



Isles of Scilly National Landscape

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Big Scilly bat survey: 2023

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1. Summary

The Big Scilly Bat Survey is a citizen science project which ran for a second year of survey in 2023. Led by the Isles of Scilly Wildlife Trust along with Stuart Newson of BTO and volunteers from the Isles of Scilly Bat Group, the survey involved deployment of static bat detectors across all five inhabited islands along with a number of uninhabited islands in 2022 and 2023. This was undertaken by a team of volunteers who were involved in each step from deployment of the detector to uploading the data and receiving the initial results.

The technique uses a partially automated acoustic analysis technique – the BTO Acoustic Pipeline – with verification and correction by the project lead to ensure accuracy. The technique is primarily focussed on bats, but is also able to detect and identify bush-crickets, small mammals and audible moths.

The first year of survey was completed in 2022 and identified baseline populations and indicative distributions of three bat species across the islands – these are common, soprano and Nathusius' pipistrelle. Three small mammal species and four cricket species were also identified, along with one audible moth species.

The second survey season completed in 2023, documented in this report, deployed a stratified sampling strategy whereby every 500m square on the inhabited islands, as well as selected uninhabited islands, were targeted for a detector deployment of at least 4 nights between May and October.

The survey results again confirm the widespread presence of common pipistrelle bats across all five inhabited islands with Nathusius' pipistrelle and soprano pipistrelle confirmed at a significantly lower frequency on a smaller geographic scale. Leisler's bat was recorded for the first time in 2023, confirming historical records which indicated transient or occasional presence of this species. As in 2022, the absence of brown long-eared bats from the dataset is likely due to their very quiet echolocation characteristics and therefore the previously confirmed breeding populations may well have been overlooked by the surveys.

The very low encounter with soprano pipistrelle in both 2022 and 2023 would suggest they are no longer present as a viable breeding population on the islands. Further research, potentially using more advanced techniques such as harp trapping or mist netting would be valuable to further characterise their current status.

A static detector deployed for 90 days from mid-January to mid-April on St Martin's, spanning the hibernation and transitional periods of a bat's lifecycle in mainland UK, identified common pipistrelle on the wing on 78% of the nights, confirming historical and anecdotal records of high levels of winter activity.

Five different species of bush-cricket were identified, and the broad pre-existing understanding of their distribution across the islands was reflected by the survey results. The species identified are long-winged conehead, speckled bush-cricket, grey bush-cricket, great green bush-cricket,

and for the first time this year, large conehead was also identified on St Agnes. The deployment of detectors on uninhabited islands in 2023 allowed long-winged conehead to be identified on Teän and the Eastern Isles; and speckled bush-cricket on the Eastern Isles. Only one species which was historically recorded on the islands – short-winged bush-cricket – was not identified in the dataset; however this may well reflect the limitations of a static monitoring survey technique on a population with a restricted geographic range – therefore absence should not be assumed based on these initial results.

Three species of small mammal were recorded – these are wood mouse, lesser white-toothed shrew and brown rat. Whilst the widespread presence of lesser white-toothed shrew reflects our prior understanding, there are areas of St Mary's where its absence may suggest further investigation to understand the habitat preferences of the species. The infrequency of wood mouse and absence of house mouse are most likely due to their quiet and easily attenuated calls. The detection distance of these last two species is less than two metres (Newson & Pearce 2021), so raising up the bat detector into the bats flyway limits the chance of recording these species. Brown rat was confirmed on all islands except for St Agnes – following the successful eradication of the species by 2016 – and Tresco which represents a change in encounter frequency as multiple records were made on this island in 2022.

2. Aims & objectives

The Big Scilly Bat Survey harnesses the enthusiasm of local volunteers to participate in biodiversity monitoring to help collect bat distribution data across Scilly. In its first year, the surveys concentrated on the five inhabited islands of Tresco, St Mary's, Bryher, St Martin's and St Agnes. In the second year, detectors were deployed in a comprehensive 500m grid across all of the inhabited islands, as well as a number of uninhabited islands including Teän and the Eastern Isles. These were sampled in a randomised order across the season from May to October. The project will run over three years.

An additional deployment of a single static detector for a period of 90 days from mid-January to mid-April 2023 provided additional information on the winter activity of common pipistrelles on St Martin's.

The core aim of the project in its first year was to generate a robust dataset on which to inform our knowledge and understanding of bat species composition and geographic distribution across the Isles of Scilly. The second year aimed to provide a wider coverage of habitats and geography on the islands, as well as include uninhabited islands where little is known regarding presence or activity by bats.

The acoustic detectors and analysis techniques also allow the identification of small terrestrial mammals, bush-crickets and audible moths – these too will be recorded and analysed in order to better understand the species composition and distribution across the islands.

As a Citizen Science project, the project has further aims which are realised as much through the undertaking of the project as from results. The recruitment of volunteers to deploy detectors, upload data and receive the results aims to involve and inspire a section of the local community to learn about and connect with a group of animals that is poorly known and misunderstood. This provides an ideal opportunity to further improve awareness of how a healthy population of bats can benefit the community, why the conservation of bats is important, what their habitat and roost requirements are, and ways in which the local community including householders can help them.

3. Methods

3.1 Static detector protocol

Our survey method is based on the Bailiwick Bat Survey (Newson et al., 2021) and aims to assess the season-wide status of bat species across Scilly. The deployments were undertaken during the main active season from May to October with additional sampling during the winter period in a single location. The scope and scale was realistically achievable through working with members of the public and our partner organisations.

The protocol enables members of the public to access passive bat recorders which they are set out in a stratified array. These detectors automatically trigger and record the calls of bats to a memory card every time a bat passes throughout a night.

The locations of the detectors were determined using GIS software to superimpose a 500m x 500m grid on each of the inhabited islands. This was completed for each island independently to correspond with the idiosyncratic shape of each island and minimise the adjustments required. In situations around the coastline where deployment is not possible, the centre was moved inland to the closest suitable location – examples include around the Garrison to the south-west of St Mary's; the northern edge of Tresco; and the north-western edge of St Agnes. The arrangement of locations can be seen in Map 02. A single deployment was not successful – this was the location to the north-east of Hugh Town on St Mary's.

The volunteers were deployed to set the detector up as close to selected location as possible, without targeting specific habitats or landscape features. The detectors were mounted on a 1.5m poles to avoid ground noise and reduce recordings of reflected calls. Guidance was provided to volunteers on the placement of the detector in order to ensure production of good quality recordings – this included positioning the detector at least 1.5m away from vegetation, water or other obstructions.

The bat detectors – the Song Meter Mini Bat manufactured by Wildlife Acoustics – were placed out to record for four consecutive nights at each location. The use of multiple nights of recording is intended to generate a more representative snapshot of activity in that location, minimising the influence of weather and other variables which can affect the results.

The bat detectors were set to switch on and record from 30 minutes before sunset until 30 minutes after sunrise the following day.

3.2 Survey effort

The survey period in 2023 ran from the beginning of May until the end of October. The long survey season covers the main period of bat activity and allows the entire project area to be surveyed using rotating deployment of the limited number of detectors available.

Each location was surveyed on a single occasions for a minimum of 4 nights of deployment. Any variation in deployment length was controlled for during data processing to reflect nightly activity rather than total activity.

For each island, an element of control of timing was introduced, depending on the number of locations to be surveyed. In the case of St Mary's where there were 32 locations, there was a pause of only a day or two between deployments; however for St Agnes with only 11

deployments the detectors were set out over 10-12 days to ensure the full season was represented on each island.

3.3 Processing recordings and species identification

The detectors used were passive real-time detectors that are triggered when they detect sound within a certain frequency range. Our survey generated a very large volume of recordings (uncompressed wav format), far more than could be feasibly managed if we needed to manually look at each wav file. Instead, we used a semi-automated approach for assigning recordings to species as follows.

After each recording period, the files recorded by the bat detector, as well as associated information on where the recording was carried out were uploaded to the BTO's Acoustic Pipeline¹<u>http://bto.org/pipeline</u>. Volunteers and staff have their own online user account, and desktop software which means they can upload the recordings directly to the cloud-based BTO Acoustic Pipeline for processing. Once analysed, the user is emailed automatically and are then able to download the automated results through their account as a .csv file. These initial results are provided with the caveat that additional manual auditing will be carried out before the survey season's end.

The BTO Acoustic Pipeline (BTO AP) applies machine learning algorithms to classify sound events in the uploaded recordings. The classifier allows up to four different "identities" to be assigned to a single recording, according to probability distributions between detected and classified sound events. From these, species identities are assigned by the classifier, along with an estimated probability of correct classification. Specifically, this is the false positive rate, which is the probability that the AP has assigned an identification to the wrong species. However, we scale the probability, so that the higher the probability, the lower the false positive rate. To give an example, given a species identification with a probability of 0.9, there is a 10% chance that the identification is wrong. Based on research into error rates in automated analysis undertaken by Barré *et al.* (2019), the decision was made that probability of less than 0.5 (50%) were discarded.

Verification of species identification was carried out through the manual checking of spectrograms using software SonoBat² which was used as an independent check of the original species identities assigned by the pipeline. The application of this auditing depended on the species in question and the aims of the project:

- For rarely encountered bats and small mammals where a measure of activity and abundance was desirable, the project lead manually checked all recordings to confirm identification.
- In the case of common pipistrelle (*Pipistrellus pipistrellus*), an R Shiny App³ was used to pull out a random sample of 1,000 recordings for auditing to quantify the likely error rate for this species in the dataset.
- For bush-crickets and audible moths there can be a large number of recordings, often of the same individual, which precludes use of the data for activity or abundance calculations. Auditing focussed on producing an inventory of species presence instead, where the three recordings with the highest probability for each site and night were selected for auditing.

¹ <u>http://bto.org/pipeline</u>

² http://sonobat.com/

³ <u>https://github.com/BritishTrustForOrnithology/BTOAcousticPipelineTools</u>

Common pipistrelle is normally straightforward to identify acoustically, but particular care is needed when considering calls at the low or high frequency end of the range for this species, which could be mis-identified as Nathusius' pipistrelle or soprano pipistrelle respectively. For these it is important to consider the call duration, and not just the peak or end frequency of the calls. For example, considering the possibility for misidentification with Soprano Pipistrelle in extreme clutter, Common Pipistrelle typically produces very short calls that are elevated in frequency, where they could be mis-identified as Soprano Pipistrelle. In addition, where there are multiple individuals of the same species present, there can be frequency-shifting as one or both individuals 'shift' their frequencies to avoid acoustic interference, which again can result in some calls in a sequence that are higher in frequency than would be typical for the species. It is normally possible to diagnose what is happening in most situations by looking at the sequence of calls, and if there are neighbouring recordings in close time of potentially the same bat. However, there will still be some occasions where this is not available, and it is not possible to assign a recording to species.

4. Results

4.1 Survey coverage

During 2023, 90 locations were surveyed across the five inhabited islands and several uninhabited islands of the Isles of Scilly where detectors were deployed. The islands subject to survey are identified in Map 01 and the number of detector locations on each island is detailed in the table below.

Island	No. of Locations
St Mary's	32
St Martin's including White Island	15
Tresco	15
St Agnes	11
Bryher	10
Eastern Isles	5
Teän	2





The distribution of detector locations across each island is shown in Map 02 below.



Map 02 – showing the distribution of bat detector survey locations across the Isles of Scilly in 2023. Each red dot represents a single deployment of a minimum of 4x nights.

All maps reproduced in this report use base map outlines derived from LIDAR Land Cover data⁴.

4.2 Overview of data gathered

Overall, 74,197 bat recordings were confirmed to species, the vast majority of which were common pipistrelle. Records of other mammal species and bush-crickets were also made.

Manual checking of recordings was carried out in line with the protocols outlined in Section 3. Following validation, the presence of 4 bat species, 3 small mammal species and 5 bush-cricket species can be confirmed.

⁴ Marston, C., Rowland, C. S., O'Neil, A. W., & Morton, R. D. (2022). Land Cover Map 2021 (10m classified pixels, GB) [Data set]. NERC EDS Environmental Information Data Centre. https://doi.org/10.5285/A22BAA7C-5809-4A02-87E0-3CF87D4E223A

4.3 Bat species

4.3.1 Baseline status

The existing understanding of the bat populations on the Isles of Scilly, prior to undertaking the Big Bat Project, is broadly as follows:

- **Common pipistrelle** is known to be resident on all islands;
- Soprano pipistrelle has been identified on St Mary's;
- **Nathusius' pipistrelle** has been confirmed on St Mary's through trapping surveys, and from acoustic records from St Martin's.
- Brown long-eared bats have been confirmed on St Mary's and Tresco;
- Leisler's bat and/or serotine have potentially been recorded on static detectors on both St Mary's and St Martin's.

4.3.2 Overview of survey findings

The surveys identified four bat species – these are common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and Leisler's bat. The number of calls and islands on which they are confirmed are outlined in the table below.

Species	Number of	Percentage of	Number of	Islands where
	recordings post	bat recordings		recorded
	validation		(% total)	
Nathusius' Pipistrelle	18	<0.01%	9 (10%)	St Mary's, Tresco,
				Eastern Isles, St Agnes
Common pipistrelle	74,157	>99.99%	89 (99%)	All
Soprano pipistrelle	2	<0.01%	1 (1%)	St Mary's
Leisler's bat	19	<0.01%	6 (7%)	Tresco, St Mary's, St
				Martin's, Eastern Isles

4.3.3 Common pipistrelle

This species was by far the most common and widely recorded bat species on Scilly there is only a single location on Gugh to the east of St Agnes where this species was not recorded in 2023, though this is likely to be reflective of specific conditions or circumstances as they were recorded in all adjacent deployments. This species was also recorded on the uninhabited Eastern Isles and Teän.



accounted for 99.9% of the bat data which reflects the dominance of this species identified in 2022.

Common pipistrelle was previously understood to be resident on all islands, as identified acoustically through bat detector surveys and bat walks. A number of confirmed roosts are known across all five islands, including maternity use.

The relative levels of activity by this species between and within different islands shows indications of habitat preferences in preliminary analysis - these will be further analysed alongside data from 2022 at the end of the project.



A further aspect of common pipistrelle behaviour was investigated through the deployment of a single static unit on St Martin's Vineyard for 90 days from 20th January – 21st April 2023. This timeframe would correspond with the winter hibernation and transitional phase of bat behaviour on the mainland, but anecdotal evidence over a number of years indicates that there is frequent low level activity throughout the winter period on Scilly.

Over the course of 90 days, bats were recorded on 70 nights representing approximately 78% of the time. This is likely to be an underestimate of the true activity levels during the winter as it relies upon a bat flying past a single static location in order to be detected. The number of records per night varies, with >100 calls on multiple nights within this period but other nights when only a small number of passes were recorded. These numbers appear low in comparison to the average number of nightly passes during the summer period indicating a smaller number of bats on the wing; or shorter duration of flight and foraging per night.



4.3.4 Soprano pipistrelle

In 2022 the soprano pipistrelle was recorded on 3 of the islands, but with only 79 recordings. In 2023, this reduced significantly to only 2 calls in a single location near Peninnis on St Mary's in August. The temporal proximity of these two calls makes it likely that these were both produced by the same bat.

The number of recordings of this species is incredibly low, especially as its acoustic characteristics can be broadly compared to those of common pipistrelle for which over 74,000 records were made in 2023. The interpretation of such small numbers of records does not allow meaningful comparison between the 79 records in 2022 and the 2 records in 2023 as this could reflect chance encounters of individual bats and recorder positions on a given night. However in combination taken across 2 years, the results make it highly unlikely that a viable breeding population remains on the islands.



4.3.5 Brown long-eared bat

Brown long-eared bats were not recorded during the survey in 2022 or 2023. This species was confirmed on St Mary's in 2011 when a pregnant female bat was caught and radiotracked back to a roost in a split Monterey pine tree⁵. This confirmed not only the presence of an individual but of a breeding population. The species has also been identified on Tresco, confirmed through DNA analysis of droppings and most recently in Holy Vale in 2023, again by DNA analysis of a dropping within a loft space.

This species is often considered a 'woodland' bat, with a strong association with tree cover. St Mary's and Tresco have the highest levels of tree cover on the islands and it is consistent with the known behavioural ecology and habitat preferences of the species that these two islands would support populations which may not be present on the more sparsely vegetated islands of St Martin's, St Agnes and Bryher.

Brown long-eared bats are often known as the 'whispering bat' due to their quiet echolocation – as such they are often significantly under-represented or even not detected at all through acoustic surveys such as the static detectors deployed in this study. The absence of records for this species does not therefore indicate that the species is not present, but further survey effort and possibly deploying alternative techniques would be required to adequately assess the current status of this species on the islands.

⁵ https://www.exeter.ac.uk/news/research/title_143855_en.html

4.3.6 Nathusius' pipistrelle

Nathusius' pipistrelle was recorded 18 times on separate nights in seven different locations around the islands, including the Eastern Isles. This pattern of a small number of encounters with a wide geographic distribution is similar to that seen with Leisler's bat, though the spacing of encounters is wider spanning the full survey season from May to October.

This species was previously known to occur on the islands, confirmed most recently in the 2022 survey and previously through capture and identification in the hand on St Mary's. Occasional acoustic records exist on both St Mary's and St Martin's including an extended encounter with a foraging individual on the vineyard on St Martin's in late October 2023.

No roosts are confirmed on the islands. The pattern and frequency of encounters in this study is consistent with individual bat(s), however it is now known if these individuals are resident or migratory. Nathusius' pipistrelle is well documented as a migratory species, moving between the UK and mainland Europe with bats caught and ringed being subsequently recaptured as far away as Russia.



4.3.7 Leisler's Bat

Leisler's bat was positively recorded for the first time during the 2023 season – this species was not detected in 2022. There were a total of 19 recordings across eight nights from six locations across the islands including the uninhabited Eastern Isles. This supports previous records including photographs and acoustic recordings which suggested transient presence of this species but these previous records were not conclusive.

All of the recordings were between 5th September and 7th October 2023. This distribution of records – across several islands within a short space of time – would indicate a transient individual rather than a resident. Leisler's bat is relatively easy to detect and its absence from recordings earlier in the year would suggest likely absence during this time.

The timing of the Leisler's bat recordings coincided with an influx of vagrant species including birds and insects from North America. The calls were considered carefully with regards to potential vagrant bat species which could have been part of this cohort but these were ruled out.

In continental Europe Leisler's bat is considered to be a migratory species with several long distance movements being recorded – it is therefore possible that this species could be present through migration, or being blown off course and finding temporary habitat on the islands. Further acoustic surveys, especially if they included the transitionary periods in spring and autumn, may help build a clearer picture of the status of these species on the islands.



4.4 Other Mammal Species

4.4.1 Baseline Status

The existing understanding of the island's terrestrial mammal populations, prior to undertaking the Big Bat Survey, is broadly as follows:

- **Brown rat** is known to be resident on all islands except for St Agnes after a successful eradication exercise on that island;
- Wood mouse is known to be present, but the distribution across the islands is unclear;
- Lesser white-toothed shrew (also known as the Scilly shrew) occurs on all islands;
- House mouse is known to be present, but the distribution across the islands is unclear;
- Hedgehogs are present on St Mary's only;
- Rabbits are present on all islands.

4.4.2 Overview of Survey Findings

The surveys identified three small mammal species in 2023 which matches the 2022 species composition – these are wood mouse, lesser white-toothed shrew and brown rat. The number of recordings and islands on which they are confirmed are outlined in the table below.

Species	No. of recordings	Percentage of small mammal recordings	No. Locations (% total)	Islands recorded
Wood mouse	6	0.41%	2 (2%)	St Mary's
Lesser white- toothed shrew	364	25.14%	46 (51%)	All
Brown rat	1078	74.45%	20 (22%)	St Mary's, St Martin's, Bryher, Eastern Isles, Teän

4.4.3 Lesser white-toothed shrew

The lesser white-toothed shrew was recorded on all five islands in 2022 and 2023, and is the only shrew species present on Scilly. The deployment of the bat detectors on the Eastern Isles and Teän allowed the species to be confirmed in these uninhabited islands as well.

The distribution appears to indicate widespread occupancy across each island – the only notable



absence is within a central east-west band through St Mary's. This is relatively consistent with the 2022 records which recorded little or no activity by this species within the same broad area.

There is evidence of the lesser white-toothed shrew existing on Scilly since the Bronze Age, as far back as when the islands were a single landmass. It is unknown how the shrews arrived, although it is believed they may have stowed away on visiting ships during prehistoric times.



4.4.4 Brown rat

Brown rat was recorded on the three inhabited islands of Bryher, St Mary's and St Martin's. In contrast to the 2022 survey, no rats were recorded on Tresco. Consistent with the rat-free status, as declared February 2016 following a successful eradication exercise, St Agnes and Gugh did not record any rats. The deployment of the bat detectors on the Eastern Isles and Teän allowed the species to be confirmed in these uninhabited islands as well.





4.4.1 Wood mouse

Wood mouse was identified from just five recordings across two nights around the Garrison on the western tip of St Mary's. This species was only recorded on Tresco in 2022. However, the calls of this species are much quieter⁶ than those of brown rat or lesser white-toothed shrew – therefore the recorded distribution is likely to be an under-representation of the true distribution of this species across the islands.

Given these acoustic characteristics, the results confirm presence but should not be used to infer distribution or frequency.

⁶ Newson, S.E., Middleton, N., & Pearce, H. 2020. The acoustic identification of small terrestrial mammals in Britain. British Wildlife 32, 186-194.

⁸ Newson, S.E. & Pearce, H. 2022. The potential for acoustics as a conservation tool for monitoring small terrestrial mammals. JNCC Report No. 708, JNCC, Peterborough, ISSN 0963-8091.

4.4.1 House mouse

House mouse was not recorded during the surveys in 2022 or 2023 – however the calls of this species can only typically be detected by the equipment at a proximity of around 1.5m. Given that this is the height at which the detectors were sited above the ground, it is very likely that this species was not detected due to its acoustic characteristics. It may also reflect the distribution of detectors in habitats which are optimal for bats, rather than necessarily reflecting ideal habitat for house mouse.

4.4.1 Hedgehog and rabbit

Hedgehog and rabbit are not species which are detected by the survey methodology – therefore this report does not provide any information on the presence or distribution of these species on the islands.

4.5 Bush-crickets

4.5.1 Baseline status

The understanding of the island's bush-cricket populations prior to the Big Bat Survey is broadly as follows:

- Great green cricket has been recorded recently on St Mary's, St Martin's and Tresco;
- Speckled bush-cricket has been recorded on St Mary's and St Martin's;
- Long-winged conehead has been recorded on all inhabited islands, though the status on St Agnes is uncertain;
- Short-winged bush-cricket has been recorded on St Agnes;
- Grey bush-cricket has a localised distribution at the southern end of Bryher only;
- Large conehead has been recorded historically on Bryher and St Mary's, but there are no recent records;
- **House cricket** has been temporarily established on St Mary's as escapees from live food; it is understood that two different house cricket species have been noted in Scilly.

4.5.2 Overview of survey findings

The surveys in 2023 identified five cricket species – these are long-winged conehead, speckled bush-cricket, grey bush-cricket, great green bush-cricket and large conehead. The number of recording dates and islands on which they are confirmed are outlined in the table below.

Bush-crickets are typically stationary and calling for long periods, which means that the number of recordings is not an informative measure of abundance. For this reason, the data shown here relates to species presence only.

Species	No. locations	Islands recorded
Long-winged conehead	16	Tresco, St Martin's, St Mary's, Bryher, Eastern Isles, Teän
Speckled bush-cricket	11	St Martin's, St Mary's, Eastern Isles
Grey bush-cricket	1	Bryher
Great green bush-cricket	10	St Mary's, Tresco
Large conehead	1	St Agnes

4.5.3 Long-winged conehead

Long-winged conehead is a small species of bushcricket typically found in rough grassland, dry heaths and woodland rides, as well as damp and coastal habitats. It is largely herbivorous, feeding on grasses, but will also eat small invertebrates.

The survey recorded this species on four of the five inhabited islands – Tresco,

Bryher, St Martin's and St Mary's. The deployment of the bat detectors on the Eastern Isles and Teän allowed the species to be confirmed in these uninhabited islands as well as White Island on the northern extremity of St Martin's.

4.5.4 Speckled bush-cricket

Speckled bush-cricket is found mainly in central and southern England, favouring rough grassland, scrub and garden habitats. It is readily identified through the covering of black speckles on their green body which also given them their common name.

This species was recorded as widely distributed on both St Mary's and St Martin's – consistent with the results of the 2022 survey. The species was not recorded from any of the other three inhabited islands but the 2023 data does confirm this species is present on the Eastern Isles.

4.5.5 Grey bush-cricket

Grey bush-cricket is considered to be a coastal species, found almost exclusively along the southern coast of England and Wales. It favours coarse grass and rough vegetation on sand dunes, shingle banks and southfacing cliffs.

The surveys identified this species as present only on

Bryher both in 2022 and again in 2023. The records are from the southern portion of the island which reflects the pre-existing understanding of their distribution on the islands.

4.5.6 Great green bush-cricket

The great green bushcricket is the largest species of bush-cricket in the UK, with females growing to 7cm long. It favours rough grassland dotted with scrub and trees and shows a preference for light, dry soils in which the eggs are laid.

species

This

recorded on St Mary's and extensively on Tresco. A single record from St Martin's in the 2022 survey was not repeated in 2023.

4.5.7 Large conehead

This species is a large, slender, bright green bushcricket with a creamcoloured band running across the apex of the head and back through the eyes. It's native range is central and southern Europe where the species occurs on riverbanks and in other wet habitats with long grass. In Britain it is considered a scarce vagrant in the south or accidental import.

Historic records of this species have been on Bryher and St Mary's – the 2023 survey now confirms the species on St Agnes as well.

4.5.8 Short-winged bush-cricket

Short-winged bush-cricket was not recorded in the surveys – this species has been recorded historically on St Agnes only.

This absence should be interpreted only as interim data at this stage – the static nature of calling crickets coupled with the distribution of detectors within 1km squares means that populations could be easily overlooked if the detectors do not happen to be deployed close to a calling individual on a given night.

4.5.9 House cricket

House cricket is a true cricket rather than a bush-cricket, which produces lower frequency calls than bush-crickets, that are not likely to be recorded on the bat detectors used here – the survey results therefore provide no information on the distribution of this species.

The populations are known from St Mary's and may be present on other islands. They are known to be extant, but their longevity and sustainability are unclear as they are established from escaped live food for pets. It is understood that two different species of house cricket have been recorded as escapes in Scilly.

5. Discussion

5.1 Overview

The completion of the second year of the Big Bat Survey builds a more detailed finer scale picture of bat activity across the islands including selected uninhabited islands, as well as our understanding of some other species groups that were recorded as 'by-catch' during bat surveys.

5.2 Bats

The results confirm once again the widespread presence of common pipistrelle across all inhabited islands, supporting the baseline assumption of breeding populations on all islands. The stratified data set will be used alongside data from the first and third years to assess habitat preferences along with temporal variation in activity of common pipistrelle. There is insufficient data on other species to assess these geographic preferences.

The survey results demonstrate that common pipistrelle are present on both the Eastern Isles and Teän. The frequency of encounter and the timing of recordings do not allow confidence regarding whether these are roosting on the islands, or commuting from roosts on the larger inhabited islands to forage on the uninhabited islands. There are no trees or buildings suitable for roosting on any of the uninhabited islands; therefore bats present must either be roosting in rock (there is an abundance of exposed granite in each location) or flying a minimum of 350m (in the case of Teän) or 500m (in the case of the Eastern Isles) across the channel to reach these smaller islands from the inhabited islands.

Further information to identify whether bats are roosting on the uninhabited islands or flying to them from the inhabited islands during the night would be useful information on the natural history of the populations. It would also provide information on the likelihood that common pipistrelles exist as a metapopulation across the islands which would buffer against the risks of local extinctions on individual islands, or risks associated the inbreeding in a small island population.

Common pipistrelle is also found to be on the wing throughout the winter period. The deployment of a passive acoustic monitoring bat detector at a site on St Martin's, as described above in section 4.3.3, gives quantitative data on this, which demonstrated a high frequency of winter nights with common pipistrelle activity at this site.

Soprano pipistrelle calls were again recorded at a very low level, mirroring the data for 2022. There is a drop in encounters which, although significant in relative terms, cannot be used to infer a change in population status due to the level of stochasticity involved in such low numbers of encounters across the geographic and temporal variation of the study. These results do however further suggest that the islands are unlikely to support a viable breeding population. Further work to target this species would be valuable, but the difficulty in tracking potentially just a single individual would make this difficult to achieve.

The absence of brown long-eared bats from the survey data is likely to reflect the presumed low population size and restricted geographic range of this species, combined with the low detection distance of this species with quiet echolocation characteristics. Complementary survey techniques would be useful to improve our understanding of the population and distribution of this species on the islands. These techniques could include mist net or harp trapping surveys. Identification of active roosts would be another way to better understand the distribution of this

species on the islands, and it is hoped that the additional public awareness and engagement raised by this project may aid in the identification of further roosts.

Nathusius' pipistrelle was recorded across a number of locations on the islands between May and October. This may be consistent with a number of potential interpretations:

- This could represent multiple individual bats passing through the islands en route between the mainland UK and mainland Europe. This species is known to migrate long distances, and to undertake regular flights across the sea. The wide distribution of recordings geographically, as well as spread throughout the season, would lend some weight to this hypothesis;
- This could represent an individual, or small number of bats which are resident on the islands year-round;
- The recordings could relate to an individual or small number of bats which spend a season, or a shorter period of time, on the islands.

The number of recordings do not at this stage indicate a likely breeding population, based upon comparison of the number of calls between Nathusius' and common pipistrelle; however this cannot be ruled out and there is the potential for a population to be in the early stages of establishment.

Complementary survey techniques, especially radio tracking or ringing, would help to shed further light on the status of this species on the island.

Leisler's bat was recorded for the first time in the survey this year – the small number of calls were all from a relatively short time period in September and early October across a relatively wide range of detector locations. The absence of this species from the 2022 data and the first 3 months of the 2023 data; coupled with the relatively short timeframe in which they were recorded would suggest that this is a vagrant or migratory individual. The coincidence of the recordings with the arrival of a number of vagrant insects and birds from America would lend weight to this hypothesis.

Both Leisler's and Nathusius' pipistrelle are known to be migratory in some geographic locations; there is therefore potential for these species to be present as part of a migration route. Scilly is well known as a stopping point for migratory bird species in the spring and autumn. Deployment of the survey methodology through the transitionary periods in spring and autumn may provide further information on the status of these species on the islands.

5.3 Bush-crickets

The surveys confirm the majority of bush-crickets known to be present on Scilly, including large conehead which was not detected in the 2022 survey. The St Agnes extends the geographic range of this species on the islands with historic records from Bryher and St Mary's. Only one species thought to be present on the islands – short-winged bush-cricket – has not been identified in the survey to date.

The 2023 data identified long-winged conehead on Teän and the Eastern Isles; and speckled bushcricket on the Eastern Isles only. This helps to further characterise the distribution of these species on the uninhabited islands, though the relatively short surveying window on each location would allow for further species to be present but undetected. Due to the combination of species ecology – typically calling for extended periods from a static location – and the static nature of the detectors, there is a high probability that species with a restricted distribution could be overlooked, or that the population distribution may be wider than currently understood. These results therefore confirm the presence of those species recorded in the locations in which they are detected, but should be viewed at this stage as a likely incomplete picture – the lack of further records should not be used to infer absence of a population at this stage.

Further survey work at a finer geographic scale would help better understand the distribution of the species and the species composition on the islands. The behavioural ecology of the bushcrickets would also suggest that a transect survey approach could be highly beneficial in better understanding the species composition and geographic range on the island. This could either be a random or strategic route depending on the focus of interest – for example the potential for further grey bush-cricket sites could be assessed through transect surveys through similar habitats to the confirmed location on Bryher or other islands. The data gathered in the first two years of survey could help inform the methodology for such surveys, through seasonal and nightly timings for the highest probability of encounter.

5.4 Small mammals

The widespread presence of lesser white-toothed shrew is confirmed; however there appears to be an area of St Mary's where this species is either absent or recorded at very low levels in both the 2022 and 2023 survey data. This could be an artefact of the sampling regime, or simply chance, but it may warrant further investigation to understand whether the species is absent from these locations. The habitat in question includes areas managed specifically for wildlife including Higher Moors and Lower Moors which reduces the risk that the absence is associated with harmful land management or agricultural practices. It is however notable that these are the key marshy wetland habitats – it may be that this habitat is not favoured by this species.

Brown rat was found on all islands surveyed except for St Agnes and Gugh – where a successful eradication programme was undertaken – and Tresco. This absence from Tresco represents a change from the results in 2022 and may suggest an elevated level of population control in 2023. The presence of this species on the Eastern Isles and Teän was known previously, but could be of conservation concern with regards to nesting seabirds on these uninhabited islands.

Wood mouse is confirmed as present on the archipelago, but the quiet acoustic characteristics of the species resulted in very few records and they are therefore likely to be more widely distributed than the single location on Tresco in 2022 and two locations on St Mary's in 2023 would indicate.

The absence of house mouse from the dataset is similarly likely to be a limitation of the survey technique when applied to this species, along with the locations of the detectors.

Further acoustic surveys may pick up further incidental records of these latter two species, but the methodology of deploying a bat detector at height is not optimal for recording these species. Further assessment of small mammal distribution on the islands would be better served through traditional survey techniques appropriate to the species, such as capture and release.

5.5 Ongoing Surveys

The work in 2022 and 2023 has greatly improved our knowledge of the bats of Scilly, and provided detailed distribution mapping over both these years. In 2024, the work is proposed to continue,

but with a focus on deployment of the five passive acoustic monitoring bat detectors at five locations across St Mary's and St Martin's. This is intended to identify the pattern of activity at likely bat activity 'hotspots', giving a detailed picture of activity for these few sites.

In addition, the Bat Group and Wildlife Trust wish to undertake further survey work in the islands using other techniques, including live capture and release, through mist netting or harp trapping. This would have a higher chance of recording brown long-eared bats, which are difficult to pick up through passive acoustic monitoring.

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Photo Credits

Brendan White – lesser white-toothed shrew.

Martin Goodey – long-winged conehead; house cricket; large conehead.

Ren Hathway – grey bush-cricket.

David Dimmock – great green bush-cricket.

James Faulconbridge – common pipistrelle; wood mouse; brown rat; house mouse; speckled bush-cricket.

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