BAT RESEARCH ON LUNDY ISLAND 2014-18

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ABSTRACT

The study, carried out between 2014-18, aimed to survey bat presence and activity at different locations and sites across Lundy i.e. water bodies, woodland, buildings, selective caves and tunnels. Methods used included: short and long duration static bat detector recording; building, cave and tunnel inspections; bat emergence surveys; bat trapping and radio tracking. Eleven bat species were recorded, some of which will only be transitory and day roosting for short periods. Common Pipistrelle was the most common resident on the island but the fluctuations in numbers suggested that there is regular interchange to/from the mainland.

Key words: *Lundy, bat species, static monitoring, bat migration, bat roosts, radio tracking.*

INTRODUCTION

Long term studies of bat movements in Europe have shown that most species migrate up-to 2000km and this is also the case for one of smaller species, *Pipistrellus nathusii.* All other species can move annually distances up to several times their daily range. Hutterer *et al*. 2005 reviewed over 70 years of bat ringing records of over 1 million bats. The results showed that most bat species migrate. Of those occurring in the UK, most were recorded traveling seasonally at least 300km, with some over 1500km (Noctule & Leislers), and up to over 1900km (Nathusius Pipistrelle*)*.The species considered to be mainly sedentary (Long-eared, Bechstein's, Lesser & Greater Horseshoe) were still found to occasionally move seasonally, with Greater & Lesser Horseshoe ranging up to 320km & 153km respectively, and others over 70km.

Lundy is a small island composed mainly of granite with steep ground or cliffs rising over 100m to a flat plateau with highest ground of 143m, partially intersected by one short, wooded valley/coombe in the southeast. The island is around 5km long and 1.3km wide. It is located 18km north of Hartland Point and 27km west of Baggy Point in North Devon, well within the migratory range of bats. The aim of the study was to increase the knowledge of Bat's use of Lundy and to try to determine if migration was occurring through the island.

METHODS

Objectives

The main objectives were:-

- To determine which bat species occur on Lundy.
- To find where resident bats roost and decide the roost status.
- To investigate whether there is seasonal variation in bat activity levels and whether migration occurs.

These were to be achieved as follows:-

- Long term static monitoring by bat detectors to determine species present and changes throughout the year.
- Island-wide static monitoring by bat detectors to determine species present and snapshots of activity in May and September.
- Attempted trapping and radio tracking to determine roosts and activity on and/or passage through the island in September.
- Investigation of most buildings by bat activity surveys and some by inspection to determine bats occupying them.
- Investigation of accessible caves and a tunnel (Benson's Cave) to determine bat use.

Long term static monitoring 2014-2015

Two Batcorder bat detector units were used, powered by solar panels through a voltage controller. Control units daily transmitted details of previous night's recordings, card space and voltage of systems by mobile text. Figure 1 shows the locations of the two static detectors fixed to trees. Bat detector one was located on a tree at the head of Millcombe valley below the east side of the village and recorded from April 2014 to August 2015. Bat detector two (Plate 1) was located on a tree in Quarter Wall Copse on steep ground southwest of Quarry Bay, and recorded from May 2014 to August 2015.

Figure 1: Locations of Bat Detectors on Lundy.

Island-wide short duration static recording

On the 1st September 2015 a single night recording sessions was carried out at: Quarry beach, Landing Beach, Rat Island, Pondsbury and inside St Helen's Church.

From 26th May-2nd June 2018 multiple night recordings were made at the following locations: Battery, Benjamin's Chair, Jetty, Jenny's Cove, Millcombe, Mouse Hole & Trap, Path to North Light and Quarry Pool.

Plate 1: Bat detector two in Quarter Wall Copse.

Building inspections

In 2015 there was a check by Laura Holmes and Tereza Rush who conducted several potential roost inspections. Sites included the following: -

- Square cottage
- Fire Station
- Old House South
- Old House North
- The Battery
- The Church
- Quarter Wall cottage
- Felix Gade Bothy
- Millcombe House outbuilding

Plate 2: Queen Mabb's Grotto.

Plate 3: Benson's Cave.

Caves

Watson (2012) provides an up-to-date list of the caves on Lundy. Five caves and a tunnel that could be reached easily and by straightforward scrambling were investigated. These were: Benson's cave (tunnel), subterranean passage under Rat Island, cave at Mousehole & Trap, Landing Key cave, Sentinels cave and Queen Mabb's Grotto.

It would be a project in itself to investigate all the island's caves for bats. A number of factors severely restrict surveying the caves:-

- Most are very difficult to access, with vertical cliffs and tidal conditions.
- The majority are used by resident Grey Seals throughout the year so preventing access to most caves at sea level.
- Important colonies of sea birds nest on the island particularly on the west and south coasts preventing access during the nesting season.
- Sea conditions are frequently unsuitable for access close to the cliffs by boat.

Bat emergence surveys

These were carried out mainly by Tereza Rush at: -

- Square Cottage
- Fire Station
- Old House South
- Old House North
- Farm barn
- Quarter Wall cottage
- The Church

Trapping and radio tracking

Trapping and radio tracking were undertaken under Natural England licence 2015-8374-SCI-SCI. On the 1st to 5th September 2015 three surveyors stayed on Lundy; a fourth surveyor was due to take part with a hired boat and skipper that would work throughout the night with radio tracking from the sea, but strong north east winds meant the idea had to be abandoned.

Trapping was carried out at Quarry Pond and in Millcombe Valley on three nights, bats were caught in single height mist nets. After capture, bats were held in catch bags before biometric data were obtained. Animals were identified, measured, sexed, and the reproductive condition of females was assessed. Bats if in good health, of a good size and not heavily pregnant, were radio tagged They were fitted with lightweight radio-tags of maximum weight 0.31g. By adding the weight of the glue the maximum weight that each bat could carry was set at no more than 5% of its body weight. The transmitters had an expected battery life of at least 7 days.

The transmitters were attached to the back of the bats between the scapulae, the fur was trimmed, and the tag was glued close to the skin using surgical ostomy cement (Salts adhesive), then the bats were put into a bag to settle / calm down and for the glue to dry prior to release. No injuries or excessive stress to any bats resulted from the catching and tagging, and all bats were recorded feeding afterwards. Tagged bats were released and radio-tracked for up to four consecutive nights. The ferry 'round island tour' was used to locate the Pipistrelle in the eastern cliff.

Two fieldworkers, experienced in radio-tracking, used *Australis* 26K or *Sika* radio receivers with

Yaggi rigid aerials to track bats. Both receivers are able to automatically scan through the different frequencies, which made it possible to search for more than one tagged bat at any time.Bespoke recording sheets were used to record data and a combination of radio sets and mobile phones were used for two-way communication. Accurate bearings of bat locations were taken from handheld sighting Silva Expedition 54 compasses. Global Positioning System devices were used to increase the speed and accuracy of the surveyors supplying exact location of surveyors continuously. Bearings of up to 1° accuracies were obtained. The data used in this report were gathered by using joint bearings (fixes, positive contact).

For all tagged bats the following data were recorded: -

- Observer location.
- Bat ID number.
- Triangulation bearings.
- Apparent location, route and behaviour.
- Roost location and details when located.

Whenever bats were commuting or at their first foraging sites, they were usually observed from fixed, often elevated points chosen where good radio reception was available, such as at high or other suitable vantage points. Where possible surveyors made close approaches to bats, to ascertain the exact foraging area and behaviour or to commence pursuit if the bat was moving away. Tracking ended when all bats had returned to the roost, moved too distant or were static.

At the start of each survey night, environmental conditions were noted. These included wind strength and direction, rainfall, cloud cover and air temperature. Any significant changes in weather throughout the survey period were also noted. Daytime work included verifying roost occupation, recording and plotting out results and investigation of any night roosting sites discovered during the tracking sessions.

The locations of the tagged bats were recorded in regular intervals throughout the night by simultaneous triangulating the signal direction. Two or three field workers co-ordinated their simultaneous bearings remaining in contact with one another using hand-held licensed channel FM- radios. Time, location of observers, bearings on the bats, accuracy data and general observations were recorded in the field onto bespoke data sheets. The positions of the bats in the field were calculated from the bearings using software package Locate III (2011).

Limitations

Underground sites

It was not realistic to access many of the caves and mines due to the presence of seals and seasonal nesting seabirds. In addition, the high rifts in some of the longer caves would be difficult to view/access. We believe a number of migrating bats may stop over in caves, but it is difficult to prove.

Radio tracking

The accuracy of a radio location varies with habitat type and may result in biased estimates of observed habitat use, Lundy's physical structure creates two extremes: signals being completely shielded (so zero reception) or good vantage from cliff tops to pick up signals to a distance.

Weather conditions (see Table 1) were suitable for bat emergence and foraging throughout the duration of our study (1st to 5th September 2015).

Building surveys

Even though repeat surveys were conducted of some buildings the nature of temporary transitional Day-roosts means that it is likely that bats were absent on some surveys.

RESULTS

Long-term static monitoring 2014-2015

Batcorder 1 (Millcombe):-

- The majority of recorded calls were Common Pipistrelles *(Pipistrellus pipistrellus)* followed by unidentified Pipistrelle species *(Pipistrellus spp.),* Soprano Pipistrelles *(Pipistrellus pygmaeus)* and unidentified bat species.
- Greater Horseshoe bats *(Rhinolophus ferrumequinum)* were recorded in low numbers mainly towards the beginning of the season.
- More unusual species included Nathusius Pipistrelle *(Pipistrellus nathusii),* Barbastelle *(Barbastella barbastellus)* and Savi's Pipistrelle *(Pipistrellus savii)*, species not considered resident in the UK.

- Other species included Noctule *(Nyctalus noctula)*, Long-eared bat *(Plecotus spp.)* and Myotis species *(Myotis spp.)* in low numbers. Myotis bats were mostly not identified to species with the exception of individual Natterer's bats *(Myotis nattereri).*
- Peak activity occurred between mid-August and mid-September.

Batcorder 2 (Quarter Wall Copse):-

- The vast majority of recorded calls were Common Pipistrelles *(Pipistrellus pipistrellus)* up to 98%.
- Greater Horseshoe bats *(Rhinolophus ferrumequinum)* were recorded throughout May, in relatively high numbers.
- More unusual species included Alcathoe bat *(Myotis alcathoe)* – a species only recently discovered and Kuhl's Pipistrelle *(Pipistrellus kuhlii)*, a species not considered resident in the UK and Nathusius Pipistrelle *(Pipistrellus nathusii).*
- Other species included Soprano Pipistrelle *(Pipistrellus pygmaeus)*, Noctule *(Nyctalus noctula)* and Long-eared bat *(Plecotus spp.)* as well as a Pipistrelle of unidentified species *(Pipistrellus sp.).*
- Peak activity occurred between the second week of August and the end of August.

Unfortunately, no weather data was available for most of this recording period as Warden Rebecca MacDonald reported the weather station was defective.

Island-wide short duration static recording

Table 1: Static bat detector recordings 1-2 September 2015.

Site Landing beach Quarry beach	Common Pipistrelle 13 3 + social calls	Savi's Pipistrelle	Natterer's
Rat Island	1127	1	2
Pondsbury			
Inside Church			

The social calls recorded on Quarry Beach suggest male roost(s) in cliffs close to the Pipistrelle cliff roost. High Common Pipistrelle foraging activity occurred on south (sheltered) side of Rat Island likely to be due to brisk NE winds.

Table 2: Static bat detector recordings 26th May to 2nd June 2018

Site	Date	Common Pipistrelle	Nathusius Pipistrelle	Savis Pipistrelle	Myotis
Battery	26/05/2018				
	27/05/2018				
	28/05/2018				
	29/05/2018				
	30/05/2018				
Benjamins Chair	26/05/2018	3			
	27/05/2018	5			
	28/05/2018	52	23		1
	29/05/2018	4			
	30/05/2018				
	31/05/2018				
	01/06/2018				
Dive Hut on the Jetty	26/05/2018				
	27/05/2018				
	28/05/2018	2			
	29/05/2018				
	30/05/2018				
	31/05/2018				
	01/06/2018				
	27/05/2018				
	28/05/2018	4			
	29/05/2018	2			
	30/05/2018	3			
	31/05/2018				
	01/06/2018				
	27/05/2018	13	1		
	28/05/2018	1			
	29/05/2018	1			
	30/05/2018				
	31/05/2018				
	01/06/2018	4			
Millcombe	26/05/2018	1			
	27/05/2018	4			
	28/05/2018	4	1		
	29/05/2018	3			
	30/05/2018	34			
	31/05/2018				
	01/06/2018	4			
Mouse Hole & Trap	26/05/2018				
	27/05/2018				
	28/05/2018				
	29/05/2018				
	30/05/2018				

Site	Date	Common Pipistrelle	Nathusius Pipistrelle	Savis Pipistrelle	Myotis
Path to North Light	26/05/2018				
	27/05/2018				
	28/05/2018	4			
	29/05/2018	2			
	30/05/2018	3			
	31/05/2018				
	01/06/2018				
Quarry Pool	26/05/2018	3			
	27/05/2018	373	48		
	28/05/2018	345	10		
	29/05/2018	92	5		
	30/05/2018	115			
	31/05/2018				
	01/06/2018	519	53	1	1
	02/06/2018	1638	148		

These recordings showed significant numbers of Nathusius Pipistrelle (a migratory species) either temporarily resident before moving on or continuously passing through at the end of May/early June, not present in September 2015.

Surveys for roosts in buildings and underground sites and bat emergence surveys. Old House South was possibly a small nursery before 2010 of Common Pipistrelle bats but since then a day roost of small numbers of individuals.

Signs of Greater Horseshoe bats were found in Queen Mabbs Grotto and The Battery. It is most likely they roost in other caves when moving seasonally.

Table 3: Roost Surveys.

Site	Findings	Type of roost
Bensons Cave	Odd droppings	Night
Queen Mabb's Grotto	10+ GHS & 6+ LE or Myt	Night, possibly day
Sentinel Cave	2 droppings	Night
Landing Quay Cave	Droppings	Night
Square Cottage	1x 45P emerging	Day
Fire Station	1x 45P emerging	Day
Old House South	c24x 45P bats resident 2010 & before	Possibly nursery or day
	5x 45P bats resident 2013	Day
	3x Pp droppings in attic 2015	Day
Old House North	1x Pp dropping in attic 2015	
The Battery	1x BLE bat and GHS & Pp droppings	Day & night
The Church	2 droppings	Day
¼ Wall Cottage		Day
Felix Gade Bothy	Droppings	Night
Millcombe outbuilding	Droppings	Night

45P – Common Pipistrelle, BLE – Brown Long-eared, GHS – Greater Horseshoe, Pp – Pipistrelle species

Tracking

During the September 2015 fieldwork on the island only four species were recorded foraging on the island, over three nights in different locations. Two bats were caught and radio tagged, a female Common Pipistrelle and a female Brown Long-eared Bat. The Common Pipistrelle was recorded late into the first night heading several kilometres (>5km) out to sea towards Baggy Point (27km away) subsequently it was found to have returned, roosting in a Manx Shearwater burrow in a cliff on the east side of the island (Plate 6) for four nights, emerging to feed at Quarry Pond and the east coast each night. The Brown Long-eared headed south later in the night and probably left the island towards Hartland Point (18km away).

Plate 4: Pipistrelle Bat © Geoff Billington.

Plate 5: Long-eared Bat © James Shipman.

Plate 6: Location of the Manx Shearwater burrow roost on the east side cliffs.

Plate 7: The Battery, the location of a bat roost on the west side of Lundy © Alan Rowland.

Table 4: Weather during trapping and tracking

Date	Temp C	Rainfall mm	Wind km/hr	Cloud %
01-09-15	15-16	0	19-34	29-87
02-09-15	14-16	0.2	22-36	49-79
03-09-15	14	0	19-39	40-85
04-09-15	14-15	0.4	25-41	37-88
05-09-15	15-17	0	24-40	46-78

Table 5: Captured bats

Bat species	sex	age	breeding condition	date of capture	location	Grid ref.	Forearm/ weight
Common Pipistrelle	F	adult	Post- lactating	01-09-15	Quarry Pond	SS13786450	31.1/5.5
Brown Long- eared	M	adult	nulliparous	02-09-15	Millcombe Valley	SS14024402	39.0/7.4

CONCLUSIONS

Nine species of bat were recorded and are listed below, together with their status on the island.

Table 6: Bat species and island use.

Bat species	Use of island	Migratory
Common Pipistrelle	Resident day roosting, possibly nursery before 2010, moves between island and mainland	Not indicated
Soprano Pipistrelle	Odd bats day roosting on the island, passing through island in September	Yes
Savi's Pipistrelle	Possible individual bats day roosting, passing through island in September	Yes
Nathusius Pipistrelle	Odd bats resident day roosting on the island, passing through island in July & September	Yes
Barbastelle	Odd records, probably visiting from mainland	Not indicated
Noctule	Odd records, probably visiting from mainland	Not indicated but they do migrate so probably not via the island
Great Horseshoe	Only recorded in May & early June passing through the island resident day roosting for limited periods	Yes
Brown Long-eared	Resident day roosting, moves between island and mainland	Not indicated
Natterer's	Resident day roosting	Not indicated

Four bat species were found to migrate via the island, Greater Horseshoe in early summer and three Pipistrelle species in late summer/early autumn. All migrating bats apparently passed through the island only one way, using alternative routes at the other end of the season.

Four caves and nine buildings were confirmed as bat roosting sites.

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