RATS AND NESTING SEA BIRDS ON LUNDY

By

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ABSTRACT

Between 14th July and 4th August 1992 a young scientists' expedition went to Lundy to continue the work of assessing the rat population and to determine whether there was any interaction between rats and ground nesting sea-birds. Both ship rats and Norway rats were trapped on Lundy at sites mentioned by previous authors and more widely: ship rats were trapped at locations broadly identified in other studies as potential and actual breeding sites for ground nesting birds. No evidence of predation of birds by rats was found.

INTRODUCTION

Lundy provides important breeding sites to sea-birds in South West Britain. However, records show that numbers of nesting birds have been in decline (Webb 1991; Aspinall 1991). It has been suggested that the decline of ground nesting birds (such as puffins and manx shearwaters) on Lundy has resulted from predation and disturbance by rats (Webb 1991; Aspinall 1991; and Warden's Report 1989).

Both the common Norway rat *(Rattus norvegicus)* and the ship (or Black) rat *(Rattus rattus)* occur on Lundy. Rattus rattus is now known to be rare in the United Kingdom, and Lundy may be the only site at which a breeding population survives (Twigg 1992). We are not aware of any documented evidence of interactions between rats and ground nesting sea birds on Lundy (Tattersall *et al.* 1992). Smith *et al.* (1992, 1993) found numbers of both species of rats very low and considered the distribution of *Rattus rattus* to be so restricted that these rats were unlikely to represent a threat to ground nesting sea birds. Other factors which may be responsible for the decline in the number of ground nesting sea birds include disturbance by tourists and their dogs, gulls, livestock and rabbits. The latter is particularly worthy of study since recent observations (Smith *et al.* 1991 unpublished observations) noted extensive erosion of cliff tops through the activities of burrowing rabbits.

In the summer of 1992 we mounted an expedition to investigate the possible interactions between rats and sea-birds. Our aims were, i) to assess the distribution of rats over the whole of Lundy, and ii) to assess other potential factors leading to the disturbance of ground-nesting seabird nesting sites.

METHODS

a. MONITORING FOR SIGNS OF RATS

Pieces of candle (approximately 25mm x 10mm) were placed all over the island among rocks, on top and at the base of walls, in buildings and in drains and other likely rat runs (fig. 1). At each position, two pieces of candle were placed close together. The presence of teeth marks on the candles was indicative of the presence of rats. It was not possible

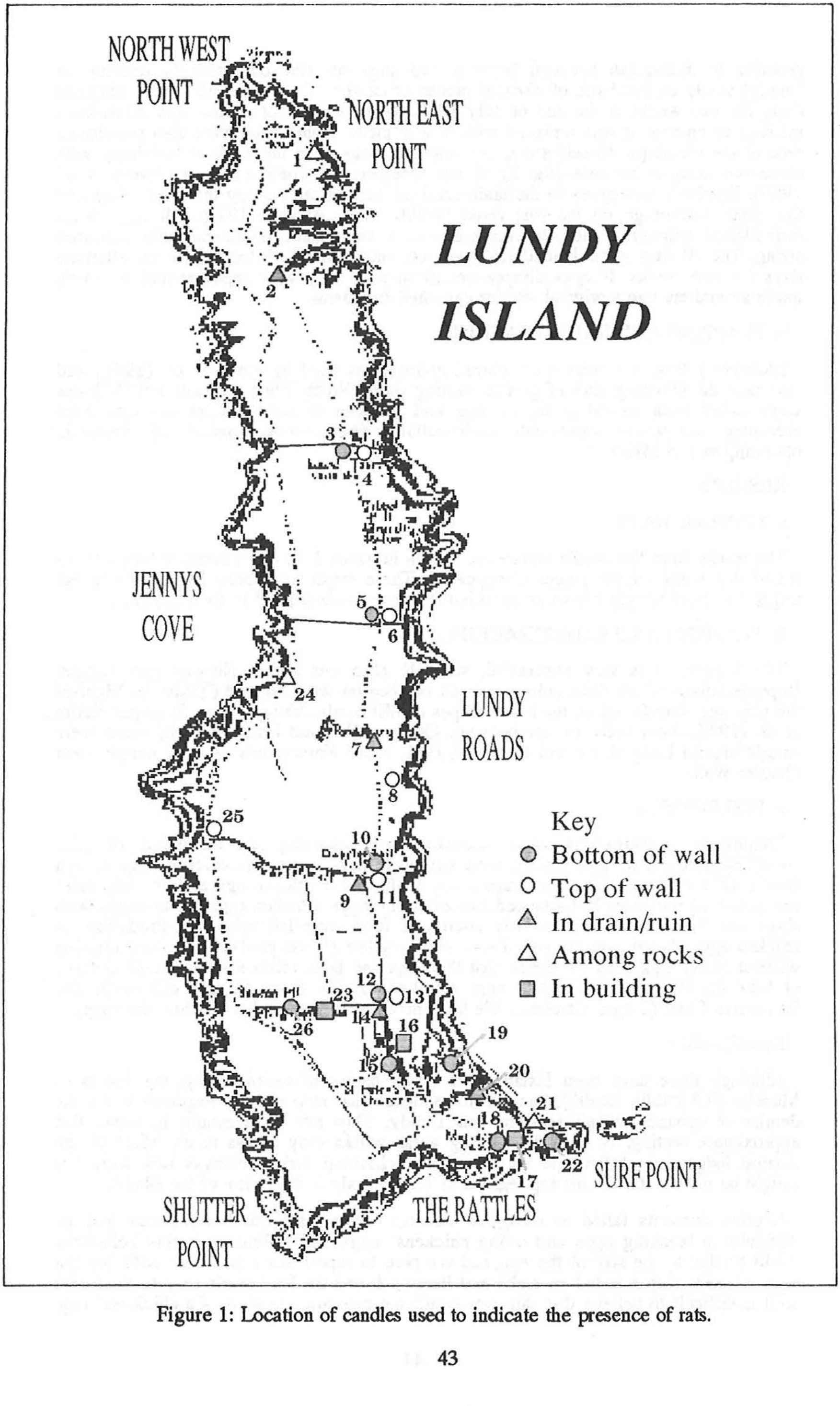

Figure 1: Location of candles used to indicate the presence of rats.

possible to distinguish between Norway and ship rats (the only rodents present on Lundy) solely on the basis of chewed pieces of candle. The candle sites were checked daily for two weeks at the end of July 1992. When a piece of candle was discovered missing or chewed it was replaced with a new piece. Hens' eggs were also positioned around the island (in 40 selected sites) between rocks or in the walls of buildings with close proximity to rat runs (fig. 2), to test whether rats would eat them (Avery *et al.* 1989). Emphasis was given to the main sea-bird nesting areas along the west coast and the Inner Anchorage on the east coast (Webb 1991; Aspinall 1991). All eggs were individually numbered and sites marked with a stick made prominent with coloured string. The 40 sites were divided into two sets and each set visited in turn on alternate days for two weeks. If eggs disappeared from sites they were replaced and a search made around the egg's original site for egg shell fragments.

b. TRAPPING AND RADIOTRACKING

Bledoberry type live traps were placed at locations used by Smith *et al.* (1991) and also near the breeding sites of ground nesting birds (Webb 1991; Aspinall 1991). Traps were baited with mixed grain, an egg and a piece of candle. Captured rats were measured and where appropriate radio-collared (transmitters supplied by Biotrack, operating at 173 MHz).

RESULTS

a. SIGNS OF RATS

The results from the candle survey are shown in Table 1. In more exposed areas it was found that many candle pieces disappeared. These might have been taken by rats but might also have simply blown away: missing pieces were ignored in the analysis.

b. TRAPPING AND RADIOTRACKING

The trapping was very successful, with 41 ship rats and 3 Norway rats caught. Representatives of all three colour morphs of ship rat were trapped (Table 2). Most of the ship rats were found on the lower slopes of Millcombe Valley (Table 3) as per Smith *et al.* (1993). Four were caught between Quarter Wall and Halfway Wall; three were caught around Long Roost and the North End. Three Norway rats were all caught near Quarter Wall.

c. EGG SURVEY

Preliminary investigations were inconclusive in assessing the likelihood of rats' predating on chicken eggs. No rats were caught in traps using only chicken eggs as bait (N=5). Of the 48 rats caught in traps using grain and a chicken egg as bait only three rats (all *R. Norvegicus*) had attacked and eaten the eggs. Chicken eggs left in cages with ships rats for 24 hours as the only source of food were left unbroken. Predation on chicken eggs placed over the island was also very low (8/280 predated; 34 went missing without trace). Egg shell (evidence that the eggs had been attacked) was found at three of the forty sites: North Light (4 eggs attacked); Puffin Slope (2 eggs attacked); and Benjamins Chair (2 eggs attacked). We have no evidence as to what attacked the eggs.

DISCUSSION

Although there have been instances of rat predation of sea-birds, e.g. the Freira of Madeira (ICI Public Health), there is no evidence that ship rats are responsible for the demise of ground nesting sea-birds on Lundy. Ship rats were caught in areas that approximate nesting, or potential nesting areas within easy access to us. Most of the nesting ledges are difficult to get to without climbing tackle. Norway rats were not caught on the coastal or cliff top regions of Lundy, only in the centre of the island.

Captive ship rats failed to recognise chicken's eggs as food. Norway rats had no difficulty in breaking open and eating chickens' eggs. The difference in this behaviour could be due to the size of the egg and we plan to repeat this experiment with bantam eggs. Captive ship rats fed on crabs and limpets found the hard shells easy to deal with so it is difficult to believe that ship rats could not puncture the shell of a chickens' egg.

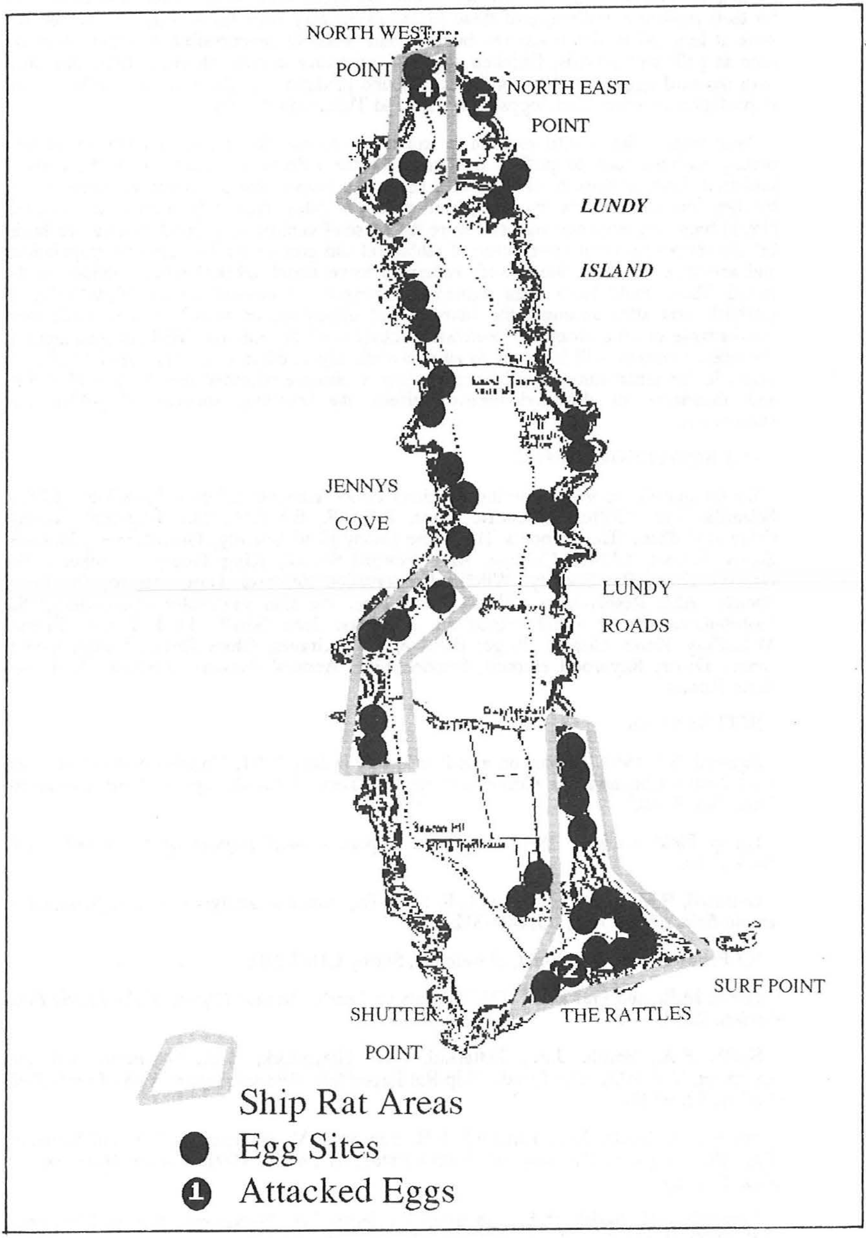

Figure 2: Ship rat areas and sites where hens' eggs were placed around Lundy.

Placing the chicken eggs in burrows around the island created more realistic conditions for their predation and some of these (8/280 (3%)) may have been taken by rats as they were at least 30cm down narrow burrows and probably inaccessible to other predators such as gulls and corvids. Chicken eggs may well vary in size, shape, colour, and smell from sea-bird eggs but other studies have found predation on chicken eggs to be similar to predation on other birds'eggs (Gottfried and Thompson 1978).

Other factors that could explain or contribute to the decline in number of ground nesting seabirds such as puffins on Lundy include a decrease in sand eels, the puffins' preferred food; occlusion of nest sites on grassy slopes due to extensive coverage by bracken and disturbance by gulls and mammals other than rats. Perrin and Gurnell (1971) found no evidence that rats were the cause of decline in ground nesting sea birds, but did propose careful monitoring of rabbit, rat and ground nesting sea bird populations and activities. In 1991 there were estimated to be about 20,000 rabbits living on the island. There could have been tremendous pressure on ground-nesting birds trying to establish nest sites amongst the burrows and grassy slopes which in turn underwent considerable erosion from the burrowing activities of the rabbits. Without management the rabbit numbers will increase to an overwhelming number in a very small number of years. In the mean time it will be interesting to observe whether the absence of rabbits and abundance of deserted burrows affects the breeding success of puffins and shearwaters.

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REFERENCES

Aspinall, S.J. 1991. Report on a visit to Lundy in July 1991. Unpublished report to the Joint Nature Conservation Committee, Seabird Team, 1 Southampton Road, Lyndhurst, Hants SO43 7BU.

Lundy Field Society. 1989. Warden's Report. *Annual Report of the Lundy Field Society*, 40.

Gottfried, B.M., and Thompson, C.F. 1978. Experimental analyses of nest predation in an old field habitat. *Auk*, 95, 304-312.

ICI Public Health, Fernhurst, Haselmere, Surrey GU27 3JE.

Perrin, M.R., and Gurnell, J. (1971). Rats on Lundy. *Annual Report of the Lundy Field Society,* 22, 35-40.

Smith, P.A., Smith, J.A., Tattersall, F.H., Natynczuk, S.E., Seymour, R.S. and Lancaster, V. (1992). The Lundy Ship Rat Expedition. *Annual Report of the Lundy Field Society,* 42, 95-98.

Smith, P.A., Smith, J.A., Tattersall, F.H., Lancaster, V., Natynczuk, S.E. and Seymour, R.S., 1993 in press. The ship rat *(Rattus rattus)* on Lundy, 1991. *Comm. Mam. Soc., J. Zool.* (Lond.).

Tattersall, F.H., Smith, P.A., Lancaster, V., Smith, J.A., Natynczuk, S.E. and Seymour, R.S., 1992. Sea birds and rats on Lundy. Report to the RSPB.

Twigg, G.I., (1992). The Black Rat *Rattus rattus* L. in the United Kingdom in 1989

Mammal Review, 22, (1) 33-42.

Webb, A. (1991) Report on survey of burrow-nesting seabirds on Lundy, 1-5th June 1991. Unpublished report to the Seabirds at Sea Team, Joint Nature Conservation Committee, 17 Rubislaw Terrace, Aberdeen AB1 1XE.

Location	Description	Number of candles	Number chewed	% Chewed
1	Rocks	2	1	50
2	Drain/run	16	2	13
3	Wall base	16	3	13
4	Wall top	16	0	0
5	Wall base	16	1	6
6	Wall top	15	3	13
7	Drain/run	16	1	6
8	Wall top	13	0	0
9	Wall top	16	4	25
10	Wall base	15	1	7
11	Drain/run	9	1	11
12	Wall base	16	1	6
13	Wall top	15	2	13
14	Drain/run	16	1	6
15	Wall base	16	2	13
16	Building	16	1	6
17	Building	16	1	6
18	Wall top	16	0	0
19	Wall base	14	0	0
20	Drain/run	14	0	0
21	Rocks	14	0	0
22	Wall base	14	6	43
23	Building	11	4	36
24	Rocks	14	0	0
25	Wall top	11	1	9
26	Wall base	14	1	7

Table 1: Results of 'candle survey' of rat distribution. For locations see Fig. 1. Total left is the number of candle sections placed at each location.

Species & morph	place & date of capture	sex	body length	tail length	body/tail ratio	ear length	foot length
R.rattus (rattus)	26-7-92 (3)	F	ESCAPED				
R.rattus (rattus)	26-7-92 (3)	juv.					
R.rattus (frugivorus)	26-7-92 (4)	F lac.	22.5	24.0	107%	2.25	3.66
R.rattus (frugivorus)	26-7-92 (4)	F lac.	24.5	23.0	94%	2.48	3.50
R.rattus (frugivorus)	26-7-92 (4)						
R.rattus (frugivorus)	26-7-92 (4)	M	21.6	21.6	100%	2.36	3.55
R.rattus (frugivorus)	26-7-92 (4)	F perf.	21.5	25.0	116%	2.43	3.23
R.rattus (frugivorus)	26-7-92 (4)						
R.norvegicus	27-7-92 (6)	F perf.	24.0	18.4	77%	2.10	3.66
R.norvegicus	27-7-92 (6)	M	26.7	16.5	62%	2.20	4.16
R.rattus (rattus)	27-7-92 (9)		ESCAPED				
R.rattus (frugivorus)	27-7-92 (1)						
R.rattus (rattus)	27-7-92 (2)						
R.norvegicus	28-7-92 (6)	M	recapture				
R.rattus (alexandrinus)	28-7-92 (9)	F	tail caught in trap: released				
R.rattus (alexandrinus)	29-7-92 (7)						
R.rattus (alexandrinus)	29-7-92 (14)	F	21.3	21.7	102%	2.40	3.70
R.rattus (rattus)	29-7-92 (3)	F lac.	19.4	22.6	116%	2.35	3.80
R.rattus (frugivorus)	30-7-92 (4)	F lac	recapture				
R.rattus (rattus)	30-7-92 (4)	M juv.	17.5	17.3	99%	2.19	3.48
R.rattus (rattus)	30-7-92 (4)	M juv.	18.9	18.8	99%	2.26	3.48
R.rattus (rattus)	30-7-92 (4)	F preg.	18.6	22.3	120%	2.33	3.64
R.rattus (frugivorus)	30-7-92 (4)	F perf.		20.3		2.22	3.40
R.rattus (alexandinus)	30-7-92 (4)	M scrt.	26.0	22.2	85%*	2.50	3.80
R.rattus (rattus)	30-7-92 (4)	M juv.	18.1	19.7	109%	2.32	3.60
R.rattus (frugivorus)	30-7-92 (4)	F lac.	recapture				
R.rattus (frugivorus)	30-7-92 (4)	M abd	22.0	23.0	104%	2.25	3.70
R.rattus (rattus)	30-7-92 (16)	F preg.	20.0	21.0	105%	2.55	3.57
R.rattus (frugivorus)	30-7-92 (17)	M	16.5	17.3	105%		
R.rattus (frugivorus)	30-7-92 (15)	M scrt.	20.7	21.0	101%	2.43	3.77
R.rattus (frugivorus)	31-7-92 (18)	M	23.8	25.0	105%	2.42	3.92
R.rattus (frugivorus)	31-7-92 (18)	F lac.	20.6			2.57	3.78
R.rattus (frugivorus)	31-7-92 (21)	M abd	22.3	19.8		2.51	3.68
R.rattus (rattus)	31-7-92 (22)	M	22.3	21.9	102%	2.42	3.62
R.rattus (frugivorus)	3-8-92 (4)	F lac.		23.3			
R.rattus (frugivorus)	3-8-92 (4)	F lac.	recapture				
R.rattus (frugivorus)	3-8-92 (4)	F perf.	recapture				
R.rattus (frugivorus)	3-8-92 (4)	M abd	recapture				
R.rattus (rattus)	3-8-92 (4)	F perf	recapture				
R.rattus (rattus)	4-8-92 (4)	F juv.					
R.rattus (rattus)	4-8-92 (4)	M srct	recapture				
R.rattus (rattus)	4-8-92 (4)	F perf.	recapture				
R.rattus (rattus)	4-8-92 (4)	F perf.					
R.rattus (rattus)	4-8-92 (4)	M scrt					
R.rattus (frugivorus)	4-8-92 (4)	M abd	recapture				
R.rattus (rattus)	4-8-92 (4)	M juv.					
R.rattus (frugivorus)	4-8-92 (4)	F juv.	17.0	14.0	82%		3.40

* part of tail missing

Table 2: Details of rat captures on Lundy between 26th July and 4th August 1992. See Table 3 for trap locations. Rats with no details were not anaesthetized and thus not measured. Lac = lactating; juv. = juvenile; perf. = perforate; scrt. = scrotal; abd = abdominal

area	code	traps placed	trap nights	no. captures + (recaptures)
Millcombe village	1	6	30	1
Millcombe gardens	2	1	2	2
Millcombe vallue	3	2	8	8
Cliffs below (3)	4	10	71	19 (9)
Sewer	5	1	4	0
Quarter Wall	6	1	3	2 (1)
N/end Virgin's Spring	7	2	4	1
North Light Bridge	8	1	3	0
N/end Long Roost (N)	9	7	14	2
N/end Long Roost (S)	10	8	16	0
North East Point	11	4	4	0
Threequarter Wall	12	4	8	0
Halfway Wall	13	3	6	0
Jenny's Cove	14	8	8	1
Quarry Bay	15	4	4	1
Rhododendron stand (N)	16	2	2	1
Rhododendron stand (S)	17	2	2	1
Battery Point	18	9	4	2
West Side near Old Light	19	4	8	0
Pilots Quay Aarea	20	4	12	0
Rocket Pole	21	6	4	1
Castle Cottage	22	4	5	1
Old Light	23	5	2	0
TOTAL		98	224	43

Trapping efficiency = 19.2% including recaptures
= 14.7% excluding recaptures

Table 3: Rats caught between 26-7-92 and 4-8-92. *Rattus norvegicus* were only caught at the Quarter Wall and account for all captures at this site. Twenty eight traps were placed in Millcombe Valley and the cliffs below on the last two days of the expedition to recover radio collars; these accounted for seven of the recaptures.