with other island species, such as seabirds. All the Peregrine territories are within a relatively small area, enabling the study of a dense island population and their relationships with the various biotic and abiotic factors within that environment. Lundy's status as a Marine Conservation Zone (MCZ), Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) also underlines the importance of continued research on this sub-population. Whilst documented studies exist for other island Peregrine populations (Beebe 1960, White *et al.* 1973, Nelson 1990), few, if any, studies have investigated the factors affecting high population density with island populations in the UK.

The aims of this paper are to:

- 1) Document the results from the 2014 National Peregrine Survey;
- 2) Outline the historical increase of the island population; and
- 3) Discuss further research questions for the future.

## METHODS

The BTO National Peregrine Survey has been conducted on a ten-year cycle since 1961, apart from the 2002 survey which was rescheduled due to the Foot and Mouth epidemic of 2001 (Ratcliffe 1963, 1972, 1984, Crick & Ratcliffe 1995, Darlston & Johnson 2003, Banks *et al.* 2010). The sixth national survey took place in 2014, some 12 years after the previous survey. A total of seven fieldwork visits were made to Lundy during the breeding season (April–July). Five of these were one-day visits and two were extended three-day visits. At least four visits are required to each individual nest territory during the Peregrine breeding season to monitor breeding performance (Hardey *et al.* 2009). Using the four-visit schedule as a guide, the first visit took place in early April to establish site occupancy by territorial adult pairs. A second visit

to confirm egg-laying and incubation was carried out from early to late May. Young were expected to be visible on the ledge in June, when the third visit was conducted. To check for fledged juveniles, a fourth visit was made to all territories in July.

To check for territory occupancy, a circuit (either clockwise or anti-clockwise) was made of the island, checking each potential territory in turn. All suitable nest cliffs and ledges were observed with 10x42 binoculars and a 12x36 spotting scope. A nest territory was considered occupied if one or more adults were present and regular, fresh kills were observed in the immediate vicinity (Hardey *et al.* 2009). No nesting ledges were approached directly, though two were checked within a range of <10 m to confirm breeding success and number and age of pulli. These checks were conducted with a Schedule 1 permit issued by the BTO on behalf of Natural England.

Where possible, dates of first egg-laying, hatching and fledging were recorded; as well as numbers of eggs, pulli and juveniles at each stage of the breeding cycle. However, experience from monitoring mainland Peregrines has shown that the location of some nests is such that there are no suitable vantage points from which to gather such data (pers. obs.). This was the case at two of the Lundy breeding territories in 2014, though it was possible to estimate the status of the nest from observed activity by the adults, e.g. incubation changeovers, food deliveries to an incubating female or food brought to young on the nest ledge.

To make an assessment of the earlier breeding population of Peregrines on Lundy, reference was made to the bird reports in Lundy Field Society online Annual Reports from 1947 to 2012 ([www.lundy.org.uk](http://www.lundy.org.uk)) and to *The Birds of Lundy* (Davis & Jones 2007). Both Mark Darlaston and Phil Johnson provided data from the 2002 National Peregrine Survey and anecdotal evidence from the past 20 years to add to the published literature. The methodology of the national survey has been constant over time, enabling valid comparisons to be made (Ratcliffe 1963, 1972, 1984, Crick & Ratcliffe 1995, Darlaston & Johnson 2003; Banks *et al.* 2010).

### Statistical analysis

Pearson's product moment correlation coefficient ( $r$ ), was used to test the relationship between successive years and the number of territorial adult pairs.

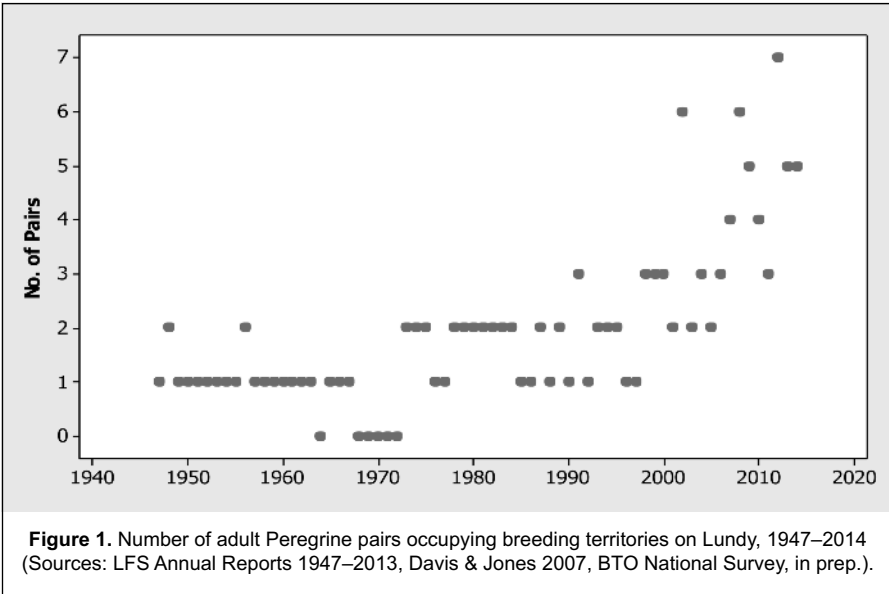
## RESULTS

### 2014 National Peregrine Survey

In 2014 there were five territorial pairs and one single female occupying nest territories on Lundy. Three pairs were occupying territories on the East Side, one adult pair at the South End and one pair and a single adult on the West Side. There were no pairs present in the north-west quarter of the island. In relation to the number of occupied territories, productivity was low (0.20,  $n = 5$ ). Only one pair bred successfully, fledging a single female from a two-egg clutch. Two pairs attempted to breed but failed at the egg or nestling stage, while no evidence of breeding activity was observed for the remaining two territorial pairs. A single adult female was observed occupying a known former breeding territory but with no evidence of an adult male in residence. The mean distance between nest cliffs was 1.24 km (SD 0.51, range 0.75–1.70,  $n = 5$ ), measured from the north-easternmost territory in a clockwise linear direction heading south. Based on a total land area of 445 ha, the mean area per adult pair was 89 ha.

### Historical breeding data

In 2002 there were six adult pairs and one single adult occupying breeding territories on Lundy (M. Darlaston & P. Johnson, pers. comm.). A comparison between the 2002 and 2014 surveys



show that three of the territories that were occupied in 2002 (two by pairs and one by a single adult) were vacant in 2014, while two territories occupied in 2014 (one by a pair and one by a single bird) were not occupied in 2002.

Records in LFS Annual Reports indicate that one to two pairs were occupying breeding territories on Lundy between 1947 to 1990, apart the years 1968–71 when no birds were recorded. In the 1991 and 2002 national surveys the number of adult pairs occupying territories increased to three and six pairs respectively. Numbers of adult pairs then varied between four and six pairs from 2007 to 2011. An unconfirmed seven pairs were reported in 2012, with five pairs in 2013 and 2014. Figure 1 shows this upward trend, with a reasonably strong and statistically highly significant relationship ( $r = +0.702$ ,  $df = 66$ ,  $P = 0.01$ ).

**DISCUSSION**

The results of the 2014 National Peregrine Survey, compared with the 2002 survey, suggest that the Peregrine population on Lundy is relatively stable. However, since recording was sporadic in the intervening years, it is difficult to assess whether the population has fluctuated since 2002 or remained at the current level. Records in LFS Annual Reports generally focus on the number of individuals observed or the number of successful pairs, rather than the total number of pairs occupying nest territories. This partly reflects the fact that recording of landbirds on Lundy depends largely on visiting birdwatchers, few of whom have the time and/or experience required for meaningful surveys of Peregrine territories. While care has been taken over the years not to publish details of individual nest sites, given the ongoing risk of persecution of Peregrines in the UK, six and five territorial adult pairs were reported in 2008 and 2009 respectively (Davis & Jones 2009, 2010), suggesting that the population has probably remained at this level since 2002.

The density of Lundy's adult Peregrine pairs, in terms of island land area, is comparable with that of two other island populations, on Skomer and Ramsey Island, Pembrokeshire, both of which had three adult pairs occupying nest territories in 2014 (B. Büche & G. Morgan, pers. comm.). The total land areas for Skomer and Ramsey are 292 and 282 ha respectively, giving a mean of 97 ha and 94 ha per pair, compared with 89 ha per pair on Lundy. However, density may be related more to available food supply, particularly seabirds, than to area alone, so this may not be the most relevant measure. Therefore, the abundance or absence of breeding seabirds may be a contributing factor to the number of breeding Peregrines on small offshore islands (Ratcliffe 1993). That said, Skomer currently has far larger seabird populations than Lundy, so it could be expected that Skomer would have more, and smaller, Peregrine territories than Lundy, which appears not to be the case.

Assessing density by measuring the linear distance between nest sites is probably more relevant. This is the method used in assessing mainland coastal Peregrine density and comparisons can be made with other coastal sub-populations. The mean figure for Lundy (1.24 km) is the shortest mean inter-nest distance recorded for coastal Peregrines in the UK. North Hoy, Orkney, had a mean spacing of 1.63 km based on four pairs breeding along a 6.5 km stretch of sea-cliffs between 1957 and 1962 (Ratcliffe 1993). In East Sussex, up to eight pairs were recorded along approximately 11 km of sea-cliffs, giving a mean linear distance of 1.38 km between nests (Ratcliffe 1993).

The variation in nest territory occupancy between national surveys is of interest. On Lundy there were four regular territories occupied by adult pairs between 2002 and 2014, with the addition of a new territory in the south-east of the island in 2014. Pairs present at two sites in 2002 (north-east and north-west) could have represented 'infill' during a period of increased population overall in the south-west of the UK (Banks *et al.* 2010). These nest cliffs could potentially also be alternate nest sites within a single territory but occupied by a new breeding pair after an increase in the breeding population. This follows the general pattern of Peregrine breeding behaviour. Several different nest sites may be used within a single territory and, when spatial conditions allow, a new pair may occupy a subsidiary nest cliff within an established territory (Ratcliffe 1993).

Though breeding productivity was low in 2014, there is not enough reliable and consistent data from previous years to estimate a long-term trend. From preliminary observations in July 2013, a possible total of six fledged juveniles were observed at four nest territories (pers. obs.). This gives a much higher figure for annual productivity compared to 2014 but is unreliable as the checks were conducted late in the breeding season and there were no direct observations of nest ledges earlier in the season. Juvenile Peregrines venture progressively further from the natal area after fledging (Ratcliffe 1993). This could result in a miscalculation of how many juveniles actually fledged from each territory, since juveniles observed within or close to a known breeding territory may not have fledged from that territory. A long-term annual monitoring programme would give reliable results (Hellawell 1991, Gregory *et al.* 2004), though the logistical difficulties of working on an offshore island with no permanent ornithological recording presence mean that such a programme would require careful coordination and effective resource mobilisation.

Baseline research on diet, foraging behaviour and movements, as well as breeding success, would be required to give an accurate assessment of the biology and ecology of the Peregrine on Lundy. Continued research could indicate how the Peregrine functions as the island's apical predator and how this may affect the overall biodiversity of the island at an ecosystem scale. Sergio *et al.* (2006) state that at sites where raptors were present, biodiversity levels were consistently higher than at sites without such apical predators. Using this knowledge, conservation plans based on an apical predator could deliver broader ecosystem-level benefits.

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