

## MANX SHEARWATERS ON LUNDY: A STUDY OF POPULATION AND DISTRIBUTION CHANGE FROM 2001 TO 2008

by

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### ABSTRACT

In May 2008 the breeding population and distribution of Manx Shearwaters on Lundy was surveyed using a repeat of the methodology from the previous survey in 2001. In addition, calibration of the response rate of incubating Manx Shearwaters to the taped calls has improved the accuracy of the population estimate. The island's Manx Shearwater population is currently estimated at 1,081 pairs, an increase of 250% since the previous assessment in 2001. The increase has occurred since the eradication of rats and represents a major success story and offers an encouraging outlook for the future.

*Keywords: Lundy, Manx Shearwater, population, calibration, rats.*

### INTRODUCTION

The first full island survey of Manx Shearwaters was undertaken in 2001, (Price & Booker, 2002) and for the first time provided a good indication of the potential breeding population and distribution. Then taped calls of male and female Manx Shearwaters were played at 7,155 burrows on the island, and the response rate recorded. In total just 154 responses were obtained, producing a population estimate of 166 breeding pairs, based on the published conversion factor (1.08) for a duetting tape (Brooke, 1978). At this level the Manx Shearwater population on Lundy was considered to be far short of its potential given the size of the island and amount of available habitat, and in particular, its close proximity to the major colonies of Skomer and Skokholm.

In the wake of the 2001 survey, the Lundy Seabird Recovery Project, a partnership between English Nature (now Natural England), RSPB, National Trust and Landmark Trust was established, and culminated in the eradication of rats from the island in 2004 (Appleton *et al.*, 2006). After some five years of rat-free conditions on the island, the 2008 survey described in this paper was carried out, using the same methodology as in 2001. Its principal objectives were:

- To establish the potential number and distribution of breeding pairs of Manx Shearwaters on Lundy in 2008
- To compare the population and distribution of birds in 2008 with that of the previous survey in 2001
- To establish the actual response rate of Lundy Shearwaters to the specific recording used in the survey, and to use this finding to calibrate the overall results.

## **METHODOLOGY**

As in 2001, daytime tape playback was used to assess the population (Walsh *et al.*, 1995). The same calls of male and female Manx Shearwaters as used in 2001 were re-recorded onto new tapes. Hand-held portable cassette tape recorders were used to play the recording for up to 15 seconds at the entrance to burrows and holes under large rocks or boulders. All holes and burrows were checked. Surveyors recorded the number of holes checked and the number of apparently occupied burrows (AOBs) found, identified when a response from a sitting bird was received.

The survey period and coverage mirrored that of the 2001 survey as closely as possible to allow a direct comparison of numbers and distribution. The bulk of the survey was undertaken during the last week of May, but owing to poor weather, the final areas were completed in the first week of June. Survey coverage included some small additional areas to investigate potentially suitable locations which, for various reasons, were not surveyed in 2001. Cliffs and unstable rock falls were avoided. The island plateau was surveyed selectively.

Surveyors typically walked horizontal contour transects 5 metres apart, looking up the slope and checking burrows in the ground above their transect line to that of the next surveyor. Transects were followed by eye, though canes were used as markers to assist accuracy.

### **Response calibration and population estimate**

An additional element of the 2008 survey was the inclusion of a calibration study to obtain a specific response rate for birds on Lundy to the taped calls used. A calibration plot was marked out at the Old Light colony (grid reference SS129446), the island's largest and most densely occupied area. Ninety-one burrows were located and labelled with small pegs individually numbered. This number of burrows was needed, as the calibration required around 50 occupied burrows to ensure a statistically significant result (Mark Bolton pers.comm.).

Each burrow was checked daily for seven days from 24 May to 30 May during the same period as the main all-island survey. Calculating the mean of the daily average response rate produced a value representing the probability of a Manx Shearwater in an occupied burrow responding to the taped calls on a single playing. This overall response rate was applied to the results from the whole island survey to produce an overall population estimate for the number of breeding Manx Shearwaters on Lundy.

## **RESULTS**

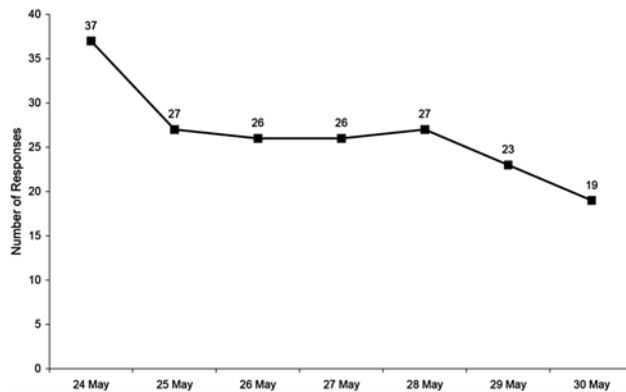
Across the whole island a total of just over 7,000 burrows were checked for nesting Shearwaters during the period 24 May to 7 June. From these holes, responses were obtained in 560 cases.

For comparative purposes, excluding the records from additional areas not covered in 2001, the number of responses obtained in 2008 was 539, which compares with 154 in 2001 and represents an increase of 250% over the seven-year period.

The distribution of occupied sites closely reflected that of 2001, but in all cases with a higher number of responses. Additionally, occupied burrows were found in many areas where no responses were heard in 2001, such that the pattern has been one of growth of existing colonial areas, both by increased density and expansion of their boundaries, together with the establishment of small colonies at new locations. Map 1 shows the number and distribution of occupied holes in 2001 and Map 2 presents the situation in 2008.

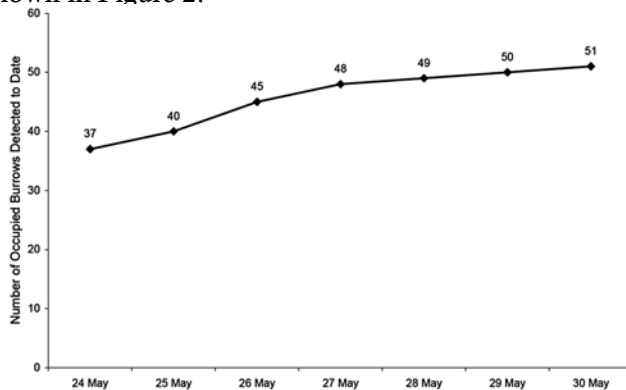
## Calibration Results

Marked burrows in the calibration study area were checked daily for seven days. There were some difficulties in recording. Some of the pegs marking holes disappeared - (perhaps removed by gulls). Also, as the checking progressed, it was discovered that some burrows had multiple entrances and some entrances had multiple nesting chambers, which could have led to over-recording on the first date. Despite this, the initial higher response combined with the decline on the last two dates may indicate that birds get used to the recording and are less likely to respond with repeated checks. This characteristic may justify further study to establish whether this is a genuine pattern. Whilst we observed this feature, we have not attempted build this potential factor into the process of calculating the calibration figure. Suitable adjustments were made to account for any known errors and led to the resulting pattern of daily responses throughout the week varying from 37 down to 19, with a general decline over the checking period as shown in Figure 1.

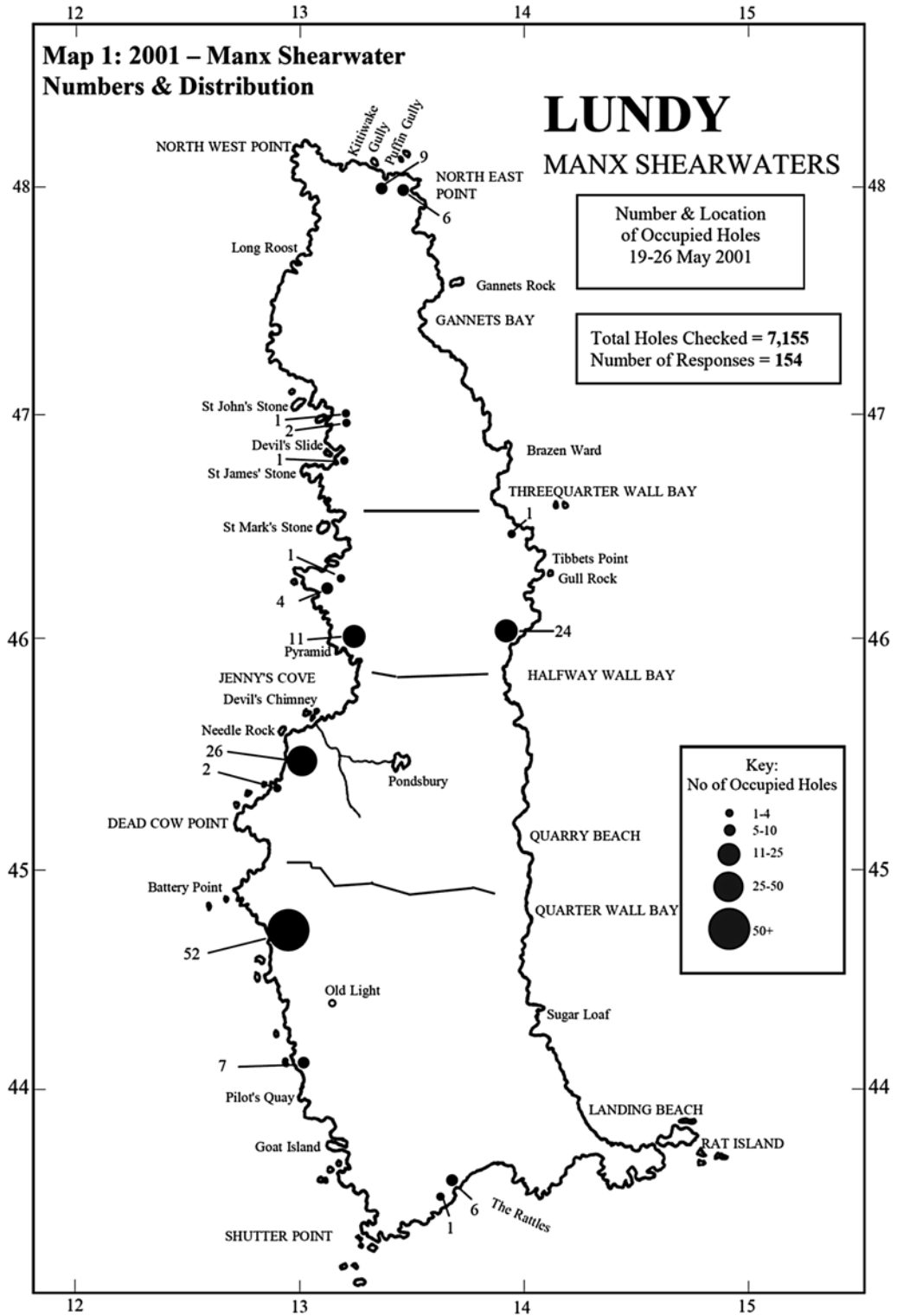


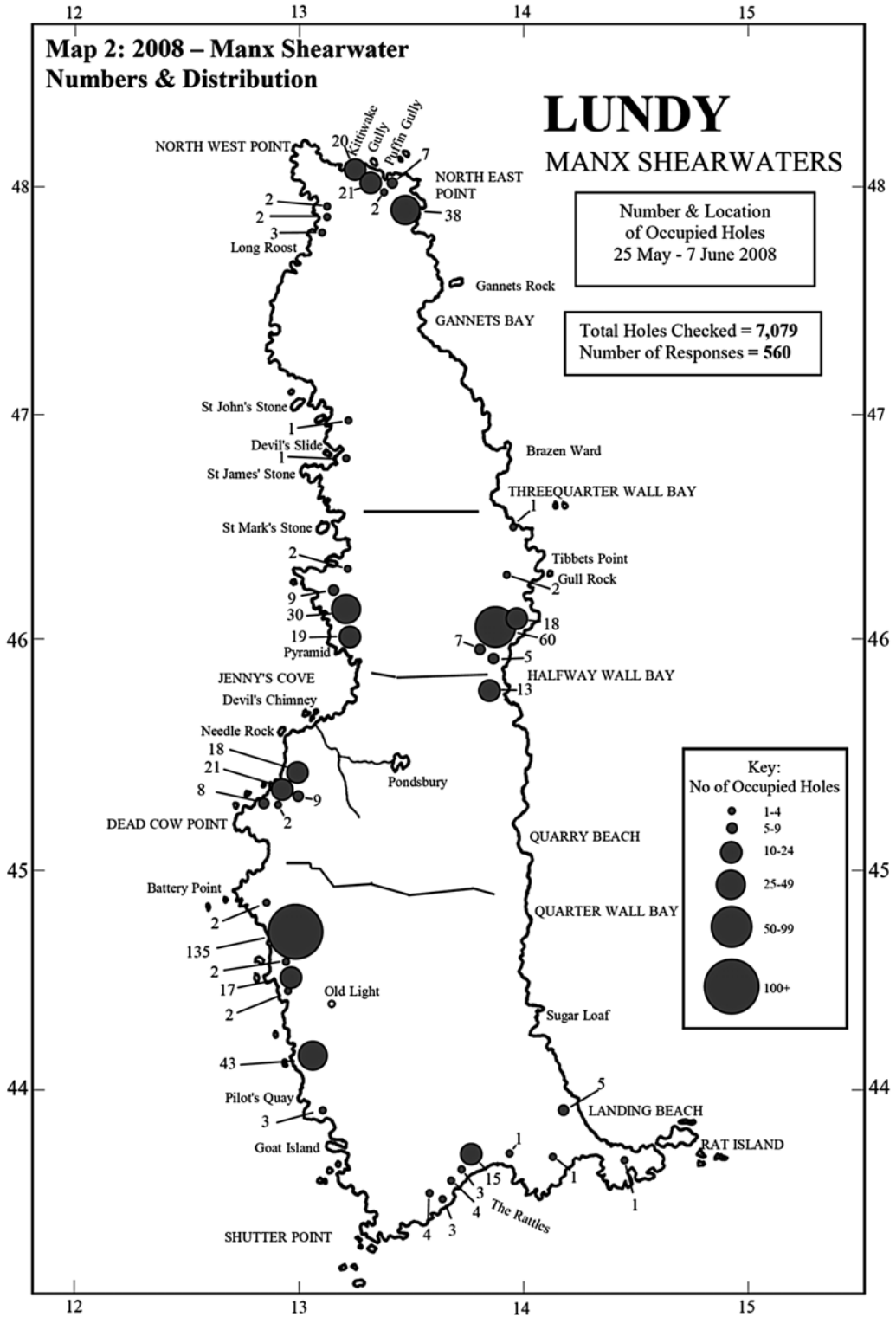
**Figure 1:** Number of Responses per Day

Over the seven days of checking, the cumulative number of occupied holes detected increased. Over the first four days newly responding birds were encountered more frequently, but from day five onwards only one additional occupied burrow was identified each day, such that by the end of the period the number of occupied holes had reached 51, as shown in Figure 2.



**Figure 2:** Cumulative number of Occupied Burrows detected





The overall response rate was calculated by taking the average of daily response rates, as shown in Table 1.

**Table 1:** Summary of Daily Response Rates & Calculation of Overall Response

	Dates							Average per Visit
	24 May	25 May	26 May	27 May	28 May	29 May	30 May	
No. of Holes Checked	94	94	94	93	93	92	91	
<b>Daily Responses</b>	<b>37</b>	<b>27</b>	<b>26</b>	<b>26</b>	<b>27</b>	<b>23</b>	<b>19</b>	<b>26.4</b>

With 51 occupied holes, an average daily response of 26.4 represents a response rate of 51.82%. This percentage is very much lower than that found at other colonies (Brooke, 1978 and Brooke, 1990), but despite this variance it genuinely represents the rate of response for this specific study on Lundy.

A response rate of 51.82% translates into a correction factor of 1.93. Thus, the 560 holes from which a response was received in the all-island survey represents a breeding population of **1,081 pairs**.

Using the same correction factor for 2001, and applying it to the 154 occupied holes located, gives a breeding population figure of 297 pairs; an improvement on the 166 estimated at the time, but still far short of the island's apparent potential. This realignment of the estimates of breeding pairs does not alter the overall growth in the population since 2001 (from 154 to 560 responses).

**DISCUSSION**

The 2008 survey located 560 occupied burrows compared to 154 recorded in 2001. With the same methodology applied and using the same sound recording, the two surveys have a high degree of comparability. Based upon responses alone (and adjusting the 2008 total down to 539 to accommodate the small differences in coverage) the results register a substantial increase in the Manx Shearwater population over the seven year period of 250%. Whilst it was anticipated that the eradication of rats would benefit this species, this phenomenal level of increase was totally unexpected.

The eradication of rats was undertaken over the winters of 2002/3 and 2003/4. After the first winter, the vast majority of the island was free of rats and so in 2003 the Manx Shearwaters were able to breed in a predominantly rat-free environment. Brooke (1990) found that the age of first breeding for Manx Shearwaters was six years, so birds successfully reared on Lundy in 2003 will not return to breed until 2009. In the intervening years, with no additions to the population by young birds, the prediction was for the population to decline before it increased (Appleton *et al.*, 2006). This was based upon the assumption that the Lundy population was a closed community - i.e. there was no immigration or emigration.

With the absence of rats and the resulting expected lack of disruption to, or predation of nests, higher levels of occupancy in late May might be expected. However, these factors alone are unlikely to have made a significant improvement in the number of nesting birds detected. The stark increase in the population can therefore only be explained by immigration to Lundy from other Shearwater colonies.

In the past, Manx Shearwaters ringed on Skomer and Isles of Scilly have been trapped on Lundy, and ringed birds from Lundy have been found at other colonies (Taylor, 1990), indicating that there is some interchange between the breeding colonies. It is therefore most likely that immigration has occurred from major colonies such as Skomer or Skokholm, perhaps as a result of immature birds prospecting Lundy as a possible breeding site, and staying to breed in the absence of predators.

Such immigration has probably been taking place for many years, but in the presence of rats, and likely low numbers of young produced, the population inevitably remained at a low level. Under such conditions it is salutary to realise that the Lundy population of Manx Shearwaters may only have been prevented from going extinct by a continuous influx of new birds from other colonies.

Maps 1 and 2 graphically illustrate the change in distribution and numbers since 2001. Sites where increased density and expansion were especially notable were at the Old Light colony on the west coast, the slopes south of Needle Rock, Pyramid sidelands and the Tibbet's colony. Aside from these major colonies, previously small groups of nests have often expanded to form more extensive concentrations. There have been sizeable expansions on the south coast to the west of Benjamin's Chair and also in the area around Pilot's Quay. In the north, the small colonies on Puffin Slope and just south of North East Point have both seen spectacular expansion.

In addition, there has been establishment of nest sites in previously unoccupied areas. Notable amongst these are the small group now nesting just below Hammers above the Landing Bay, and the handful of occupied holes north of Long Roost.

From 2009, young birds raised on Lundy in 2003 subsequent to the rat eradication, will become mature and start to return to breed. This will provide a further boost to breeding numbers on the island. As the Lundy population increases in size and more of the suitable habitat is occupied, it will be instructive to observe if the level of immigration remains at the current level or whether there is a fall off in the number of new arrivals.

## **CONCLUSIONS**

Lundy's Manx Shearwater population in 2008 was estimated at 1,081 pairs, an estimate that represents a 250% increase in the population since the previous survey in 2001. Such an increase greatly exceeded the expectation of the surveyors and the wider Lundy Seabird Recovery Project partnership.

The eradication of rats appears to have enabled this tremendous growth in the population, and for the increase to have taken place in such a short time must have been largely due to immigration from other colonies.

The inclusion of the response calibration was a crucial addition to the survey that enabled a more accurate population estimate to be determined. Despite the variance of the overall response rate to other studies and locations, the calibration exercise has established that when the taped calls used in this survey were played at occupied burrows on Lundy, just over half of the sitting birds were likely to respond.

The increased accuracy of the population estimate, combined with the detailed understanding of the distribution of nesting sites around the island gives an indication of the likely pattern of any future expansion in the population. There would still appear

to be plenty of suitable habitat available on the island, and with the return of Lundy-reared young birds from 2009 onwards and some degree of continuing immigration the outlook for Lundy's Manx Shearwaters is very encouraging.

### **ACKNOWLEDGEMENTS**

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