MANX SHEARWATERS ON LUNDY
Further Ringing Studies and Observations on Breeding Status

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In an earlier paper (Taylor 1985), information gained from ringing and other observations was shown to indicate that Manx Shearwaters *Puffinus puffinus* attempted to breed on Lundy but were largely unsuccessful. Since then a further 244 Manx Shearwaters have been ringed on the island, forty have been retrapped and three from elsewhere have been controlled. In contrast to earlier work, which had been carried out at a variety of sites, most of this recent ringing effort has been concentrated in a small area. It is a sloping patch of short turf, less than 50m square, just above the cliff top, between the Old Light and the Battery. Compared with surrounding areas there is much less bracken *(Pteridium aquilinum)* and fewer exposed boulders, making the observation and catching of birds considerably easier.

Birds have been found to enter burrows regularly in this area and have been detected underground during the day in April, May and July by playing tape-recordings of Manx Shearwater calls outside the burrows, eliciting calls from the birds inside. In previous attempts to find birds later in the breeding season, in late August and early September, the searches had not been focussed on such a well-established site, so at the end of August 1988 the study area was visited to look for any signs of activity.

RINGING STUDIES, 1986-89

During the four years of this study, fourteen of the forty birds retrapped were caught within three months of ringing but twenty-one were in the year following ringing, four were after two years and one after five years. The twenty-six birds caught after a year or more add greatly to the previously sparse evidence that at least some of the Manx Shearwaters on Lundy have long-term associations with the island.

The 244 birds ringed during this study period can be divided into three groups: those caught in the study area in April and May, which are likely to be potential breeding birds; those caught in the study area in July, likely to be a mixture of breeders and young non-breeding birds; and birds ringed away from the study area in July, in places where there was no evidence of breeding activity. These three categories are compared in table 1.

Table 1: Comparisons between Lundy Manx Shearwater catches at different sites and seasons.

Ringing site	Month	Previously unringed birds:	Birds previously ringed on Lundy:		Subsequent retraps of the previously unringed birds:		Controls:
		Number caught and ringed	Number caught	as % of total catch	Number	as % of birds ringed	Number caught
Study area	April & May	108	22	17%	25	23%	0
Study area	July	76	18	19%	13	19%*	0
Outside the study area	July	60	0	0%	0	0%	3

* Birds ringed in July 1989, which could not have been retrapped within the period of this analysis, have been excluded from the calculation.

Comparing catches in the study area in spring (April and May) with those in July, there are no statistically significant differences in the proportions of retraps caught or the proportions of the birds ringed which are subsequently retrapped. This is perhaps surprising, because if breeding birds are joined by non-breeders in July it might be expected that the catches would be 'diluted' with wandering non-breeders that have little chance of being retrapped, lowering the overall retrapping rate. However, the situation is complicated by the effects of variations in catching methods, discussed below.

Comparing July catches in the study area with those outside the area, the complete absence of retraps in the catches away from the area, and of subsequent retraps generated by these catches, is significantly different from the 19% values in the study area (Retraps in catches: $chi^2 = 14.4$; $p < 0.01$. Subsequent retraps: $chi^2 = 10.7$; p 0.01). This suggests that the birds outside the study area are non-breeders, not faithful to a particular site. If this were not the case, some retraps would have been expected, particularly in Halfway Wall Bay, where fifty birds were caught in several visits to the same site (the remaining ones were caught only about 200m from the study area, again in more than one visit). These results also suggest that the birds visiting the study area regularly limit their activities to that site alone.

Further evidence for the contrast in activities in and out of the study area comes from the controls. All three were caught outside the study area and all were birds unlikely to have formed a site attachment. Two were ringed as pulli on Skomer (Dyfed) and were three and four years old when controlled - below breeding age. The third was ringed as a full-grown bird on Bardsey (Gwynedd) only seven weeks before reaching Lundy, so was unlikely to be breeding that year.

In analysing the results of ringing in the study area in July 1987, it became clear that the ring numbers of birds which were retrapped subsequently were not randomly distributed. Further investigation revealed that all eleven of them were ringed at times when a tape-lure was not being used: tape-luring is found to have a statistically significant effect in reducing the chances of birds being retrapped subsequently ($chi^2 = 10.4$; $p < 0.01$). See table 2.

Table 2: Effects of tape-luring on Manx Shearwater catches on Lundy, July 1987.

Catching method	Previously unringed birds:	Birds ringed previously on Lundy		Subsequent retraps of the previously unringed birds:	
	Number caught and ringed	Number caught	as % of total catch	Number	as % of birds ringed
Without tape-lure	38	7	16%	11	29%
With tape-lure	37	6	18%	0	0%

At first sight it seems contradictory that in July 1987 retraps were caught at similar rates with and without tape-lures. However the records, though not always entirely clear, imply that none of these retraps had been exposed to tape-luring when they were originally ringed, whereas most catching after July 1987 was definitely done using tape-lures. The data suggests that Manx Shearwaters learn to avoid tape-lures in order to avoid being caught a second time. This idea was supported when a short catching session in July 1989 without tape-luring produced twelve birds, five of which were retraps.

Referring back to the comparison between spring and July catches in the study area, differences in the use of tape-lures at these times make it difficult to draw any firm conclusions from the retrap data in these sections of table 1.

SURVEYS OF THE STUDY AREA, 1987-88

In July 1987 a thorough examination of the study area burrows was made in daylight hours. Two burrows were found from which adult Manx Shearwaters called in response to tape-recordings of calls. In another burrow, within arm's reach of the entrance, there were many feathers from an adult bird. The chewed bases of the feather shafts suggested predation. In a fourth burrow there was a broken egg-shell and membrane. The damage to them suggested predation rather than hatching.

In the last week of August 1988, day and night-time surveys of the study area were made. There was no response from any burrow to tape-recordings by day. A large number of burrows had entrances completely overgrown with long grass and clearly had not been occupied recently. Many of the others had clear signs of occupation by rabbits *Oryctolagus cuniculus,* in the form of fur or footprints. There were no signs of Manx Shearwaters such as footprints or down from pulli. At night, in dark conditions normally favoured by shearwaters, there was no sign of emerging young or visiting adults, although tape-luring was tried and extensive torch-light searches of the area were made. Mist-netting was not possible because of wind and drizzle.

These observations are consistent with those discussed in Taylor (1985) and give further support to the idea that, while Manx Shearwaters attempt to breed on Lundy, they are largely unsuccessful because of predation by rats. If this is the case, the population must be sustained by immigration, probably mainly from the large and successful South Wales colonies.

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REFERENCE

Taylor, A.M. 1985. Manx Shearwaters on Lundy. *Annual Report of Lundy Field Society* 36, 23-24.