

RECEIVED

By A King at 1:48 pm, Dec 15, 2020

PRELIMINARY ECOLOGICAL APPRAISAL & PRELIMINARY BAT ROOST ASSESSMENT OF:

GARAGE AT CHARLOTTE HOUSE
GARRISON LANE
HUGH TOWN
ST MARY'S
TR21 0JD

Client: Mr Rob Green

Our reference: IoSWT-BS39

Planning Application Number:

Report date: 8/11/20

Author: Darren Mason

Report peer reviewed: Sarah Mason

Report signed off: Sarah Mason

REPORT ISSUED IN ELECTRONIC FORMAT ONLY

This page is intentionally blank

Contents

Non-Technical Summary	4
1.0 Introduction	5
1.1 Survey and reporting	5
1.2 The application site.....	5
1.3 Details of proposed works	6
2.0 Methodology	7
2.1 Preliminary Ecological Appraisal - Desk Study.....	7
2.2 Preliminary Bat Roost Assessment.....	7
2.3 Classification of building	7
2.4 Surveyor details.....	8
3. Results	10
Preliminary Ecological Appraisal	10
3.1 Pre-existing information on bat species	10
3.2 Statutory and non-statutory sites.....	10
3.3 Habitats surrounding the application site.....	11
3.4 Habitats within the application site	12
Preliminary Roost Assessment.....	13
3.5 External	13
3.6 Internal.....	15
3.7 Summary	16
4. Assessment and recommendations (excluding bats)	16
4.1 Protected sites.....	16
4.2 Nesting birds	16
5. Assessment and recommendations (bats)	17
5.1 Survey constraints.....	17
5.2 Further survey requirements.....	17
5.3 Presence or absence surveys.....	17
5.4 Mitigation.....	18
6. Summary	19
7. Bibliography	20

Non-Technical Summary

- On the 8th December 2020, the Isles of Scilly Wildlife Trust (IoSWT) conducted a Preliminary Ecological Appraisal (PEA) and Preliminary Roost Assessment (PRA) of a detached garage at Charlotte House, Garrison Lane, Hugh Town, St Mary's, Isles of Scilly, TR21 0JD in order to establish baseline conditions, determine the importance of any ecological features within and around the survey area and to establish the actual or potential use of the building by bats to help inform the determination of a future planning application (not submitted at the time of survey)
- This report outlines the findings of the PEA and PRA assessment and provides advice based on the survey's conclusions.
- During the PRA and external/internal inspection of the building was undertaken (where accessible).
- The immediate habitat surrounding the proposed development is considered sub-optimal habitat for foraging bats, most likely due to the potential light spill over the garden from adjacent properties
- However, links to the wider countryside and optimal foraging habitat can be easily navigated to particularly to the west and south initially.
- The garage offers features both externally and internally, which could be used by crevice-roosting species such as Common Pipistrelle. The features are most likely to provide suitable conditions for a non-breeding day or transitional roost.
- The garage's open internal space and exposed roof trusses also provides suitable conditions for a night roost for all species of bat recorded from the area.
- Taken in combination, the characteristics of the building and the surrounding habitat suggests **low roost potential** for bats
- The recommendations of this PEA and PRA are that **one activity survey is carried out, consisting of one dusk emergence survey carried out within the bat active season between May and September.**
- Aside from bats, no other ecological constraints are identified which require consideration to inform the determination of this planning application.
- **It must be noted that this report is not enough to support a planning application.**

1.0 Introduction

1.1 Survey and reporting

This report details the results of a preliminary ecological appraisal (PEA) and a preliminary bat roost assessment (PRA) of a detached garage at Charlotte House, Garrison Lane, Hugh Town, St Mary's, Isles of Scilly, TR21 0JD. The survey was carried out on the 8th December 2020.

1.2 The application site

The garage is located on the western side of Hugh Town, St Mary's (National Grid Reference SV9015310527) on the lower eastern slope of the Garrison. The application site is comprised of a large detached, granite two-storey property and detached single garage, set within its own plot (see Figure 1 below).



Figure 1. Charlotte House general location



Photo 1. North elevation of detached garage

1.3 Details of proposed works

At the time of this survey no planning application had been submitted, though plans were available which propose the removal of the existing roof structure, a raising of the roof height by approximately 1.5m, a change aspect from south to east and a replacement roof covering of corrugated steel.

2.0 Methodology

2.1 Preliminary Ecological Appraisal - Desk Study

A desk study data search was undertaken. This involved carrying out a review of the Local Records Centres (LRC) available records for bat species and publicly available datasets and citations of statutory designated sites of importance for nature conservation for sites within the zone of influence (ZOI) of the survey area (considered to be a maximum of 2km in this case). The desk study was also undertaken to identify habitats and features that are likely to be important for bats and assess their connectivity using aerial photographs.

2.2 Preliminary Bat Roost Assessment

The Preliminary Bat Roost Assessment comprised a survey of the building for bats, signs of bats and features potentially suitable for use by roosting bats, and an assessment of the surrounding habitat in terms of its suitability for commuting and foraging bats.

The survey consisted of a ground-based inspection and a detailed search of the interior and exterior of the building (from ground level), looking for bats and/or evidence of bats including droppings (on walls and windowsills and in roof and loft spaces), rub or scratch marks, staining at potential roosts and exit holes, live or dead bats and features, such as raised or missing tiles, potentially suitable for use by roosting bats. Binoculars, a ladder and a high-powered torch were used as required.

2.3 Classification of building

The building was classified according to its suitability for use by roosting bats. The classification was dependent on a number of factors including (but not limited to):

- Bats and/or signs of bats;
- External and internal features potentially suitable for use by roosting bats (e.g. raised or missing tiles, gaps behind fascia boards etc);
- Setting;
- Night time light levels;
- Disturbance levels;
- Proximity of suitable foraging habitat and commuting routes (e.g. ponds, streams, woodland, large gardens, hedgerows).

The categories used to classify buildings and the survey effort required to determine the presence or absence of bats (as per the Bat Conservation Trust's Bat Survey Guidelines¹, referred to by Natural England in their standing advice to planning officers) are described in Table 1 (see below).

2.4 Surveyor details

The survey was undertaken by Darren Mason BSc (Hons) of the Isles of Scilly Wildlife Trust. Darren has undertaken professional Bat Licence Training and holds a Natural England WML-A34-Level 2 (Class 2 License); registration number: 2020-46277-CLS-CLS which permits him to survey bats using artificial light and endoscopes and capture bats using hand and hand-held static nets.

Table 1 – Description of the categories used to classify a building’s bat roost potential and the survey effort required to determine the likely presence or absence of bats

	Roost status	Description	Survey effort required to determine the likely presence or absence of bats
Bat Roost Potential	High	Numerous features potentially suitable for use by roosting bats, optimal or good quality bat foraging habitat nearby and good habitat connectivity. Alternatively, a building with fewer features potentially suitable for use by roosting bats and optimal foraging habitat nearby.	Three dusk emergence and/or pre-dawn re-entry surveys between May and September. Optimum period May – August. Two surveys should be undertaken during the optimal period and at least one survey should be a pre-dawn survey.
	Moderate	More than a few features potentially suitable for use by roosting bats, good foraging habitat nearby and limited habitat connectivity. Alternatively, a building with a few features potentially suitable for use by roosting bats but optimal foraging habitat nearby.	Two or three dusk emergence and/or pre-dawn re-entry surveys between May and September (but only if features will be affected by the proposals).
	Low	Only a few features potentially suitable for use by roosting bats but good bat foraging habitat nearby. Alternatively, a building with more than a few features potentially suitable for use by roosting bats but sub-optimal foraging habitat nearby and limited habitat connectivity.	One or two dusk emergence and/or pre-dawn re-entry surveys between May and September (but only if features will be affected by the proposals).
	Negligible	Very few features potentially suitable for use by roosting bats and / or in an area (such as a densely populated urban area) which has limited habitat connectivity and poor foraging habitat.	No further surveys required.

Table 1. Categorising and classifying a building’s bat roost potential

1 Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust

3. Results

Preliminary Ecological Appraisal

3.1 Pre-existing information on bat species

The desk study showed that no species of bat had previously been recorded within the building. A data search of LRC records for bats revealed information on 6 species of bat recorded within the 2km ZOI of the site. The species conclusively identified were Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*) and Brown Long-eared Bat (*Plecotus auritus*) both UK Biodiversity Action Plan (BAP) priority species, Whiskered Bat (*Myotis mystacinus*) and the rare Nathusius Pipistrelle (*Pipistrellus nathusii*). Several bat roosts are known to exist within the 2km of the proposed development, with 2 known roosts within 500m of the property.

3.2 Statutory and non-statutory sites

In addition, the desk study revealed the presence of the following statutory designated sites within the 2Km ZOI of the site:

- i.) **Peninnis Head SSSI** – Lying 750m south east of the proposed development is Peninnis Head SSSI. The site designated primarily for its maritime heathland, maritime grassland and scrub habitats together with good populations of a number of rare plant and lichen species, in addition to its significant quaternary geomorphology.
- ii.) **Lower Moors SSSI** – Situated 840m due east of Charlotte House lies Lower Moors SSSI. A topogenous mire that has a range of wetland habitats supporting a diverse range of wetland wildflower species, including the Nationally Scarce Tubular Water-dropwort (*Oenanthe fistulosa*). The site also holds locally important populations of Royal Fern (*Osmunda regalis*) and Southern Marsh Orchid (*Dactylorhiza praetermissa*) and is particularly important feeding for passage and wintering birds including Corncrake (*Crex crex*) and Spotted Crake (*Porzana porzana*).
- iii.) **Higher Moors & Porth Hellick Pool SSSI** – 1.9km east north-east of the proposed development is Higher Moors SSSI. A topogenous mire designated for several rare and notable plant species) including; Bog pimpernel (*Anagallis tenella*), Star Sedge (*Carex echinata*) and Marsh St John's-wort (*Hypericum elodes*).

3.3 Habitats surrounding the application site

Charlotte House and associated detached garage lies within the Built-Up Areas Boundaries² (2011) for England and Wales (published by the Office for National Statistics, Geography). The main conurbation of Hugh Town, however, lies to the east of the application site. The street lighting throughout the town is intermittent and minimal, consisting of orange sodium lighting. Though intermittent, there is an increase in lighting immediately to the west of the development site, with the nearest being 32m due west and a further 4 all within 75m of the proposed development to the west and south. Across this slope (for approximately 70m) are a scattering of properties of varying size and with some having gardens that contain mature shrubs, or low-level hedges. Between 100 and 150m west the properties become more scattered, with the gardens becoming larger and containing numerous shrubs and trees. Beyond 150m the properties back onto the Garrison, an open expanse of grassland, heathland and scrub, with shelterbelts, the latter situated towards its southern and eastern end.

One hundred and fifty metres to the south is the beach of Porthcressa, with its strandline stretching 400m to the east before it meets Buzza Hill, an area of open grassland and scrub, which is linked to the wider countryside and to the SSSI of Lower Moors by a mixture of other properties gardens, the old school site at Carn Thomas and the small allotments below Pilot's Retreat. To the south-east of Porthcressa beach (approximately 600m) are further allotments that comprise of cultivated fields enclosed by small hedgerows. Beyond these and further to the south-east is the open headland of Peninnis Head SSSI. The wider countryside is comprised of a combination of small, enclosed hedgerow bound fields cultivated for flower farming, or utilised for grazed pasture. These hedgerows link small Elm (*Ulmus* sp.) copses, larger coniferous shelterbelts and open expanses of conservation-grazed headlands of maritime grassland and heathland, particularly to the north and east.

In summary, the habitat surrounding the proposed development has limited opportunity for bats to commute and feed for the following reasons: the immediate habitat around the development provides little opportunity to feed and though the gardens of other houses immediately to the west provide better feeding conditions, to get to these bats would need to navigate around the street-lighting, which has been shown to negatively impact upon a bats commuting and foraging routes³. In contrast, it has been shown that species such as Common Pipistrelle will feed around street-lighting, to take advantage of the insectivorous prey that congregates around them. However, this has been shown to be dependent on the

light emitting from the lamps, with orange sodium light (found here in this instance) having the greatest negative impact on feeding opportunities⁴.

Though Soprano Pipistrelle has been shown to utilise more built-up areas, compared to Common Pipistrelle⁵ all species of bat require 'edge' habitat like hedgerows to both feed from and commute to other feeding areas^{6, 7&8}. This type of habitat is limited to the west and quickly breaks down after approximately 150m, where the landscape becomes very open, which most species of bat prefer not to utilise⁹. Furthermore, the preferred habitat for species such as Soprano and Nathusius Pipistrelle, which includes open bodies of water and watercourses^{6,7&8} which lies over 1km to the east. Though this could be reached utilising the 'strand-line' along the beach to the south, it has been shown that of all the pipistrelle species only Common Pipistrelle is known to use this as feeding habitat¹⁰.

In contrast, Whiskered Bat in Britain has been shown to favour more open areas of semi-natural grassland and pasture with scattered hedgerows, or small woodland blocks^{11&12} in which to feed. Habitat such as the Garrison to the west and the golf course to the north-east are typical examples of such habitat which they could exploit and fall within the typical core sustenance zone for this species¹¹. Brown Long-eared bat have been shown to prefer to feed in open canopy deciduous woodland typically located close to their roosts, which would also have larger tracts of woodland available to feed no greater than .5km away¹³, making the Garrison to the west and the former school site at Carn Thomas potential sites to feed. Both sites fall within this species core sustenance zone of 1.1km¹³, however the lack of trees in the immediate area of the complex may limit the sites' use as a roost.

3.4 Habitats within the application site

The detached garage of Charlotte House sits immediately west of the main property, bounded to the north by a low drystone wall; to the west by a large granite retaining wall and to the south by a low drystone wall with larch-lap fencing on top. Immediately north of the garage the area is laid primarily to concrete but contains a small border of tall Privet (*Ligustrum* sp.) shrubs with an understorey of Crimson bromeliad (*Fascicularia bicolor*). The main garden lies immediately south of the detached garage. The area is terraced being built into the hillside. An upper terrace is laid with decking but contains raised beds of a variety of herbs including Flat-leaved Parsley (*Petroselinum crsipum* var. *neapolitanum*), Curled leaf Parsley (*Petroselinum crispum*), Sage (*Salvia officinalis*) and Rosemary (*Salvia Rosmarinus*) alongside vegetables including potato (*Solanum tuberosum*) Chard (*Beta vulgaris*) and Lettuce (*Lactuca sativa*). Surrounding the

decking are borders containing Lavender (*Lavandula* sp.), Nasturtium (*Tropaeolum* sp.), African Lily (*Agapanthus africanus*), Ice plants (*Sedum* sp.), African Daisy (*Osteospermum* sp.) and Tree Houseleek (*Aeonium arboretum*). The small border to the south contains individual specimens of Angel's Trumpets (*Brugmansia* sp.), Tree Bugloss (*Echium pininana*), Cordoba escallonia (*Escallonia cordobensis*) and Cabbage Palm (*Sabal palmetto*). The main garden is surrounded on 3 sides by adjacent properties all of which have large windows, or French doors that could cause light-spill over the garden during the hours of darkness.

In summary, the immediate habitat within the property's footprint provides a few beneficial species of shrub and plants that may attract invertebrates which bats may prey upon, whilst the Privet shrubs immediately to the north-west would provide cover for bats leaving a roost. However, the potential for light-spill onto the main garden from the surrounding properties may deter bats from using the garden to feed from. Therefore, the immediate habitat can be classed as sub-optimal for bats.

Preliminary Roost Assessment

3.5 External

The detached garage externally is faced with granite, with its western elevation forming part of the large retaining wall to the property to the west of Charlotte House. The mortar work throughout is in good condition throughout with no crevices, or missing mortar which could be used by bats to roost in. The fenestration consists of a combination of wooden and aluminium single-glazed windows and wooden single-glazed doors. Throughout, the frames of this fenestration are in good condition with no obvious cracks between the frame and the blocks which bats could utilise as a roost.

The eastern elevation had been cleared recently (within the last 2 months pers. comm.) of dense Ivy (*Hedera helix*). Inspection behind the remaining trunks and branches revealed that the blockwork and mortar was in good condition, with no crevices which bats could utilise as a roost.

Along the full length of the eastern elevation wooden fascia is present. Gaps between the fascia and the blockwork are present in the south-east corner and between the fascia and the lintel above the single door (see Photo 2.), which provides potential roosting space for crevice-dwelling species of bat such as Common Pipistrelle. North of the door the gap between the fascia and the blockwork is choked with Ivy branches (mentioned above). Above the double doors used as the vehicular access on the northern elevation



Photo 2.

vertical hanging tiles are present (see Photo 1.). Here, a gap between the blockwork above the lintel and the boarding which the vertical tiles are attached too is present which could be used as a roost site by crevice-dwelling bats (see Photo 3.).

The roof is constructed of modern fibre corrugated sheets. It has a southern aspect with an approximate pitch of 2°.

The corrugated sheets sit on top of what appears to be a previous flat roof of bitumen felt which can be seen below the corrugated sheeting on all three aspects (see Photos 1 and 2). The corrugated sheets where they overlapped were attached together well, with no obvious gaps which crevice dwelling bats could utilise.



Photo 3.

Access below the ridges of the sheets along the southern elevation were compromised by lead-flashed guttering which sat just above the level of the ridges. Inspection below the ridges with endoscope revealed many cobwebs, suggesting no use by bats. In contrast, the ridges along the length of the northern elevation (apart from the north-east corner which was obscured by Ivy) in combination with the insulating bitumen felt below provide potential roosting opportunities for crevice-dwelling species of bat.

3.6 Internal

The internal space of the garage is completely open, including the roof space which has revealed the basic 'mono A' roof trusses. The trusses are constructed with modern butt joints throughout. None of the gaps between the joints were wide enough for bats to utilise as a roost. Likewise, the gap between the top of the wall plate and the first roof rafter on both the west and east elevations were well in-filled with mortar. No roofing membrane was present, instead the hardboard base for the flat roof was exposed leaving no material to roost behind.

The 'mono A' style of trusses do provide suitable perches for void-dwelling species such as Brown Long-eared Bat. However, a search of the floor below the rafters revealed no bat droppings. The garage is also frequently used as a workshop and disturbance levels (noise and dust) are thought to be high which is likely to impact on the suitability of the internal space for void-dwelling bat species. No bat droppings were found along the tops of the individual rafters, but droppings of Lesser White-toothed Shrew (*Crocidura sauveolens*) were noted on the top of the internal boxing for the guttering on the southern elevation.



Photo 4.

Above the double wooden doors on the north elevation the trusses sit on top of a large concrete lintel creating voids between the individual trusses (see Photo 4.) and the lintel itself. Inspection with endoscope revealed that these voids lead directly to the gap between the blockwork and the vertical hanging tiles (as seen in Photo 3.) thereby could permit access for bats into the internal space of the garage.

3.7 Summary

The well-constructed external shell of the garage limits the number of potential roosting opportunities to only those features identified above the double doors on the north elevation. These features are suitable for crevice-dwelling such as Common or Soprano Pipistrelle or void-dwelling species such as Brown Long-eared Bat. Though the garage internally is open and has suitable perches for void-dwelling species the high disturbance levels are likely to impact on the roost potential for the latter species.

4. Assessment and recommendations (excluding bats)

4.1 Protected sites

The proposed development falls into the SSSI Impact Risk Zones of Lower Moors, Higher Moors and Peninnis Head SSSIs. Impact zones are used in the assessment of planning applications for likely impacts on SSSI's, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar Sites (England). However, the likely attributable impact in these zones is for residential developments of 100, or 50 or more houses outside existing settlement/urban areas. Therefore, in this instance the development is not likely to impact on the surrounding SSSIs.

4.2 Nesting birds

All wild birds are protected under the Wildlife and Countryside Act 1981 (as amended). Section 1 of this Act makes it an offence to kill, injure or take any wild bird, or intentionally to take damage or destroy the nest of any wild bird while that nest is in use or being built¹⁴. During this survey, no evidence of nesting birds was found. However, if demolition was to commence between the months of March and August inclusive, then the site would need to be checked first for nesting birds and if, any evidence of breeding activity was found, or nests are identified works that would disturb the adults, the nest or young must be postponed until all young have fledged the nest and it is no longer in use.

5. Assessment and recommendations (bats)

5.1 Survey constraints

The survey was undertaken at a time of year suitable for undertaking preliminary bat roost assessments and it was possible to survey the whole area of the proposed development.

5.2 Further survey requirements

The detached garage at Charlotte House is considered to provide 'low' potential to support roosting bats (see Table 1.). This assessment is based on the occurrence of the following features within or immediately adjacent to the site:

- The garage has several features which would provide suitable roosting habitat for small numbers of crevice dwelling bats, most likely as a transitional or a non-breeding summer roost.
- The building provides suitable, open internal space and perches to permit all species of bat recorded from the area to use the garage as a night roost

To confirm whether this building supports roosting bats, further surveys (see Section 5.3) would need to be undertaken during the bat active season.

5.3 Presence or absence surveys

The Bat Conservation Trust's Bat Survey Guidelines¹ (referred to by Natural England in their advice to planning officers) state that buildings with 'low' bat suitability requires one survey visit comprising of one dusk emergence survey.

The surveys should take place in optimum weather conditions, to maximise the likelihood of recording bats, with dusk air temperatures exceeding 10°C and not rain or strong wind.

Dusk emergence surveys should commence 15 minutes before sunset and continue for 1.5 – 2 hours after sunset. A pre-dawn re-entry survey should commence 1.5 – 2 hours before sunrise and continue until 15 minutes after sunrise.

Sufficient surveyors should be used on each survey so that all aspects of the building can be viewed at one time, therefore the building should be adequately surveyed by three surveyors. Surveyors should be positioned no more than 50m away from the buildings with an awareness of the likely exit/access points

and potential roost locations. Each surveyor should be equipped with a bat detector and recording equipment and should count the number and species of bats and their activity in a defined area.

With due regard to the distribution of potential roosting features; the size and orientation of the buildings; and the scope of potential impacts associated with the proposals, it is identified that **two surveyors** would be required to provide comprehensive visual coverage of the garage.

If no roosts are found during the presence or likely absence surveys, then no further surveys would be required.

5.4 Mitigation

To comply with planning policy and wildlife legislation (both domestic and European) it will be necessary to ensure that following the development the "favourable conservation status" of bats will be maintained. This means that, where a roost will be lost, appropriate mitigation needs to be provided.

If roosts are found a detailed roost characterisation survey would be required to establish how bats use the roost, the intensity of use and what features and characteristics of the roost and the surroundings are important. The information gained would allow an accurate assessment of the potential impacts of the development on bats and inform the requirement of a European Protected Species Mitigation licence, to be considered and issued by Natural England prior to the works commencing.

If roosts are found, then a data search will be required to support the European Protected Species Mitigation licence if an application is required. Information should be obtained in relation to bat roost sites or any sites of nature conservation importance designated for their bat interest within or near to the proposed development site. When requesting information, a minimum search radius of 2km from the site should be applied.

6. Summary

The detached garage at Charlotte House was found to have **low potential** to support transitional or a non-breeding summer roost for cavity dwelling species such as Common and/or Soprano Pipistrelle and is considered most suitable as a transitional or day roost. For all other species of bat, the garage is considered suitable as a night roost.

To assess whether bats roost in the building one further survey is recommended in the form of one dusk emergence to be carried out between May and September. The survey requires two surveyors to be strategically positioned to observe all potential roosting features which may be affected by the proposals. If bats are found to be roosting in the barn, then further surveys may be required to fully characterise the roost and inform a mitigation strategy which would need to be implemented.

Aside from bats, no other ecological receptors are identified which require consideration to inform the determination of this planning application.

7. Bibliography

1. Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition)*. The Bat Conservation Trust
2. COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services - <https://data.gov.uk/dataset/15e3be7f-66ed-416c-b0f2-241e87668642/built-up-areas-december-2011-boundaries-v2>
3. Stone, E.L., Jones, G. & Harris, S. (2009). *Street Lighting Disturbs Commuting Bats*. *Current Biology* 19. P1123-1127
4. Blake, D. et al. (1994). Use of lamp-lit roads by foraging bats in southern England. *Journal of Zoology* 234. P 453-462.
5. Lintott, P. et al. (2015). Differential responses of cryptic bat species to the urban landscape. *Ecology and Evolution* 6 (7). P2044-2052
6. Vaughan N, Jones G, Harris S (1997) *Habitat use by bats (Chiroptera) assessed by means of a broad-band acoustic method*. *J Appl Ecol* 34:716-730.
7. Russ JM, Montgomery WI (2002) *Habitat use associations of bats in Northern Ireland: implications for conservation*. *Biol Conserv* 108:49-58
8. Nicholls B, Racey PA (2006) *Habitat selection as a mechanism of resource partitioning in two cryptic bat species Pipistrellus and Pipistrellus pygmaeus*. *Ecography*, vol 29 (5) 697-708
9. Downs N, Racey PA (2006). *The use by bats of habitat features in mixed farmland in Scotland*. *Acta Chiropterologica*, vol 8:169-185.
10. Hough, T. (2015). *Coastal habitat use by bat species*. BSG Ecology
11. Berge, L. (2007). *Resource partitioning between the cryptic species Brandt's bat (Myotis brandtii) and the Whiskered Bat (M. mystacinus) in the UK*. University of Bristol. School of Biological Sciences
12. Buckley, D.J. et al. (2012). *The spatial ecology of the whiskered bat (Myotis mystacinus) at the western extreme of its range provides evidence of regional adaptation*. *Mammalian Biology* Vol 78. Issue 3: p198-204
13. Entwistle, A.C., Racey, P.A. and Speakman, J.R. (1997). *Roost selection by the brown long-eared bat Plecotus auritus*. *Journal of Applied Ecology* 34. P399-408
14. H.M.S.O. (1981). *The Wildlife and Countryside Act 1981 (as amended)*. London.