

THE SIZE OF THE COLONY OF MANX SHEARWATERS (*Puffinus puffinus*) ON LUNDY

BY DAVID H. THOMAS

Department of Zoology, University College, Cardiff CFI 1XL, South Glamorgan

INTRODUCTION

Over the years, various statements have been made about the numbers of Manx Shearwaters believed to be breeding on Lundy. For example, in the last 40-50 years R. Perry (quoted by Southern and Tucker, 1944) considered the colony to amount to a thousand pairs or more. Southern and Tucker (1944) themselves, in the only systematic study on this subject that seems to have been published, could find positive evidence of breeding only on Puffin Slope (where they found 19 occupied burrows and estimated a minimum of 50 birds as "actually visiting the slope"). During seven nights spent on the island in July 1942 Southern and Tucker (1944) failed to find shearwater burrows at seven other sites, some of which were apparently near where I have subsequently found occupied burrows, but they acknowledged previous evidence for possible occupation of some of these sites by shearwaters. Davis (1954) stated that there were several small colonies but considered that many birds that come ashore were pre-breeding adults from the Pembrokeshire colonies. In "Operation Seafarer" Lundy's shearwaters were estimated as about 100 pairs (Cramp, Bourne and Saunders, 1974) but it is not clear how this particular census was carried out. Dymond (1972) noted birds "coming to land and presumably visiting burrows" at Pilots Quay — Battery (few), Quarry Bay Tibbets Point (some), Middle park (several), and Raven's Gully — The Ugly and Puffin Slope (many). Later Dymond (1980) stated that the breeding population is "probably between 100 and 1000 pairs" and suggested that many birds occupying burrows during the breeding season were immatures (i.e. pre-breeding adults) visiting from the Pembrokeshire colonies.

Manx Shearwaters are notoriously difficult to census on account of their nocturnal and burrow-nesting habits, especially in the presence of rabbits with whom burrows may be shared, and there seems to be no published record of the type of prolonged systematic study which is necessary to underpin the conclusions that have been drawn concerning the status of the Manx Shearwaters on Lundy. In can be concluded from the foregoing that, notwithstanding statements in print, very little is really known concerning the Manx Shearwater population on Lundy. The consensus of recent opinions is that the Lundy population is small, but this does not square with the large numbers of birds which visit the island on suitable nights in the breeding season, the apparent suitability of the habit, and the presence of other large colonies on the coasts of the British Isles facing the Western Approaches. Therefore, it seemed desirable to carry out a more thorough and extensive study of the problem, and to do so I have been able to take advantage of regular annual visits to Lundy in the summer (end of June — early July) when most Manx Shearwaters in this region would have hatching eggs, and also a single trip in spring (late April — early May), when breeding birds would have established burrow ownership and started to lay eggs (Cramp & Simmons, 1977). Graduates and undergraduates from the Department of Zoology, University College, Cardiff, have helped with the fieldwork for these studies.

DISTRIBUTION OF NOCTURNAL ACTIVITY OF SHEARWATERS

The first priority was to try and establish whether there were any localities on the island which shearwaters visited preferentially, so that more laborious detailed searches could be concentrated in the more likely places. This was carried out on the nights of 26th June — 4th July, 1976 using counts of shearwater calls as an index of activity. Counts were made at a total of 16 sites distributed at 200-900m intervals along the sidelands all round the island. Observations started just after dark (well before the arrival of calling shearwaters) and continued until at least 30 minutes after the last call heard in the morning (i.e. until 3-4 a.m.). Observers worked in pairs at each site, but counted independently, and in different pairs and at different sites on

successive nights. Relative bias (persistent over or under-counting) by each observer could be calculated (the range was 95-106% of the overall mean counts) and was used to correct the raw counts of each observer. Counts were made at two reference sites (north of Old Light and south of Gannets' Bay, grid references (SS) 131 444 and 136 472) every night to check for variation from night to night. In principle, other sites were counted on only two nights (chosen at random), but some sites (Marisco Castle, Devil's Limekiln, Battery Point path, downstream from the Punchbowl, south of Threequarter Wall, an unnamed site west of South Cwm (130 472), and Puffin Slope) were counted on only one night because the counts there were very low (despite considerable activity at other sites the corresponding nights).

The results of these studies can be summarised as follows:

1. Although there was night-to-night variation in counts at the two reference sites, there was no correlation of nightly counts between sites. This suggests that no nights in the study period were especially good or bad everywhere for shearwaters visiting the island, and therefore that counts at other sites may be compared even though not all were made on the same night.
2. Calling birds were heard between 23h30 and 03h30, with over 85% of all calls between 00h30 and 02h30. Mean total counts at each site (corrected for observer bias) ranged from 16 to 1001 calls/night.
3. Shearwater calls were not heard uniformly around the island, but were heard mainly at seven of the eight east side counting sites and at two of the eight west side sites. Very few calls were heard by me above the main plateau of the island, during numerous transits between counting sites each night. To assess the relative importance of sites the mean nightly count at each site can be expressed as a percentage of the total of mean nightly counts at all sites. The seven good east side sites (more or less evenly separated between the slopes below John O'Groats House (135 479) and above White Beach, 139 444) each accounted for 9-15% of the total nights' call count; together these sites span about 33% of Lundy's coastline but accounted for 80% of calls heard. The two best west side sites (Pilot's Quay, 131 440 and Old Light, 131 444 spanning about 4% of the coastline) accounted for 15% of calls heard.

Thus, 95% of shearwater calls were heard along less than half the coastline, and birds were heard landing and taking off in these sideland areas.

These results indicate a strong preference of Manx Shearwaters for the sidelands, on the east side from White Beach northwards, and on the west side from Pilots Quay to some way north of Old Light. Experience at the same time of year in 4 subsequent years (1977, 1978, 1980 and 1981) has confirmed these observations, but they are not in complete agreement with those of Southern & Tucker (1944) or Dymond (1972). These authors found considerable numbers visiting Puffin Slope (where we heard very few birds), but otherwise there is broad agreement between this study and the two reports just cited, of the locations where calling shearwaters are found at night.

From the distribution of calls in space and time it seems most unlikely that the shearwaters at Lundy are simply birds *en route* for the big Pembrokeshire colonies. Birds just passing along the island might be expected to be heard all along the east or west coasts (not at specific portions of either), and more birds might be expected off the west coast (since relatively few shearwaters move far up the Bristol Channel east of Lundy), whereas in fact most birds are heard along the east side of the island. Moreover birds visit Lundy at the same times of night as those at other colonies, whereas birds travelling to or from (say Skomer (75km away in a direct line, perhaps 1½h flying time for shearwaters) should pass Lundy some time before or after the main times of activity at the other colony.

In fact, we have direct observations of the night-time activities of shearwaters flying around Lundy in April-May (1981) and June-July (1977, 1978, 1980 and 1981), and these show that birds above the slopes and immediately offshore are generally wheeling, turning and circling, rather than moving persistently along the coast. These observations were obtained using an image-intensifying night-vision

telescope, which amplifies existing light levels and was therefore most successful when used around Half-way Wall Bay, where natural light was regularly augmented by the beam from South Light. In addition, these observations showed that very large numbers of birds were flying around at times of peak calling activity, and that even then the great majority of birds were not calling. Unfortunately, the image definition of the night-vision telescope was not sufficient to pick up shearwaters against an uneven background of rocks, grass and bracken, and so it could not be used to locate landing birds.

All the foregoing results indicate that by June-July, large numbers of Manx Shearwaters visit selected parts of Lundy night after night, and that the majority are probably not *en route* for other colonies. It would be most surprising if no birds were breeding, but Manx Shearwaters do not breed until they are 5-6 years old, although they do return to their natal colonies (and sometimes other colonies) as pre-breeders of 2-4 years old (Cramp & Simmons, 1977). Therefore, the picture in June-July is complicated by the likely presence of an unknown proportion of birds outwardly adult, but actually of pre-breeding age, some of which might eventually breed elsewhere (since ringing shows that young eventually breed in their natal colony).

SHEARWATER ACTIVITY IN SPRING (APRIL/MAY)

It is generally considered that birds of pre-breeding age return to the breeding colonies during the summer, much later than breeding birds (Cramp & Simmons, 1977). Therefore, a visit was made in spring (28th April — 5th May 1981), which coincides with the early part of the laying period on Skokholm (Harris, 1966). At this season the vast majority of birds present should be of breeding age, by which stage they are thought to have a high degree of fidelity to the natal colony (Harris, 1972). A second advantage of working at this time year is that bracken has not yet formed a closed canopy; in previous summers the bracken canopy largely frustrated attempts at searching for occupied shearwater breeding burrows.

There were two main objectives to this survey: firstly, to see whether the level of nocturnal activity of shearwaters was noticeably different in spring (as would be expected if a large proportion of the summer activity was due to pre-breeding birds), and, secondly, to determine the distribution and numbers of burrows in current use in the areas visited by shearwaters. Although a proportion of burrows would undoubtedly be used exclusively by rabbits, breeding shearwaters would be confined necessarily to areas with burrows and absent from areas without them (thus narrowing down areas for further attention), and a burrow count would provide an extreme upper limit to the number of breeding pairs of shearwaters which could be present.

Call counts and direct observation of flying birds with a night-vision telescope at Half-way Wall Bay, and calling activity in the Pilot's Quay — Old Light area, all showed that spring nocturnal activity was at least as high as our previous summer observations. This suggests that either many breeding shearwaters also visit land other than at their breeding colony or that pre-breeders are present in force at the time of egg-laying or that there really are substantial numbers of shearwaters of breeding age associated with Lundy. The first two suggestions do not conform to current understanding of the biology of Manx Shearwaters.

The burrow survey was confined to the side slopes of the island (since calling shearwaters are rarely heard over the main plateau even at times of peak coastal activity) and was concentrated on those slopes where calling birds were known (from the previous survey) to be most active. Slopes covered in this survey were therefore from near North East Point (grid reference 136 479) to Millcombe (140 441) on the east side and from South of Pilot's Quay (131 439) to just south of Battery Point (127 448) on the east side.

Counts of "active" burrows in the survey areas were made, and the locations of concentrations of burrows were noted. In the primary counts (for which "active" burrows were defined as lacking plant seedlings or any accumulation of debris in the burrow), totals of 413 (east side) and 547 "active" burrows (west side) were found; these counts do not distinguish between shearwater and rabbit activity.

On the basis of the primary counts attention was concentrated on two large groups of burrows, on the north side of Halfway Wall Bay (139 459), about 2 ha in area) and south of Battery Point (129 447, about 0.3 ha). At both sites shearwaters were seen taking off and landing, and burrows were marked which were found to be occupied (birds seen or heard to be present in the burrow). As a result of observations at these occupied burrows, it was apparent that the earlier definition of "active" burrows was much too restrictive, since occupied burrows could be clear, but commonly contained considerable amounts of debris (trampled down), could also have growing plants inside and might even have the entrance partially overgrown; occupied burrows did not necessarily have bird droppings and often had rabbit droppings (usually old and dry) associated with them. Accordingly, burrows were recounted at both sites, including as "active" all burrows conforming to the appearance of burrows known to be occupied. The following counts were found for "active" burrows on the latter criteria: Halfway Wall Bay, 377 (46 "active" burrows on the primary count); Battery Point, 318 (118 on the primary count). Observations at these sites during daylight, and at the Halfway Wall Bay site at night with a vision image intensifier, showed a little rabbit activity at the Battery Point site (suggesting most "active" burrows may be shearwater burrows) and moderate rabbit activity at the Halfway Wall Bay site (so that perhaps half the "active" burrows may be shearwater burrows).

Comparisons of primary and revised counts of "active" burrows at these two sites suggest that the overall primary counts should be increased 3-8 fold: for the coastal slopes surveyed, total "active" burrows are therefore estimated as 1200-3300 (east side) and 1600-4400 (west side), providing an extreme upper limit of 2800-7700 pairs of shearwaters in these areas combined. An unknown proportion of these burrows is certainly due to rabbit activity, but rabbits were in reduced numbers at the time of the survey because of recent intense cropping. On the other hand, observations at the Battery Point site indicate that there can be a substantial traffic of low-flying shearwaters visiting burrows in the absence of much calling; therefore, areas of coastal slopes excluded from the present survey on the basis of slight calling activity may not necessarily lack breeding shearwaters. (This was confirmed in June-July 1981, when burrows occupied by shearwaters were found on the west sidelands near the Devil's Slide, where very little calling activity was recorded (less than 1% of the nightly total call count) in the 1976 survey of calling birds).

The results of the burrow survey can be summarised as follows:

1. Two sites with concentrations of burrows (Halfway Wall Bay and south of Battery Point) probably had about 500 pairs of shearwaters occupying burrows in late April — early May. At this season (in the first half of the laying period in the Pembrokeshire colonies), these birds are likely to be breeders rather than young (pre-breeding age) adults.
2. Extensive survey of about 40% of the coastal slopes (in those areas where most shearwater calls are heard in June-July) indicates an extreme upper limit of 2800-7700 pairs of shearwaters in the area surveyed, based on the number of active burrows there.
3. New observations show that absence of calling by shearwaters on a few census nights may not be a reliable indication of an absence of birds with burrows, so it is possible that the coastal slopes not covered by the burrow survey actually contain further groups of occupied shearwater burrows.

GENERAL CONCLUSIONS

It is plain that large numbers of Manx Shearwaters visit Lundy in spring and summer. If it is indeed true that most birds present ashore early in the breeding season (during burrow establishment and the first part of egg-laying) are adults of breeding age, then our observations suggest that the population of shearwaters of breeding age associated with Lundy is substantial, and the results of the burrow survey are in agreement with this. Since the area surveyed for burrows was selected on the basis of high levels of nocturnal calling activity, and contained 2800-7700 "active" burrows (representing the maximum possible number of breeding pairs of

shearwaters in the area), and since observations at the Battery Point site showed that there may be considerable shearwater traffic to burrows without a great deal of calling activity, it suggests that the area of sidelands excluded from the burrow survey (about 60% of the island perimeter, many parts of which having burrows of some sort) may also include burrow-occupying breeding-age shearwaters.

These considerations taken together suggest that the size of the breeding colony of Manx Shearwaters on Lundy may be as large as order 4 (i.e. between 1,000 and 10,000 breeding pairs). If that is indeed the case, the Lundy colony would be among the ten largest Manx Shearwater colonies in the British Isles (Cramp *et al.*, 1974). Breeding has not been confirmed by me because I have never had the opportunity to be on the island when fledglings would be exercising at the burrow entrances, and because it is not desirable to dig out burrows unnecessarily. However, there are definite records of Manx Shearwater chicks on the island (see Southern & Tucker, 1944), although not of many individuals.

It may be asked how 1,000 to 10,000 breeding pairs of shearwaters could have gone largely unnoticed if they do in fact occur on the island. Firstly, our burrow survey and general observations of the more open sidelands (without bracken) suggest that there are not any extreme concentrations of burrows, such as occur on Skomer. Thus, on Lundy, groups of breeding shearwaters are probably fragmented into relatively small and scattered sub-colonies which are inherently less conspicuous. Secondly, there is evidently a great extent of burrowable ground along the island sidelands, allowing wide scattering and thus increased inconspicuousness. Finally, finding scattered groups of occupied burrows involves a lot of luck or a lot of man-hours; the former would explain the paucity of earlier reports, and the latter explains our comparative success in this respect.

This is a preliminary report of these studies; a full report is in preparation.

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REFERENCES

- Cramp, S., Bourne, W.R.P. & Saunders, D. (1974). *The Seabirds of Britain and Ireland*. Collins, London, 287 pp.
- Cramp, S. & Simmons, K.E.L. (1977). *The Birds of the Western Palaearctic*. 1, 145-150. Oxford University Press.
- Davis, P. (1954). *A list of the birds of Lundy*. Lundy Field Society. 114 pp.
- Dymond, J. N. (1972). Bird report 1972. *Rep. Lundy Field Society*. 23, 4-30.
- Dymond, J. N. (1980). *The Birds of Lundy*. Devon Bird Watching and Preservation Society, 80 pp.
- Harris, M. P. (1966). Breeding biology of the Manx Shearwater. *Ibis*. 108, 17-33.
- Harris, M. P. (1972). Inter-island movements of Manx Shearwaters. *Bird Study*. 19, 167-171.
- Southern, H. N. & Tucker, B.W. (1944). The Manx Shearwater on Lundy. *British Birds*. 38, 122-129.