Technical Appendix 8.5: Bat Survey Report

Windburn Wind Farm

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1.0 Introduction

1.1 Background

SLR Consulting Limited (SLR) was commissioned by Windburn Wind Farm Ltd (The Client) in March 2023 to undertake bat surveys for the proposed Windburn Wind Farm (OS grid reference NN 87858 03244), 'the site', to inform the Environmental Impact Assessment (EIA) for the proposed development. The original site layout initially considered was for 15 wind turbines. This was then reduced to 13 turbines. This report provides the results of the bat surveys for the site.

It should be noted that the site was partially surveyed in 2021. Although this data is superseded by the 2023 survey results, the data collected in 2021 has been reviewed and any relevant records included within this report where appropriate.

1.2 Site Description

The site is located in the Ochil Hills approximately 4.5km north of Alva and it is characterised by open habitats such as heathland, bog, and acid grassland, with some woodland within sheltered glens and small plantations. There are several watercourses within the site boundary including the Danny Burn, the River Devon and the Finglen Burn. The Upper and Lower Glendevon reservoirs are present outwith the site boundary to the east.

1.3 Scope of Survey

The aim of the surveys was to obtain baseline information relating to use of the site by bats and associated levels of activity. This in turn allows for completion of an assessment into the level potential risk to bat species as a result of the proposed development.

Specific study objectives were to:

- assess the suitability of habitats within the site for supporting commuting, foraging and roosting bats;
- identify the bat species assemblage using the site;
- assess the level of activity of all bat species recorded at the site, both spatially and temporally; and
- where possible, assess the potential risk of turbine-related impacts for each bat species recorded within the site.

The assessment of ecological effects as a result of the proposed development and any recommended mitigation, compensation and enhancement measures is beyond the scope of this study and is instead presented separately within Chapter 8 of the EIA Report.

1.4 Relevant Legislation

All bats in Scotland are classed as European protected species and receive full protection under both national and international legislation (**Annex A**). The overarching aim of this legislation is to protect, restore and maintain populations of protected bat species at favourable conservation status[1] . It is therefore an offence to intentionally or recklessly kill, injure or disturb any bat, or damage a destroy a bat roost.

[1]'Favourable conservation status' describes as situation on which a species is thriving throughout its natural range and is expected to continue to thrive in the future.

While bat fatalities associated with wind farms are generally considered to relate to 'incidental' killing[2] and are unlikely to class as an offence, once a certain level of fatality impact is reached, such killing may cease to be incidental and become classified as intentional or reckless. It is therefore important to understand what species of bat utilise the site, and how they use it, so that any potential impacts on populations can be adequately assessed, avoided, and/or mitigated for, to ensure compliance with relevant legislation.

[2] As described in page 49, paragraph 83 of 'Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC (2007)'. Available at: https://ec.europa.eu/environment/nature/conservation/species/guidance/pdf/guidance_en.pdf

2.0 Methodology

2.1 Desk Study

A desk-based study was carried out in January 2024 to gather information relating to existing records of bat species within the site and surrounding area. This included:

- a search for statutory designated sites (for which bats are a qualifying feature) within 10km of the site boundary, conducted through the NatureScot Sitelink website[3];
- a data request for bat records (relating to flight records and roosting bats) within 10km of the site Boundary, submitted to The Wildlife Information Centre (TWIC); and
- a review of aerial imagery (Google Earth[4]) to identify habitats within the site and surrounding area that bats may utilise for commuting, foraging or roosting purposes.

Where possible, data relating to bats were also gathered from existing ecological records collected to inform Environmental Statements (ESs) and EIA Reports for nearby renewable development projects, including:

- Wind Prospect (2017), Burnfoot East Wind Farm – Environmental Statement; and
- Wind Prospect (2011), Rhodders Wind Farm – Environmental Statement.

2.2 Field Survey

The field survey methodology was designed in accordance with current wind farm specific guidelines developed by NatureScot *et al* (2021)[5] and current bat survey guidance[6]. Full details of each survey type are provided below; in instances where the methodology deviates from current guidelines, a rationale has been provided. No at height monitoring or walked transects were carried out as part of the survey work, as, due to the habitats present on the site it is considered that the bat activity levels recorded at ground level are representative of bat activity on the site as a whole.

2.2.1 Habitat Suitability Appraisal

A Daytime Bat Walkover (DBW) was undertaken via a review of aerial maps and target notes made during walkover survey for protected and notable species during 2023 (results of the protected and notable species surveys can be found in **Technical Appendix 8.2**). The DBW comprised a high-level habitat appraisal to assess the suitability of habitats within the site and surrounding area for roosting, commuting and foraging bats.

During the appraisal, habitats within the site and surrounding area were assessed against specific criteria detailed within guidance of relevance to the survey period[6] in order to assign a 'level' of both roosting and commuting and foraging suitability (i.e. High, Moderate, or Low).

[3] https://sitelink.nature.scot.home

[4] https://earth.google.co.uk/

[5] NatureScot (2021) Bats and onshore wind turbines – survey, assessment and mitigation. Available online at https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation#:~:text=3.-,ASSESSING%20POTENTIAL%20IMPACTS,other%20forms%20of%20anthropogenic%20mortality)

[6] Collins, J. (ed.) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). The Bat Conservation Trust, London.

2.2.2 Ground Level Tree Assessment

As per BCT guideines[6] a Ground Level Tree Assessment (GLTA) survey is required to assess the potential of roosting bats to utilise the trees on site that have the potential to be impacted by the development.

During the GLTA, trees in close proximity to proposed infrastructure were assessed from ground level for the presence of any potential roost features (PRFs). Trees are assessed against the following suitability criteria[6]:

- None: Either no PRFs in tree or highly unlikely to be any;
- FAR: Further assessment required to establish if PRFs are present in the tree; and
- PRF: A tree with at least one PRF present.

Where trees are categorised as 'PRF', if possible, trees were further categorised as follows:

- PRF-I: PRF only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats; and
- PRF-M: PRF is suitable for multiple bats and may therefore be used by a maternity colony.

2.2.3 Bat Activity Surveys

NatureScot guidance[5] states that the survey effort should be focused in areas of the site where turbines are proposed, in order to provide a representative sample of bat activity at or close to these points. For sites containing less than ten turbines, detectors should be placed at each proposed turbine location. For development proposals with over ten turbines, detectors should be placed at each of the ten turbine locations, with the remaining third distributed according to a system of stratified sampling based on the availability of different habitats and topographical features of the site.

Based on a proposed 15 turbine layout provided by the Client at the scoping stage, a programme of bat activity surveys using full spectrum static bat detector units (Wildlife Acoustics SM4BATFS) was planned and carried out at eleven turbine locations plus two additional locations situated between turbines, during the 2023 active bat season (extending from April to mid-September in Scotland). A total of 13 static detectors were therefore deployed. Details relating to the location and positioning of each static detector are displayed in **Annex B** and shown on **Figure 8.5.1.**

Each static detector unit was set to record bat activity for a minimum period of ten consecutive nights per season, with each night of monitoring commencing approximately 30 minutes before sunset and ending 30 minutes after sunrise. The dates and timings of each static detector survey period are provided in **Table 2-1**: .

Table 2-1: Summary of static detector survey dates

Month	Survey Dates	Number of Survey Nights Per Static Detector
Spring	17.05.23 – 30.05.23	14
Summer*	28.06.23 – 13.07.23	16
Autumn	16.08.23 – 01.09.23	16
*No static detector was deployed at survey location L8 during the summer survey period. For further details, please refer to Section 2.6 Limitations.		

Where possible, static detector deployment was targeted for periods where the weather forecast indicated the best possible chance for suitable weather conditions (i.e. dusk temperature of 8ºC or above (in Scotland), ground level wind speed of 5m/s or lower, and no rain/very light rainfall). To accommodate for variable weather conditions, static detectors were deployed for a minimum period of 14 nights during each season to maximise the chances of obtaining 10 nights of data recorded during optimal weather conditions.

2.2.3.1 Weather data

Weather data were collected using the Davis Instruments VantageVue weather station. The weather station was positioned within open habitat (OS grid reference NN 88763 01026) and set up to record temperature (ºC), wind speed (m/s) and rainfall (mm) at 10-minute intervals during each night of monitoring.

Due to technical issues associated with weather station set up, it was not possible to collect onsite data for the Spring survey period, see Section 2.6.1 for full details.

2.3 Bat Sonogram Analysis

Bat echolocation calls recorded during activity surveys were analysed in full spectrum format using Kaleidoscope Pro software. An automatic identification (auto-ID) filter within Kaleidoscope Pro was initially applied to assign calls to likely species, using a 'Bats of Europe' filter. This software is designed to automatically assign recorded echolocation calls with bat species that produce the same echolocation call structure. While the software is efficient, it is not totally infallible. Manual classification of echolocation files was therefore carried out by an experienced member of staff, with reference to guidance outlined in Russ (2021)[7], for the following:

- all files (100%) recorded as bat species through the auto-ID system;
- all files (100%) recorded as 'no-ID' through the auto-ID system; and
- spot checks and amendment, where required, of at least 25% of total noise files recorded through the auto-ID system.

Due to close similarities in the echolocation call structure of certain species, some echolocation files were identified to genus level only. This is of relevance to species of the following genera:

- *Myotis* species – Daubentons *Myotis daubentonii*, Natterers *Myotis nattereri*, or whiskered bat *Myotis mystacinus*;
- *Nyctalus* species – Noctule *Nyctalus noctula* or Leislers bat *Nyctalus leisleri*; and
- *Pipistrellus* species – common *Pipistrellus pipistrellus*, soprano *Pipistrellus pygmaeus* or Nathusius' pipistrelle *Pipistrellus nathusii*.

For the comparison of results, a quantity called a 'bat pass' has been applied within this report. A bat pass has been defined as a file generated by the bat detector, which contains two or more bat echolocation pulses (likely attributed to the same bat). The detectors are programmed to generate a new file when no bat call has been detected for at least one second. The number of bat passes may not relate to the number of bats present in one sample location (as one bat may make several passes); yet rather, gives an indication of the level of bat activity in that location over each recording period.

[7] Russ, J. (ed) (2021) *Bat Calls of Britian and Europe. A Guide to Species Identification*. Pelagic Publishing, Exeter.

2.4 Collision Risk Assessment

The vulnerability of bat related injury or mortality associated with collision with wind turbines or barotrauma[8] is largely dependent on the positioning of wind turbines in relation to bat activity levels[5].

Bat species data, and associated activity levels recorded within the site can therefore be assessed to establish their vulnerability to collision as a result of the proposed development. This assessment is based on three main factors:

- relative abundance;
- collision risk; and
- bat activity recorded within the site.

Table 2-1 sets out relative abundance and potential collision risk of each species known to be present in Scotland and indicates potential vulnerability of such species populations as described in NatureScot guidance on bats and onshore wind turbines[5].

Table 2-1 Potential collision risk and population vulnerability of bat species known to be present in Scotland

	Low Collision Risk	Medium Collision Risk	High Collison Risk
Common species	N/A	N/A	Common pipistrelle Soprano pipistrelle
	Low vulnerability	**Low vulnerability**	**Medium vulnerability**
Rarer species	Brown long-eared Daubenton's Natterer's	N/A	N/A
	Low vulnerability	**Medium vulnerability**	**High vulnerability**
Rarest species	Whiskered Brandt's	N/A	Nathusius' pipistrelle Noctule Leisler's
	Medium vulnerability	**High vulnerability**	**High vulnerability**

The assessment of the potential risk to bats as a result of proposed development is conducted through a two-stage process, as summarised below.

2.4.1 Stage 1 – Initial Site Risk Assessment

The initial site risk assessment considers an assessment of habitat risk (based on results of the habitat suitability appraisal for the site) and the size of the proposed development. The full method for assessing potential site risk, in line with NatureScot guidance[5], is outlined in **Annex C**.

[8] Barotrauma describes injuries that occur when a bat encounters sudden and extreme changes in atmospheric pressure as a result of rotating turbine blades. This rapid change in pressure can rupture air containing tissues in bats (e.g. the lungs), resulting in fatal internal bleeding.

2.4.2 Stage 2 – Overall Risk Assessment

The overall risk to populations of bat species was calculated by multiplying the initial site risk (**Annex C**) with the level of bat activity generated through an online tool called Ecobat[9]. Ecobat is an online tool designed to compare activity data recorded on site (entered by the user) with bat data collected within a defined search area at the same time of year and, (where possible) in comparable weather conditions. Ecobat generates a percentile rank for eachnight of activity and provides a numerical way of interpreting the relative levels of bat activity recorded at a site with other sites across the same region.

The bat survey data were entered into Ecobat and relative levels of activity were determined by comparison with a reference data set including records from within 30 days of each survey date, and within 200km of the survey location.

Only bat presence is captured by Ecobat. The tool does not capture nights or sample points where no bat activity is recorded, such that the output statistics and percentiles relate only to those nights where bats were recorded.

For each night where bat activity is recorded, Ecobat reports the percentile (and associated confidence limits) of the night of data against the reference range. For example, data reported as being within the 80th percentile means that 80% of the nights within the reference range have less than or equal number of bat passes than the night being analysed.

NatureScot guidelines[5] define bat activity levels on a particular night as:

- 0-20th percentile – low;
- 21st-40th percentile – low to moderate;
- 41st – 60th percentile – moderate;
- 61st – 80th percentile – moderate to high; and
- 81st – 100th percentile – high.

2.5 Survey and Data Analysis Personnel

Table 2-2 provides detail of the SLR staff who carried out baseline bat survey work and assessment as part of this study.

Table 2-2: SLR Survey Personnel

Name and Position	Professional Membership	Experience	Tasks conducted
Niamh Ni Nagy (Assistant Ecologist)	Qualifying member of CIEEM	1.5 years	Static detector/weather station deployment and collection.
Sophie McPeake (Assistant Ecologist)	Qualifying member of CIEEM	1 year	
Amy Green (Project Ecologist)	Qualifying member of CIEEM	2 years	

[9] Lintott, P. R., Davison, S., Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J. & Mathews, F. (2018). *Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data.* Ecology and Evolution 8(2): 935-941.

Name and Position	Professional Membership	Experience	Tasks conducted
Euan Macrae (Assistant Ecologist)	Qualifying member of CIEEM	1.5 years	
Rachel McLeod (Project Ecologist)	Qualifying member of CIEEM	3 years	Sound analysis
Hannah Rowding (Senior Ecologist)	Associate member of CIEEM (ACIEEM)	8 years	Sound analysis quality assurance review and technical reporting
Cróna McMonagle (Senior Ecologist)	ACIEEM	7 years	Technical reporting
Callum Taylor (Senior Ecologist)	Qualifying member of CIEEM	5 Years	Technical report review
Sara Toule (Associate Ecologist)	ACIEEM	10 years	Quality assurance review

2.6 Limitations

2.6.1 Ground Level Tree Assessment

Two trees in close proximity to the new access track section close to the A9 were not able to be surveyed during the GLTA due to access issues, these trees therefore cannot be ruled out as having roosting potential.

2.6.2 Bat Activity Survey

This study provides a ‘snapshot’ of bat activity prevailing at the time of the survey. Lack of evidence of any one protected bat species does not necessarily preclude them from being present on site at a later date. Whilst it is considered unlikely that evidence of additional bat species has been overlooked, due to the nature of the survey, it is feasible that some species may not have been recorded by virtue of habit or random chance.

Due to an equipment malfunction, no data was collected at static detector location L8 during the summer survey period. Despite this limitation, it is considered that data collected from the 12 other static detector units during this time period provides sufficient coverage and a suitable representation of bat activity within the study area.

Weather

Due to technical issues associated with weather station data collection, weather data for the Spring survey period, and measurements of temperature for the Summer survey period, were obtained via the ‘Menstrie weather’ observation site on Met Office WOW. While the altitude difference between the site and weather station is approximately 500m, the station is located only 5km south-west of the site. Therefore, data provided through Met Office WOW is considered adequate for providing an indication of conditions likely to be experienced on the site itself during these time periods.

2.6.3 Sonogram analysis

Limitations associated with the Ecobat analysis tool have been identified. For example, the outputs of the Ecobat tool are considered in the context of wider data collection from third parties and are not accepted as a rigorous appraisal method in isolation.

3.0 Results

3.1 Desk Study

3.1.1 Statutory Designated Sites

No statutory or non-statutory designated sites for bats were identified within a 10km radius of the site boundary.

3.1.2 Data Search

Data returned from TWIC identified historic records relating to least four species of bats in flight within 10km of the site; common pipistrelle, soprano pipistrelle, Daubenton's bat, and species of the genera *Pipistrellus* (**Annex A** of **Technical Appendix 8.2**).

3.1.3 Existing Ecological Records

A bat habitat roost suitability assessment carried out to inform the Rhodders Wind Farm 2011 Environmental Statement (ES)[10] identified very limited bat commuting, foraging or roosting resource within the site and surrounding area. No further surveys relating to bats were carried out to inform the ES.

Static bat detector surveys carried out during the 2015 to inform the Burnfoot East Wind Farm ES[11] identified a single *Pipistrellus* species pass during the active season survey period (five monitoring nights per month in May, July and September). Activity transect and spatial point count surveys also identified only a single *Pipistrellus* species pass across three survey visits between May and September 2015. The results of the activity surveys therefore indicated very low levels of bat activity within the site, of which were attributed to the high elevation and exposed nature of the site, with few linear features, edge habitats and lack of roosting resource.

3.2 Field Surveys

3.2.1 Habitat Suitability Appraisal

The site is comprised of open upland habitat formed primarily of blanket bog and acid grassland, intersected by several small watercourses (including the Danny Burn, Finglen Burn, River Deveron, East Cameron Burn, and a series of unnamed watercourses). There is a lack of woodland coverage within the main site itself, however small stands of coniferous woodland exist adjacent to the proposed access route (e.g. TN1, **Table 1**:, **Annex D**) and Carim Lodge (TN3).

Watercourses that intersect the site may provide some opportunities as linear commuting and foraging features. Commuting and foraging suitability for bats was also noted along the proposed access track, where small pockets of coniferous woodland, interspersed with grassland, narrow watercourses and scrub habitat exist. Overall however, the site was considered to provide low suitability for commuting and foraging bats due to its largely exposed nature.

[10] Wind Prospect (2011) Rhodders Wind Farm – Environmental Statement. Technical Appendix 7.1 Burnfoot Wind Fam Extensions: Protected Species Survey Report (Non-Avian)

[11] Wind Prospect. (2017). Burnfoot East Wind Farm Environmental Statement. Technical Appendix 7.3 Bat Survey Report.

3.2.2 Ground Level Tree Assessment

Habitats within the site, considered suitable to support bat roosting include pockets of broadleaved woodland, mixed woodland and plantation woodland situated adjacent to the proposed access track.

A total of nine trees within 30m of the site were identified with PRFs, results are summarised in **Table 3-1**. Full results of the GLTA can be found in **Annex D** and are shown on **Figure 8.5.2**.

Table 3-1 GLTA results

Tree no.	Categorisation (no of PRFs)	Distance from RLB
14	PRF (two features both PRF)	1m
15	PRF	2m
16	PRF (two features both PRF)	4m
17	PRF	1m
18	PRF (two features) FAR (two features)	0m
19	PRF	15m
20	PRF	16m
21	PRF-I	5m
22	PRF (two features) PRF-M (one feature)	4m

Conifer plantation is generally considered less suitable for roosting bats and the conifer plantation present on site is young, therefore considered of negligible suitability. Due to this, the relatively small size of the broadleaved and mixed woodland habitats and lack of overall woodland coverage, the overall site is considered to be of low suitability for roosting bats.

3.2.3 Bat Activity Survey

Thirteen static detectors were deployed within the site for a total of 582 nights during the 2023 active bat season (see **Figure 8.5.1** for static detector locations in relation to proposed turbine locations). Data analysis identified at least five bat species utilising the site during the survey period:

- Common pipistrelle;
- Soprano pipistrelle;
- *Pipistrellus* species;
- *Myotis* species;
- *Nyctalus* species; and
- Brown long-eared bat *Plecotus auritus*.

During this time, a total of 641 bat passes were recorded. A summary relating to spatial and temporal patterns of bat activity for the site as a whole, and general activity levels demonstrated by each species, is described below.

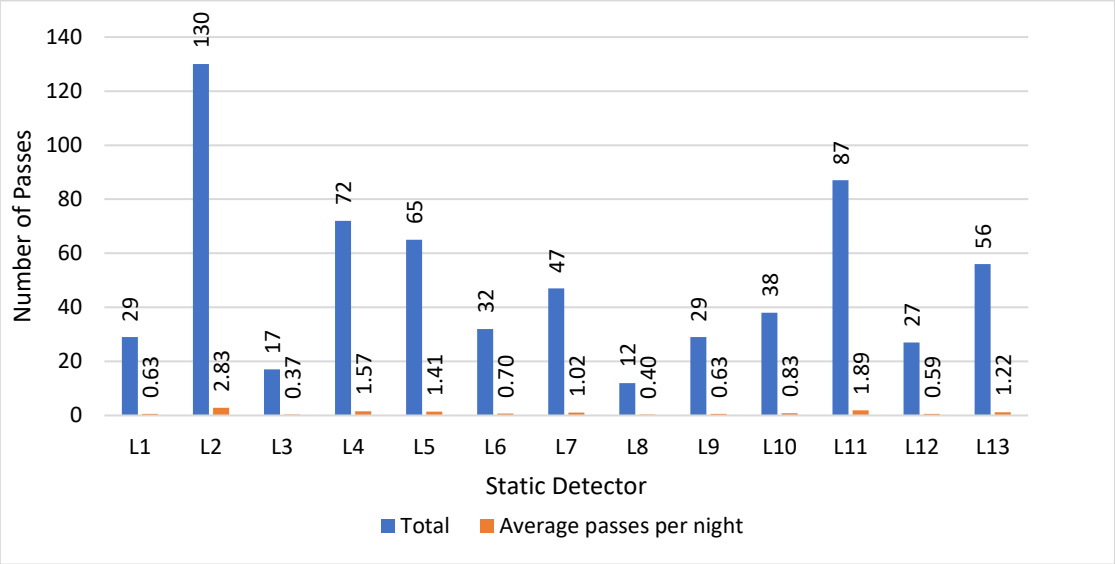
For full set of tabulated bat activity results, please refer to **Annex E.** Weather data corresponding with dates of the bats activity surveys are provided in **Annex F**[12].

3.2.3.1 Spatial overview

The total number of bat passes recorded across the site is shown in **Chart 3-1**. The information presented indicates that:

- the greatest number of passes overall was recorded at survey location L2 to the south of the site, with a total of 130 passes (averaging 2.83 passes per night[13]).
- lowest overall bat activity was recorded at L8, with a total of 12 passes (averaging less than one pass per night). It should however be noted that no static detector was deployed at this location during the summer survey season due to equipment failure (see Section 2.6.1) and therefore true activity levels may be slightly higher. However, survey location L3 also recorded very low level of activity, totalling 17 passes during the 2023 survey period (an average of less than one pass per night).

Chart 3-1 Total and average bat passes per night, per detector, recorded over the entire survey period



3.2.3.2 Temporal Overview

The total number of bat passes recorded across the site during each survey season is shown in in **Chart 3-2**. The information presented indicates that:

- the greatest level of bat activity overall was recorded during the autumn survey period, with a total of 516 passes (averaging 2.48 passes per night[14]).

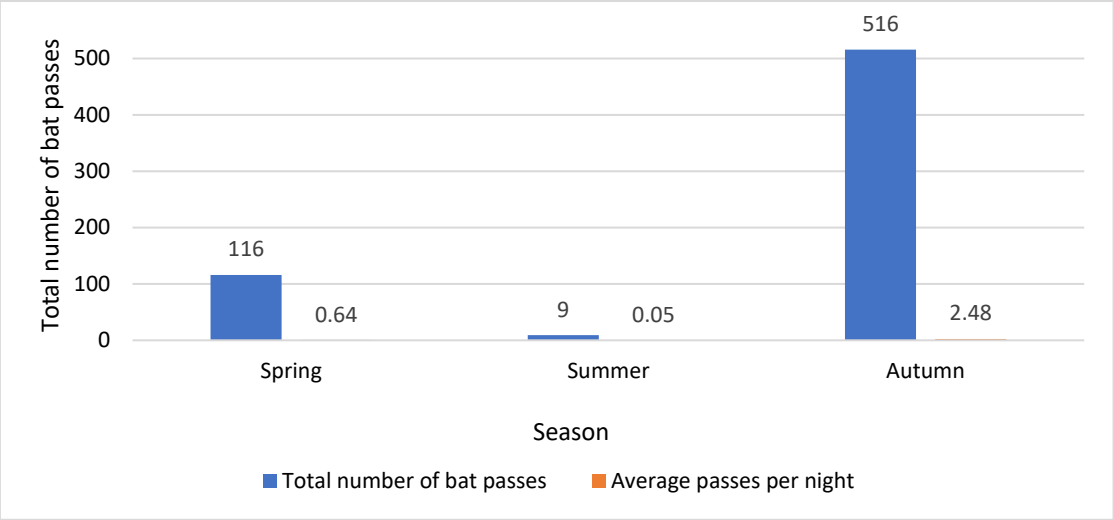
[12] To inform context for this report of this report, weather data has been displayed in hourly increments within Appendix F.

[13] Average passes per night, per static detector, per species was obtained by dividing the total number of passes of each species at each detector by the total number of survey nights per detector. (The total number of survey nights per detector was 46, with exception of L8, of which was 30).

[14] Average passes per night was obtained by dividing total number of passes per season by total number of survey nights (for all static detectors combined) per season. (Total number of survey nights per season: Spring - 182; Summer - 192; and Autumn - 208).

- the lowest overall bat activity was recorded during summer, with a total of nine passes (averaging 0.05 passes per night, per detector). It should however be noted the true overall level of bat activity in summer may be minimally higher than reported due to the lack of data obtained at L8 during this period.

Chart 3-2 Total and average bat passes per night, per season, for the whole Site



3.2.3.3 Activity by Species – Whole Site Overview

Chart 3-3 indicates that the most frequently recorded species within the site was soprano pipistrelle, with a total of 280 passes recorded. This equates to 43.68% of total bat passes recorded within the site during the survey period, as demonstrated in **Chart 3-4**. However, overall levels of activity across the site were generally very low, averaging less than one pass per night during the full survey period.

Common pipistrelle was the second most encountered species within the site, with a total of 252 passes per night recorded (again, averaging less than one pass per night, per detector). This equates to 39.31% of total bat passes recorded within the site during the survey period.

Total passes attributed to the genera *Pipistrellus* and *Myotis* species were similar, with 42 and 62 passes recorded respectively (both averaging less than one pass per night per detector). Files attributed to the genus *Pipistrellus* accounted for 6.55% of total passes, while *Myotis* accounted for 9.67%.

The remaining echolocation files were attributed to brown long-eared bats (four passes recorded during the entire survey period, equating to 0.62% of total passes) and species of the genera *Nyctalus* (one pass recorded – 0.16% of total passes recorded).

Chart 3-3 Total and average passes per night per species, across the whole Site

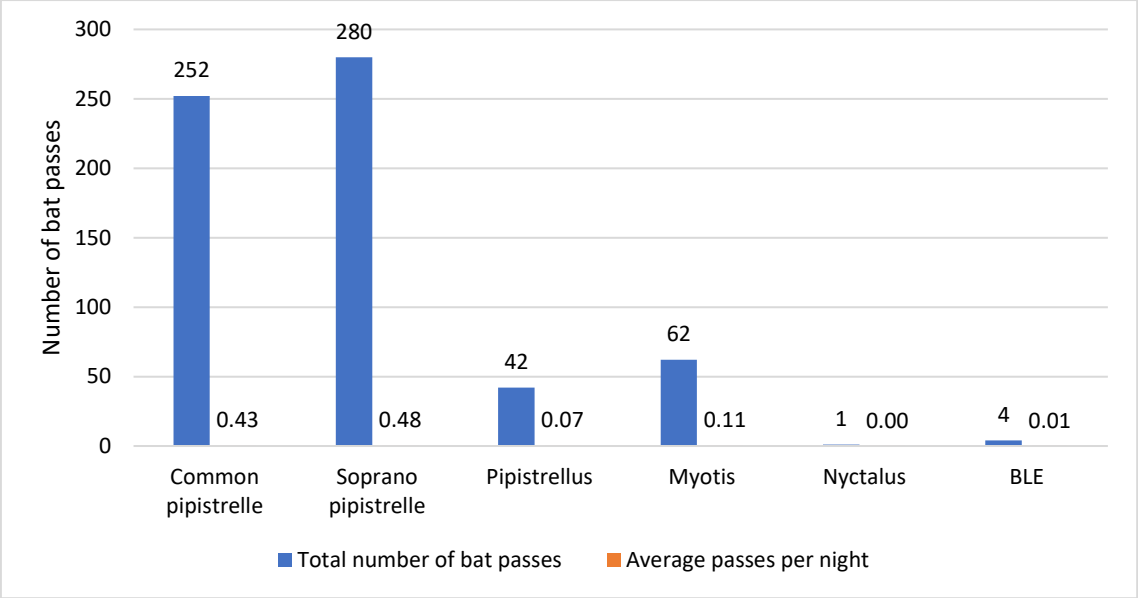
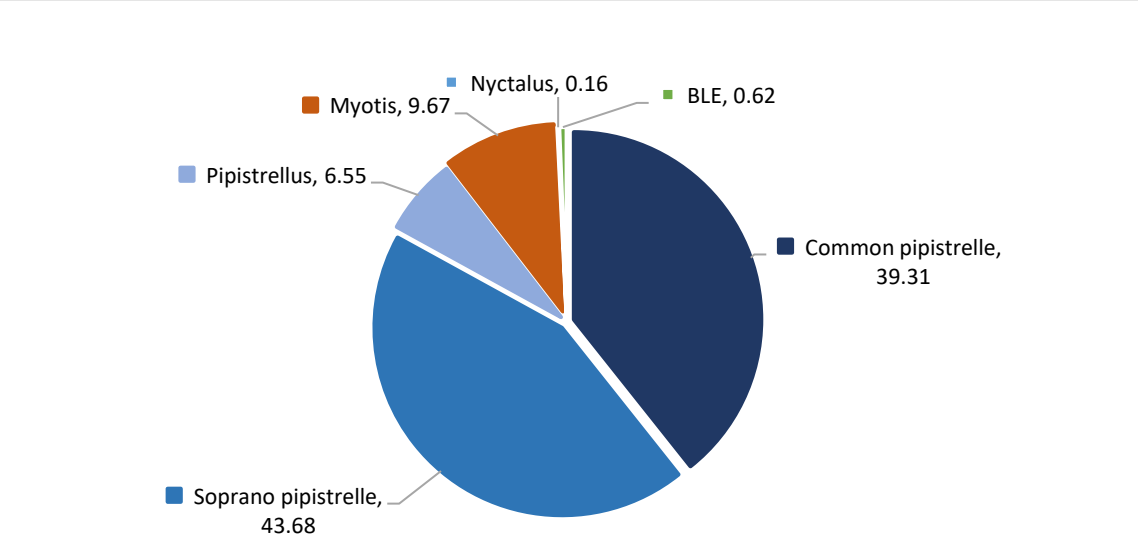


Chart 3-4 Proportion (%) of total bat species passes within the Site as a whole during activity surveys



3.2.3.4 Species-specific Results

Data relating to the total number of bat passes recorded at each static detector, per survey season, is provided in **Annex E**. Species-specific total, average and median bat passes per night, recorded at each static detector, per survey season, are provided in **Chart 3-5** to **Chart 3-8**. A summary account of the spatial and temporal occurrence of each species is described below.

Common Pipistrelle

A summary of total, average and median common pipistrelle passes per night, recorded at each static detector, per survey season, is provided in **Chart 3-5**. The data presented illustrates that:

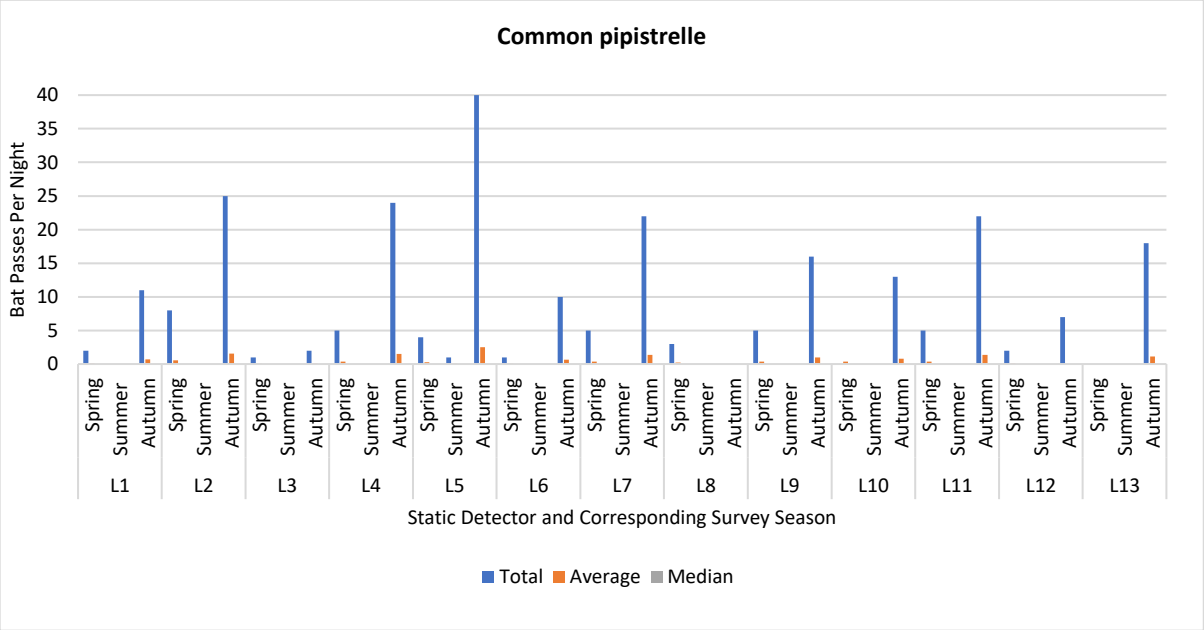
- common pipistrelle were recorded at all static detector locations during certain periods during the active bat season;
- the greatest levels of common pipistrelle activity were recorded during the autumn survey period. During this time at total of 40 passes were recorded at static detector location L5 (averaging 2.5 passes per night), 25 passes were recorded at static detector location L2 (averaging 1.56 passes per night) and 24 passes were recorded at L4 (averaging 1.5 passes per night).

  Further review of data indicates that while activity was generally low on most nights of survey, higher levels of activity contributing to the majority of total passes recorded were noted on specific nights at the following locations:

  - Static detector L2: 16 August 2023 (14 passes from a total of 25 during the Autumn survey period)
  - Static detector L5: 23 August 2023 (29 passes from a total of 40).

  The increase in activity levels noted on the above dates above also corresponds with optimal weather conditions for bats, whereby night-time temperatures were at least 8°C, windspeed less than 6m/s with little or no rainfall for much of the survey night (**Annex F**); and
- The lowest levels of common pipistrelle activity were recorded in summer, with a maximum of one pass recorded at static detector location L5. Average bat passes measured less than one pass per night at all static detector locations during the summer survey period.

Chart 3-5 Total, average, and median number of common pipistrelle passes per night, per detector, during each survey season



Soprano pipistrelle

In terms of soprano pipistrelle activity, the data presented in **Chart 3-6** illustrates that:

- soprano pipistrelle was recorded at all static detector locations.
- the greatest levels of soprano pipistrelle activity were recorded in autumn at static detector locations L11 and L2, with a total of 55 and 53 passes recorded respectively

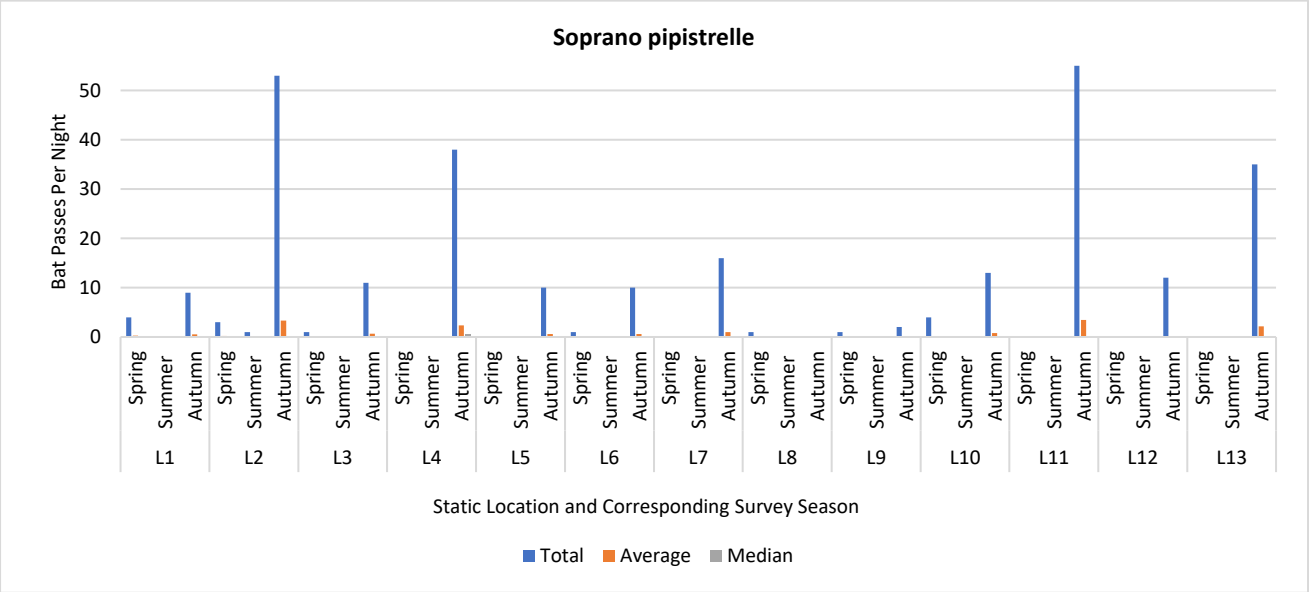
(averaging 3.44 and 3.31 passes per night). The median value for statics at both L2 and L11 in autumn was however 0.00. Further review of data indicates that while activity was very low on most nights of survey (zero to one pass per night), higher levels of activity contributing to the majority of total passes recorded were noted on specific nights:

- Static detector L2: 16 August 2023 (28 passes); 20 August 2023 (10 passes); and 31 August 2023 (12 passes); and
- Static detector L11: 31 August 2023 (48 passes).

The increase in activity levels noted on the above dates above also corresponds with optimal weather conditions for bats, whereby night-time temperatures were at least 8°C (with the exception of the morning of 1 September, measuring just below 8°C), windspeed less than 6m/s, and no rainfall (**Appendix F**); and

- the lowest levels of soprano pipistrelle activity were recorded in summer, with a maximum of one pass recorded at static detector location L2. Average and median bat passes measured less than one pass per night at all static detector locations during the summer survey period.

Chart 3-6 Total, average and median soprano pipistrelle passes per night, per detector, during each survey season



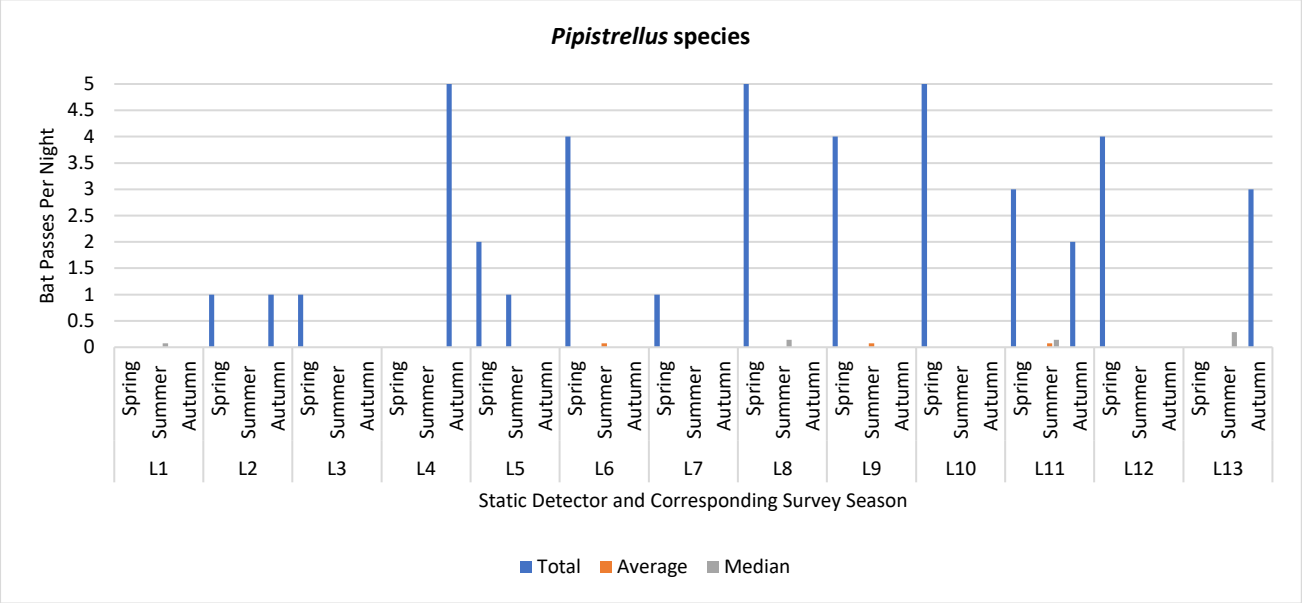
Pipistrellus species

Echolocation files containing bat passes that were not easily identifiable as either common or soprano pipistrelle species due to overlapping echolocation call parameters, have been classified to genus level only. This data is presented in **Chart 3-7** and indicates:

- bat activity attributed to species of the genus *Pipistrellus* was identified at all static detector locations;
- the greatest levels of *Pipistrellus* activity were recorded at static detector L8 and L10 in spring (totalling five passes each) and L4 in autumn (total of five passes). Average and median passes per night were however less than one across all static detector locations;

- the lowest levels of *Pipistrellus* species activity were recorded in summer, with a maximum of 1 bat pass recorded at static detector L5.
- the overall level of *Pipistrellus* activity recorded across the site was very low.

Chart 3-7 Total, average and median *Pipistrellus* spp. passes per night, per detector, during each survey season

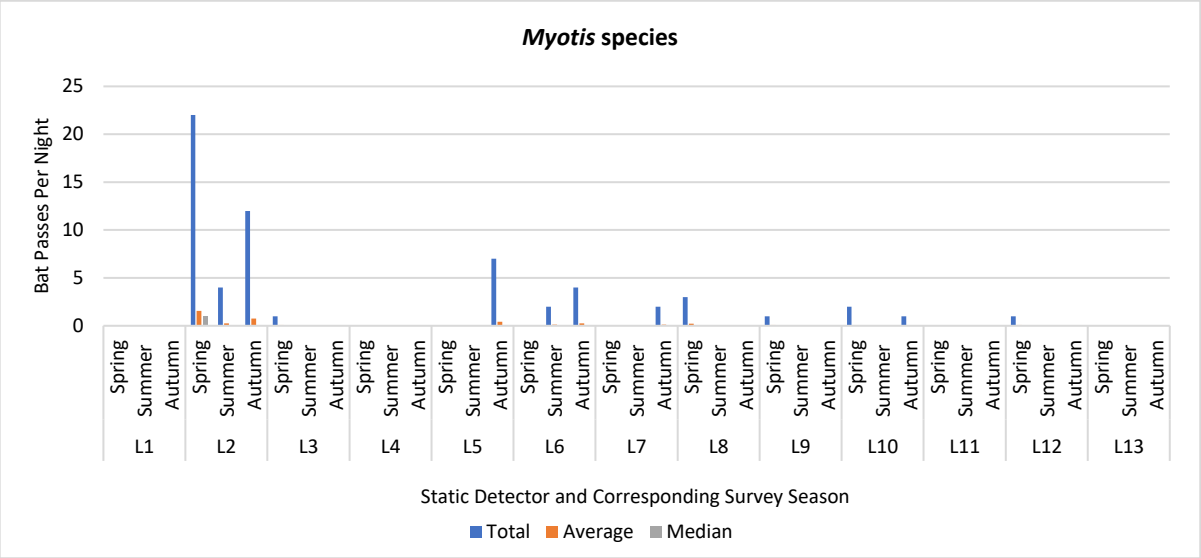


Myotis species

Data presented in **Chart 3-8** illustrates that:

- *Myotis* species were recorded at nine of the 13 static detector locations within the site;
- the greatest level of *Myotis* activity were recorded at static detector L2 during the spring (total of 22 passes, averaging 1.57 passes per night) and autumn (total of 12 passes, averaging 0.75 passes per night) survey periods; and
- no files relating to *Myotis* were recorded at static detector locations L1, L4, L11 and L13.

Chart 3-8 Total, average and median *Myotis* passes per night, per detector, during each survey season



Nyctalus species

A single file relating to a *Nyctalus* species pass was recorded at static detector location L1 during the autumn survey period. No further data relating to *Nyctalus* species were obtained, and therefore the level of *Nyctalus* activity within the site is considered to be very low.

Brown long-eared bat

A total of four brown-long eared bat passes were recorded during the autumn survey period, two of which were recorded at static detector L1 during the autumn survey period. with the others recorded at L7 and L12 (one pass at each detector during the autumn survey period). Based on these results, the overall level of brown long-eared bat activity within the site is considered to be very low.

3.2.4 Potential Roosting Assessment

Recordings made within the species-specific emergence window (dusk emergence time for each species according to Andrews and Pearson, 2022 and BCT guidance) are considered to give an indication as to the likelihood of a roost being nearby, therefore, recordings made prior to the emergence window are considered to be a strong indication of a nearby roost.

Table 3-2 summarises the recordings within the data set that fall within emergence window for each species. See **Annex G** for Ecobat output relating to roost emergence time.

Table 3-2 Bat Passes recorded in emergence window

Species	Detector Location	No. of calls recorded within emergence window	Date of recording
Common pipistrelle	L1	1	20/08/2023
	L2	1	31/08/2023
	L4	1	23/08/2023

Species	Detector Location	No. of calls recorded within emergence window	Date of recording
	L5	1	20/08/2023
	L12	1	19/08/2023
Soprano pipistrelle	L2	5	20/08/2023
		1	31/08/2023
	L4	1	19/08/2023
	L7	2	19/08/2023
Pipistrellus sp.	L2	1	16/08/2023

The recordings in **Table 3-2** suggest that there may be both a common pipistrelle and soprano pipistrelle roost in close proximity to the site.

Soprano pipistrelle calls at L2 were recorded early in the emergence window (between 15 minutes and 30 minutes after sunset) suggesting likelihood of a nearby roost. It is unlikely that this roost is situated within suitable habitat within the site along the access track, as the static detectors situated closer to this habitat recorded no calls on these dates, therefore it is most likely that this roost occurs out with the site. Given the proximity of L2 and L4 to each other, it is reasonable to assume that calls recorded at L4 could be attributed to the same roost. The relatively low numbers of recordings may indicate a non-breeding roost.

All of the common pipistrelle calls detailed in **Table 3-2** occur within the latter half of the emergence window, this may suggest that a roost, if present, is not necessarily within the site given that common pipistrelles are known to forage within 2km of their roosts[6]. As with soprano pipistrelles, all soprano pipistrelle calls within the emergence window were recorded at turbines within the southeastern part of the site, and no calls were picked up at detector locations closer to suitable roosting habitat within the site, suggesting that these bats are likely roosting out with the site. The relatively low numbers of recordings may indicate a non-breeding roost.

3.3 Collison Risk Assessment

3.3.1 Initial Site Risk Assessment

The site is formed of open upland habitat comprised primarily of blanket bog and acid grassland, with several small upland watercourses and limited woodland coverage. Based on the criteria provided in NatureScot guidance (see **Annex C**), the following applies:

- small number of potential roost features, of low quality;
- low quality foraging habitat that could be used by small numbers of foraging bats; and
- isolated site not connected to wider landscape by prominent linear features.

Based on the above, the habitat risk is considered to be low.

The proposed development comprises 13 turbines with a blade tip height of 149.9m, with five wind farm developments within 5km. This constitutes a large project size based on NatureScot guidance[5]. However, this is likely to be an overestimation, given that projects of a ‘Large’ size are stated to also have over 40 turbines.

Through combining results of project size and habitat risk, the results of the initial site risk assessment indicate that the proposed development presents a medium initial risk level to populations of bat species (score of 3, see **Annex C**).

3.3.2 Overall Risk Assessment

Results of the bat activity survey were compared with a 'reference range; to provide a numerical way of interpreting the relative levels of bat activity recorded on site with other sites across the same region. Ecobat recommends a reference range of 2000+ is used to be confident in the relative activity level scores. Summaries of the percentile statistics generated from Ecobat for high collision risk species on site are provided, and the full Ecobat output can be provided upon request. It is important to note that Ecobat analysis does not take into account nights were no bats were recorded at all.

The Ecobat analysis provided the following reference ranges for each species:

- Common pipistrelle – 15,261records;
- Soprano pipistrelle – 22,074 records;
- *Pipistrellus* sp. – 612 records;
- Brown long eared – 159 records;
- Myotis sp. – 1,651 records; and
- *Nyctalus* sp. – 993 records.

Table 3-3 provides a summary of total relative activity levels on site.

Table 3-3: Ecobat Output Site Risk Assessment

Species/Species Group	Median Percentile	Typical Activity Level (median percentile)	Typical Activity Risk Assessment	Max Percentile	Peak activity Level (max percentile)	Peak Activity Risk Assessment
Common pipistrelle*	0	Low	Low (3)	15	Low	Low (3)
Soprano pipistrelle *	0	Low	Low (3)	18	Low	Low (3)
Pipistrellus Sp.*	7	Low	Low (3)	13	Low	Low (3)
Brown long eared	35	Low-moderate	N/A	69	Moderate-High	N/A
Myotis Sp.	4	Low	N/A	19	Low	N/A
Nyctalus Sp.*	0	Low	Low (3)	0	Low	Low (3)
**High collision risk species*						

The results contained in **Table 3-3** indicates that activity levels for almost all bat species recorded on site are low during periods of both 'typical' activity and 'peak' activity. Brown long-eared bats are however the exception, whereby a low-moderate level of passes were recorded during periods of 'typical' activity, and a moderate-high level of passes during nights of 'peak' activity. It should, however, be noted that the reference range for brown long eared bats was only 159. On that basis, the overall activity level is considered to be low.

The results of the assessment of relative activity levels for high collision risk species (*Nyctalus* sp and common and soprano pipistrelles) across the site as a whole indicate a low risk of collision.

4.0 Summary

A summary of key findings of the suite of bat activity surveys to establish baseline conditions of the proposed development site are presented below:

- The desk study returned records of at least four species of bats in flight within 10km of the site; common pipistrelle; soprano pipistrelle; *Pipistrellus* species, *Myotis* species; and brown long eared bat.
- Habitats within the site are largely open and exposed, formed primarily of blanket bog and acid grassland, with a network of small watercourses intersecting throughout. There is a single standing deadwood tree c.17m from the proposed access track with moderate suitability for roosting bats. Habitats were classified as having low suitability for supporting commuting, foraging and roosting bats.
- Data recorded during bat activity surveys confirmed that at least five bat species utilise the Site for commuting and foraging purposes: common pipistrelle; soprano pipistrelle; *Pipistrellus* species, *Myotis* species, *Nyctalus* species and brown long eared bat.
- The highest number of passes was recorded at static detector L2, which lies in the south of the site (180 total passes), however, bat activity was recorded (at low levels) across the majority of the site.
- Species of the genera *Pipistrellus* (including passes from common, soprano and unidentified *Pipistrellus* species combined) were by far the most commonly occurring genera on site, accounting for almost 89.54% of total passes recorded during the 2023 survey period.
- The greatest levels of bat activity were recorded during the autumn survey period. However, activity during this period was still considered to be low due to the low average and median passes per night recorded (less than three).
- The lowest levels of bat activity were recorded during the summer survey period (with less than 10 bat passes recorded across the entire site, averaging less than one pass per night).
- Bat calls recorded within the emergence period for each species indicates the potential presence of a soprano and common pipistrelle roost within close proximity of the site, however due to the location of the detectors within the site it is unlikely that these roosts are within the suitable roosting habitat present on site.
- A review of site habitat risk and activity exhibited by high collision risk species (common pipistrelle, soprano pipistrelle, *Pipistrellus* species and *Nyctalus* species) deemed overall levels of activity within the site, and overall collision risk, to be low. The data does however indicate that the risk of collision associated with soprano pipistrelle may however increase slightly during nights with optimum weather conditions experienced during Autumn, as demonstrated by peaks in activity during certain nights in August.

Figures

Bat Survey Report

Windburn Wind Farm

Wind 2 Limited

SLR Project No.: 428.V12959.00001

2 June 2025

285000 286000 287000 288000 289000 290000 291000

704000 703000 702000 701000

12959.00001.0239.0 Static Bat Detector Locations

N

LEGEND

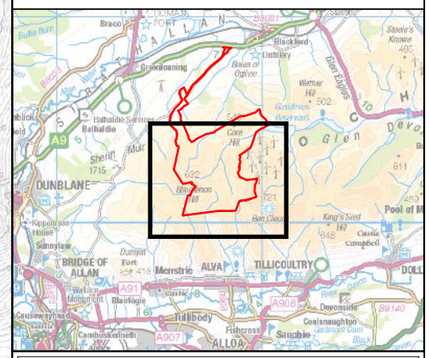
- Application Boundary
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head
- Bat Static Detector Location

T13 L13 BP2 T12 T11 L12 T10 T9 L6 L11 T8 L8 L5 T7 TCC2 T6 L10 TCC3 L7 T5 L9 BP1 T4 L4 L2 L1 T3 T2 T1 L3

Core Hill Old Shielings Waterfall Carim Lodge Little Corum Greenforet Sauchanwood Hill Scadlaw White Craig Burnfoot Hill Burnfoot Hill Wind Farm Ochil Hills Mickle Corum Glen Tye Old Wharry Burn Memorial Greenforet Hill Blairdenon Hill Alva Moss Ben Buck Big Hunt Hill Kidlaw Hill Menstrie Moss Ben Cleuch 721 Bengengie Hill Craighorn Ben Ever Colsnaur Hill Waterfalls Cairn Sheep Pens The Cloves Fords Ford

0 0.5 1

Kilometres



WINDBURN WIND FARM LTD

SLR

WINDBURN WIND FARM

BAT SURVEY REPORT

STATIC BAT DETECTOR LOCATIONS

FIGURE 8.5.1

Scale 1:20,000 @ A3

Date MAY 2025

287750 288000 288250 288500

708500 708250 708000

A9

N

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

LEGEND

Application Boundary

Proposed Access Track

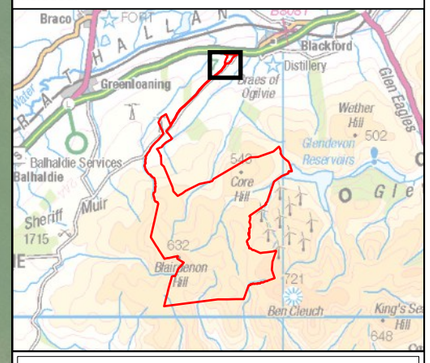
Existing Road (To Be Upgraded)

Ground Level Tree Assessment

PRF-I (Suitable For Individual Bats)

FAR (Further Assessment Required)

Note
Only trees with Potential Roost Features (PRF) have been included.



0 125 250

Metres

WINDBURN WIND FARM LTD

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BAT SURVEY REPORT

GROUND LEVEL TREE ASSESSMENT RESULTS

FIGURE 8.5.2a

Scale 1:3,000 @ A3

Date MAY 2025

12959.00001.0338.0 GLTA Results

285750 286000 286250 286500

706000

705750

N

TCC1

19

20

21

22

0 125 250

Metres

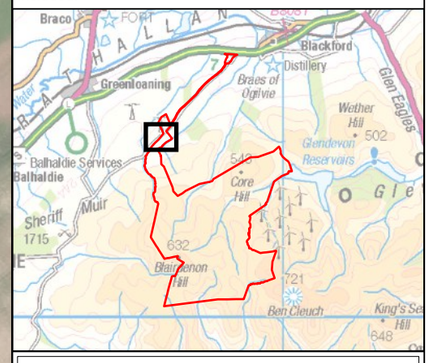
LEGEND

- Application Boundary
- Proposed Temporary Construction Compound (TCC)
- Proposed Access Track
- Existing Road (To Be Upgraded)

Ground Level Tree Assessment

- PRF-M (Suitable For Multiple Bats/Maternity)
- PRF-I (Suitable For Individual Bats)
- FAR (Further Assessment Required)

Note
Only trees with Potential Roost Features (PRF) have been included.



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BAT SURVEY REPORT

GROUND LEVEL TREE ASSESSMENT RESULTS

FIGURE 8.5.2b

Scale	Date
1:3,000 @ A3	MAY 2025

12959.00001.0338.0 GLTA Results

285750 286000 286250 286500

705250

705000

12959.00001.0338.0 GLTA Results

N

23 24 25 26 28 27

0 125 250

Metres

LEGEND

Application Boundary

Proposed Access Track

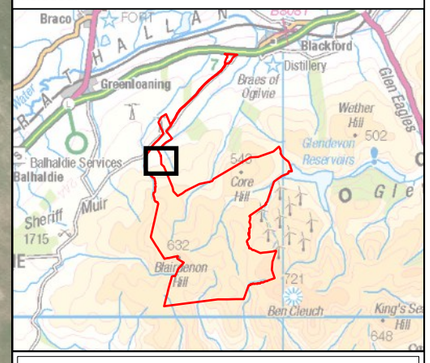
Existing Road (To Be Upgraded)

Ground Level Tree Assessment

PRF-I (Suitable For Individual Bats)

FAR (Further Assessment Required)

Note
Only trees with Potential Roost Features (PRF) have been included.



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BAT SURVEY REPORT

GROUND LEVEL TREE ASSESSMENT RESULTS

FIGURE 8.5.2c

Scale	Date
1:3,000 @ A3	MAY 2025

Annex A: Relevant Legislation

A.1.1 Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

All bat species found in Scotland are classed as European protected species. They receive full protection under the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended in Scotland). This legislation makes it an offence to deliberately or recklessly:

- Capture, injure or kill a wild bat;
- Harass a wild bat or group of bats;
- Disturb a wild bat in a roost (any structure or place it uses for shelter or protection);
- Disturb a wild bat while it is rearing or otherwise caring for its young (this would be a 'maternity' roost);
- Obstruct access to a bat roost or to otherwise deny the animal use of the roost;
- Disturb such a wild bat in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of that species; and to
- Disturb a wild bat in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

It is also an offence to:

- Damage or destroy a breeding site or resting place of such an animal (whether or not deliberately or recklessly); and to
- Keep, transport, sell or exchange, or offer for sale or exchange any wild bat (or any part or derivative of one) obtained after 10 June 1994.

A.1.2 Nature Conservation (Scotland) Act 2004

The Nature Conservation (Scotland) Act 2004 places a duty on public bodies to further the conservation of biodiversity in Scotland. Under this Act, Scottish Ministers must designate one or more strategies for biodiversity conservation, as defined within the Scottish Biodiversity Strategy. They are also required publish lists of species of flora and fauna and habitats considered to be of principal importance for biodiversity conservation in Scotland.

The Scottish Biodiversity List (SBL) is a list of plants, animals and habitats that Scottish ministers consider to be of principle importance for biodiversity conservation in Scotland. The following bat species are identified as a conservation priority through their listing on the SBL:

- Common pipistrelle *Pipistrellus pipistrellus;*
- Soprano pipistrelle *Pipistrellus pygmaeus;*
- Nathusius pipistrelle *Pipistrellus nathusii;*
- Daubentons bat *Myotis daubentonii;*
- Natterers bat *Myotis nattereri;*
- Whiskered bat *Myotis mystancinus;*
- Brandt's bat *Myotis brandtii;*
- Noctule *Nyctalus noctula;* and
- Brown long-eared bat *Plecotus auritus.*

Annex B: Static Detector Locations

Table 1: Static Detector Locations

Static Detector Location	Co-ordinates (x,y)	Location Description
L1	288157, 701161	Located at Turbine 1
L2	288691, 701237	Located at Turbine 2
L3	288344, 700864	Located at Turbine 3
L4	288281, 701542	Located at Turbine 4
L5	287522, 702170	Located at Turbine 5
L6	288074, 702580	Located at Turbine 6
L7	288155, 701871	Located at Turbine 7
L8	288054, 702229	Located at Turbine 8
L9	287713, 701521	Located at Turbine 9
L10	287606, 701849	Located at Turbine 10
L11	287348, 702459	Located at Turbine 11
L12	287658, 702967	Located between Turbines 12 and 13
L13	287907, 703421	Located between Turbines 13 and 14

Annex C: Initial Site Risk Assessment Criteria

Table 1: Stage 1 – Initial Site Risk Assessment

	Project Size			
		Small	Medium	Large
Habitat Risk	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5
Key *Site Risk Level (1 – 5), whereby 1-2 = Low site risk, 3 = Medium site risk, 4 – 5= high site risk*				

Table 2: Habitat and Project Size Descriptions for Assessing Initial Site Risk

Habitat Suitability	Habitat Description
Low	• Small number of potential roost features, of low quality. • Low quality foraging habitat that could be used by small numbers of foraging bats. • Isolated site not connected to the wider landscape by prominent linear features.
Moderate	• Buildings, trees or other structures with moderate-high potential as roost sites on or near the site. • Habitat could be used extensively by foraging bats. • Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.
High	• Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. • Extensive and diverse habitat mosaic of high quality for foraging bats. • Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. • At/near edge of range and/or on an important flyway. • Close to key roost and/or swarming site.
Project Size	**Description**
Small	• Small scale development (≤10 turbines). • No other wind energy developments within 10km. Comprising turbines
Medium	• Larger developments (between 10 and 40 turbines). • May have some other wind developments within 5km. Comprising turbines 50-100m in height.
Large	• Largest developments (>40 turbines) with other wind energy developments within 5km. • Comprising turbines >100m in height.

Annex D: Daytime Bat Walkover and Ground Level Tree Assessment Results

Table 1: Daytime Bat Walkover Target Notes

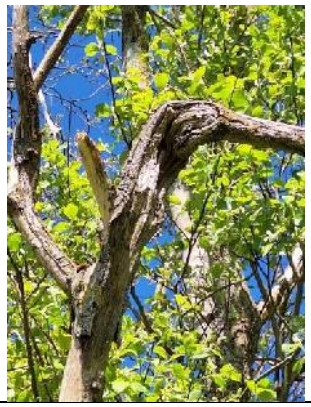
TN	Location (x,y)	Description	Photo
1	286449, 706202	Conifer plantation - immature <20 years. Providing suitable bat foraging.	
2	288287, 708520	Line of semi-mature broadleaved and conifer trees at the side of the main A9 road (outside site boundary). No signs of bat roost potential observed but could be used as a commuting/foraging route for bats.	
3	286761, 706715	Open acid grassland that would provided foraging opportunities for bats specializing in open space	

TN	Location (x,y)	Description	Photo
4	285877, 705078	Juvenile pine tree plantation c207 ha. Access prevented by locked deer fencing on both sides of road. Felled woodland where forest was previously mapped.	
5	286271, 706140	Split limbs, raised bark, egress points on main stem. Moderate bat roost potential.	

Table 2: GLTA Survey Results

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
1	140	Alder 10m Alive	1	NN 88376 08531	PRF	SE	Large crack on mainstem 6m up	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
			2		PRF	SE	Crack in secondary branch 7m up	
			3		PRF	SE	Crack with open top 9m up	
2	138	Alder 11m Alive	1	NN 88376 08531	PRF	SE/NW	Large crack secondary branch 8m up	

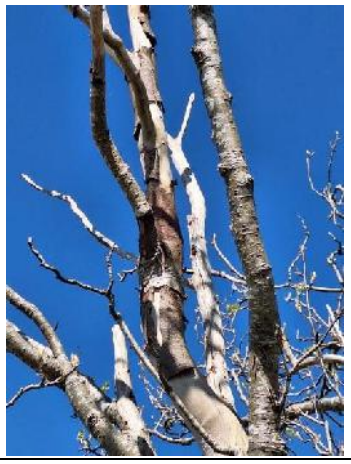
Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
3	129	No ID 11m Alive	1	NN 88452 08453	PRF	S	Lifting bark and crack on mainstem 2.5 m up	
4	124	No ID 5m Dead	1	NN 88366 08519	PRF-I	S	Cracks on mainstem 5m high (potentially some <1m but limited drop area)	
5	119	Alder 12m Alive	1	NN 88366 08519	PRF/ FAR	SW	Cracks on secondary branch 6m high	
6	116	No ID 4m Dead	1	NN 88414 08515	PRF	SE	Cracks on mainstem at 1m with potentially hollow interior	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
			2		PRF	SE	Cracks on mainstem at 1.5m with potentially hollow interior	
7	112	Sycamore 12m Alive	1	NN 88406 08517	PRF	S	Main trunk primary branch has peeling bark at 2m	
8	96	Alder 10m Alive	1	NN 88378 08523	PRF	S/SE	Large sections peeling all way up main trunk	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
9	90	Alder 10m Alive	1	NN 88317 08497	PRF	S/SE	Tree bends in two at secondary branch at 4m high with a large number of cracks	
10	64	Alder 12m Alive	1	NN 88283 08521	PRF	S/N facing	Large crack mainstem 8m high (straight through with S/N orientation)	
11	44	Alder 14m Alive	1	NN 88278 08512	PRF	SW	Large crack in primary branch at 8m high	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
12	127	No ID 2m Dead	1	NN 88411 08485	PRF-I	W	Multiple woodpecker holes and rotting cavities at 0.5 and 1.5m	
13	128	Ash 15m Alive	1	NN 88277 08336	PRF	S	Rotting cavity 1m high	
			2		PRF	S	Cracked branch at 2.5m	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
14	1	Elder 8m Alive	1	NN 88128 08164	PRF	S	Rot hole at 3m of dead secondary branch	
			2		PRF	SE	Rot hole at 3m of dead secondary branch	
15	2	No ID 15m Alive	1	NN 88012 08194	PRF	NW	Large crack with peeling bark at 1m, bark lifting on several other branches	
16	4	Elder 12m	1	NN 87957 07972	PRF	N	Branch scar at secondary branch	N/A
			2		PRF	NW	Crack at secondary branch at branch	N/A

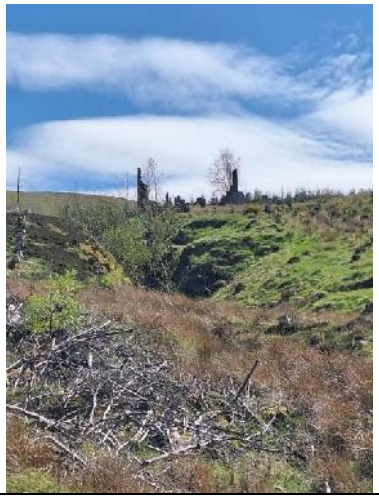
Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
							junction at 1.5m	
17	1	Salix sp. 12m Alive	1	NN 87953 08043	PRF	S	Tear out 4m	
18	0	Elder 12m Alive	1	NN 87828 07811	PRF	S	Large areas of bark peeling	
			2		FAR	SE	Hole on main trunk 3m	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
			3		PRF	SE	Crack at 1m on broken trunk	
			4		FAR	S	Deadwood stem with x4 FAR	
19	15	Conifer Fallen Dead	1	NN 86279 06117	PRF	Every direction	Fallen tree with large protruding cracks on the mainstem at 1-5m	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
20	16	Larch sp. 12m Alive	1	NN 86279 06117	PRF	SE	Crack in twisted mainstem all the way up 1-10m	
21	5	Larch sp. 18m Alive	1	NN 85904 05671	PRF-I	SE	Rough bark with PRF-I potential throughout	
22	4	Larch 20m Alive	1	NN 85751 05578	PRF	SE	Large broken primary branch with small holes at 2m	
			2		PRF	W	Cracks at juncture of broken branch 15m	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
			3		PRF-M	W	Large hollow cavern from 0-1m (potentially extends higher providing drop area)	
23	159	House	1	NN 85983 05281	PRF-I FAR	Every direction	Large number of gaps in masonry and surrounding remaining wood in door entrance and window pane (activity surveys recommended)	
24	141	House		NN 85959 05273	PRF-I FAR	Every direction	Large number of gaps in masonry, roof collapsed with roof tiles still intact and may provide PRF-I (wall very unstable nearly collapsed) (activity surveys recommended)	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
								
25	93	Building / old sheep pen		NN 85995 05185	PRF FAR	Every direction	Large number of gaps in masonry, some original features have small cavern features that may support maternity roots (although are <1m in height but drop height likely to be c. 1.5m)	
26	86	Building / old sheep pen		NN 86008 05151	PRF FAR	Every direction	Metal sheeting has corroded and been replaces providing gaps between the two that could support a number of bats	

Tree No.	Distance from access track (m)	Tree Species/ Height/ Alive	Feature No.	Grid Ref	PRF	Orientation	Description	Picture
								
27	84	Building		NN 86087 04775	FAR	N/A	Behind deer fence couldn't access – likely features	
28	58	No ID 10m Dead		NN 86037 04895	FAR	N/A	Behind deer fence couldn't access – likely features	

Annex E: Static Detector Results

Table 1: Static Detector Results

Row Labels	Sum of Common pipistrelle	Sum of Soprano pipistrelle	Sum of Pipistrellus sp.	Sum of Myotis sp.	Sum of Nyctalus sp.	Sum of Brown long-eared
T1	**13**	**13**	**0**	**0**	**1**	**2**
Spring	2	4	0	0	0	0
Summer	0	0	0	0	0	0
Autumn	11	9	0	0	1	2
T2	**33**	**57**	**2**	**38**	**0**	**0**
Spring	8	3	1	22	0	0
Summer	0	1	0	4	0	0
Autumn	25	53	1	12	0	0
T3	**3**	**12**	**1**	**1**	**0**	**0**
Spring	1	1	1	1	0	0
Summer	0	0	0	0	0	0
Autumn	2	11	0	0	0	0
T4	**29**	**38**	**5**	**0**	**0**	**0**
Spring	5	0	0	0	0	0
Summer	0	0	0	0	0	0
Autumn	24	38	5	0	0	0
T5	**45**	**10**	**3**	**7**	**0**	**0**
Spring	4	0	2	0	0	0
Summer	1	0	1	0	0	0
Autumn	40	10	0	7	0	0
T6	**11**	**11**	**4**	**6**	**0**	**0**
Spring	1	1	4	0	0	0
Summer	0	0	0	2	0	0

Row Labels	Sum of Common pipistrelle	Sum of Soprano pipistrelle	Sum of Pipistrellus sp.	Sum of Myotis sp.	Sum of Nyctalus sp.	Sum of Brown long-eared
Autumn	10	10	0	4	0	0
T7	**27**	**16**	**1**	**2**	**0**	**1**
Spring	5	0	1	0	0	0
Summer	0	0	0	0	0	0
Autumn	22	16	0	2	0	1
T8	**3**	**1**	**5**	**3**	**0**	**0**
Spring	3	1	5	3	0	0
Summer	0	0	0	0	0	0
Autumn	0	0	0	0	0	0
T9	**21**	**3**	**4**	**1**	**0**	**0**
Spring	5	1	4	1	0	0
Summer	0	0	0	0	0	0
Autumn	16	2	0	0	0	0
T10	**13**	**17**	**5**	**3**	**0**	**0**
Spring	0	4	5	2	0	0
Summer	0	0	0	0	0	0
Autumn	13	13	0	1	0	0
T11	**27**	**55**	**5**	**0**	**0**	**0**
Spring	5	0	3	0	0	0
Summer	0	0	0	0	0	0
Autumn	22	55	2	0	0	0
T12	**9**	**12**	**4**	**1**	**0**	**1**
Spring	2	0	4	1	0	0
Summer	0	0	0	0	0	0
Autumn	7	12	0	0	0	1

Row Labels	Sum of Common pipistrelle	Sum of Soprano pipistrelle	Sum of Pipistrellus sp.	Sum of Myotis sp.	Sum of Nyctalus sp.	Sum of Brown long-eared
T13	**18**	**35**	**3**	**0**	**0**	**0**
Spring	0	0	0	0	0	0
Summer	0	0	0	0	0	0
Autumn	18	35	3	0	0	0
Grand Total	**252**	**280**	**42**	**62**	**1**	**4**

Table 2: Total, Average and Median Bat Species Passes, per Survey Season

Static Detector	Season	Common pipistrelle			Soprano pipistrelle			*Pipistrellus* sp.			*Myotis* sp.			*Nyctalus* sp.			Brown long-eared		
		Total	Average	Median	Total	Average	Median	Total	Average	Median	Total	Average	Median	Total	Average	Median	Total	Average	Median
L1	Spring	2	0.14	0.00	4	0.29	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.06	0.00	0	0.00	0.07	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	11	0.69	0.00	9	0.56	0.00	0	0.00	0.00	0	0.00	0.00	1	0.06	0.00	2	0.13	0.00
L2	Spring	8	0.57	0.00	3	0.21	0.00	1	0.00	0.00	22	1.57	1.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	1	0.06	0.00	0	0.00	0.00	4	0.25	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	25	1.56	0.00	53	3.31	0.00	1	0.00	0.00	12	0.75	0.00	0	0.00	0.00	0	0.00	0.00
L3	Spring	1	0.07	0.00	1	0.07	0.00	1	0.00	0.00	1	0.07	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	2	0.13	0.00	11	0.69	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
L4	Spring	5	0.36	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	24	1.50	0.00	38	2.38	0.50	5	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.00	0.00
L5	Spring	4	0.29	0.00	0	0.00	0.00	2	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	1	0.06	0.00	0	0.00	0.00	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	40	2.50	0.00	10	0.63	0.00	0	0.00	0.00	7	0.44	0.00	0	0.00	0.00	0	0.00	0.00
L6	Spring	1	0.07	0.00	1	0.07	0.00	4	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.07	0.00	2	0.13	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	10	0.63	0.00	10	0.63	0.00	0	0.00	0.00	4	0.25	0.00	0	0.00	0.00	0	0.00	0.00
L7	Spring	5	0.36	0.00	0	0.00	0.00	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	22	1.38	0.00	16	1.00	0.00	0	0.00	0.00	2	0.13	0.00	0	0.00	0.00	0	0.00	0.00
L8	Spring	3	0.21	0.00	1	0.07	0.00	5	0.00	0.00	3	0.21	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Static Detector	Season	Common pipistrelle			Soprano pipistrelle			*Pipistrellus* sp.			*Myotis* sp.			*Nyctalus* sp.			Brown long-eared		
	Autumn	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
L9	Spring	5	0.36	0.00	1	0.07	0.00	4	0.00	0.00	1	0.07	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.07	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	16	1.00	0.00	2	0.13	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
L10	Spring	0	0.36	0.00	4	0.00	0.00	5	0.00	0.00	2	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	13	0.81	0.00	13	0.81	0.00	0	0.00	0.00	1	0.06	0.00	0	0.00	0.00	0	0.00	0.00
L11	Spring	5	0.36	0.00	0	0.00	0.00	3	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.07	0.14	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	22	1.38	0.00	55	3.44	0.00	2	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.06	0.00
12	Spring	2	0.14	0.00	0	0.00	0.00	4	0.00	0.00	1	0.07	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	#DIV/0!	0.00
	Autumn	7	0.00	0.00	12	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
L13	Spring	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Summer	0	0.00	0.00	0	0.00	0.00	0	0.00	0.29	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Autumn	18	1.13	0.00	35	2.19	0.00	3	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00

Annex F: Weather Data

Table 1: Weather Data

Text highlighted in **red** indicates sub-optimal weather conditions for bat activity (i.e. where temperatures drop below 8°C, windspeed is greater than 6m/s and periods of rainfall).

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
17.05.23 - 18.05.23	21.26 – 04.57	21:30:09	11.9	0.0	0
		22.30.09	11	0.9	0
		23:30:21	10.6	0.0	0
		00:30:24	10.6	0.0	0
		01:30:24	10.3	0.5	0
		02:35:24	10	0.0	0
		03:30:24	10.1	0.9	0
		04:30:22	9.9	0.9	0
		05:30:40	10.1	1.3	0
18.05.23 – 19.05.23	21.28 – 04.55	21:35:38	13.4	0.5	0
		22:30:20	13.1	1.3	0
		23:30:19	12.2	0.0	0
		00:30:23	10.9	0.5	0
		01:30:41	9	0.5	0
		02:30:22	8.1	0.0	0
		03:35:40	7.2	0.0	0
		04:35:22	**6.6**	0.0	0
		05:35:22	**7.4**	0.0	0
19.05.23 – 20.05.23	21.29 – 04.54	21:35:18	14.3	0.0	0
		22:30:36	13.6	0.0	0
		23:30:37	12.8	0.0	0
		00:35:20	12.1	0.5	0
		01:35:20	11.8	0.0	0
		02:30:20	11.4	0.9	0
		03:30:20	11.2	1.3	0
		04:35:20	10.8	0.0	0
		05:30:20	10.8	0.5	0
20.05.23 – 21.05.23	21.31 – 04.52	21:30:18	12.7	0.0	0
		22:30:35	12.4	0.0	0
		23:35:35	12.3	0.0	0
		00:35:20	12.1	0.0	0
		01:30:18	12.1	0.0	0
		02:30:18	12.3	0.0	0
		03:30:18	12.0	0.0	0
		04:30:18	11.7	0.0	0
		05:30:18	11.5	0.0	0
21.05.23 – 22.05.23	21:33 – 04:50	21:30:16	11.8	0.0	0
		22:30:16	11.7	0.0	0
		23:30:35	11.6	0.5	0
		00:30:18	11.5	0.5	0
		01:30:18	11.4	0.0	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		02:30:36	11.4	0.0	0
		03:30:16	11.2	0.0	0
		04:30:16	11.2	0.0	0
		05:35:35	11.2	0.0	0
22.05.23 – 23.05.23	21:35 – 04:49	21:30:14	12.6	3.6	0
		22:35:33	11.4	1.3	0
		23:35:14	11.1	0.9	0
		00:35:34	10.9	1.8	0
		01:30:35	10.7	0.5	0
		02:30:16	9.8	0.0	0
		03:35:34	9.2	0.0	0
		04:30:16	**7.8**	0.9	0
		05:35:16	**7.9**	0.0	0
23.05.23 – 24.05.23	21:36 – 04:47	21:35:31	12.1	0.5	0
		22:35:13	10.9	2.3	0
		23:30:11	10.4	0.9	0
		00:30:33	9.2	0.9	0
		01:35:14	**7.7**	0.0	0
		02:30:14	**7.1**	0.0	0
		03:30:14	**6.8**	0.9	0
		04:30:14	**8.6**	1.8	0
		05:30:14	**7.3**	0.0	0
24.05.23 – 25.05.23	21:38 – 04:46	21:30:29	12.9	0.0	0
		22:30:09	11.6	0.9	0
		23:35:10	11.5	0.5	0
		00:35:12	9	0.0	0
		01:30:30	8.6	0.5	0
		02:30:12	**7.1**	0.5	0
		03:35:12	**6.2**	0.0	0
		04:35:31	**5.8**	0.0	0
		05:30:30	**5.8**	0.0	0
25.05.23 – 26.05.23	21:40 – 04:44	21:30:10	15.6	0.0	0
		22:30:10	13.7	0.0	0
		23:30:09	12.9	1.8	0
		00:35:11	11.5	0.5	0
		01:30:12	9.9	0.0	0
		20:30:12	8.8	1.3	0
		03:35:10	8.2	0.0	0
		04:30:10	**7.3**	0.0	0
		04:35:28	**7.4**	0.0	0
		05:35:10	9.2	0.0	0
26.05.23 – 27.05.23	21:41 – 04:43	21:35:08	16.6	0.5	0
		22:35:08	14.8	0.9	0
		23:35:09	13.6	0.0	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		00:35:09	12.6	0.0	0
		01:30:28	11.4	0.5	0
		02:35:10	10.4	0.9	0
		03:35:10	9.4	0.9	0
		04:30:10	8.9	0.5	0
		05:35:08	8.8	0.0	0
27.05.23 – 28.05.23	21:43 – 04:42	21:30:25	12.6	0.9	0
		22:30:06	11	1.3	0
		23:30:05	9.3	0.5	0
		00:30:06	**7.5**	0.9	0
		01:35:27	**6.9**	0.0	0
		02:35:08	**6.2**	0.0	0
		03:35:08	**7.2**	4.0	0
		04:35:08	**6.8**	1.8	0
		05:30:08	**5.9**	0.0	0
28.05.23 – 29.05.23	21:44 – 04:40	21:30:04	12.4	0.9	0
		22:30:04	10.2	0.0	0
		23:30:03	8.8	0.0	0
		00:30:04	8.1	0.5	0
		01:30:06	**7**	0.0	0
		02:30:06	**6.3**	0.9	0
		03:30:07	**5.9**	0.0	0
		04:35:06	**5.5**	0.0	0
		05:35:06	**4.9**	0.0	0
29.05.23 – 30.05.23	21:46 – 04:39	21:30:04	13.2	0.9	0
		22:30:04	11.4	0.0	0
		23:35:03	9.8	0.5	0
		00:35:04	9.2	1.3	0
		01:30:04	8.8	0.0	0
		02:35:22	**7.5**	0.0	0
		03:30:04	**6.7**	0.5	0
		04:30:04	**6.3**	0.9	0
		05:35:04	**6**	0.0	0
28.06.23 – 29.06.23	22:06 – 04:32	20:30	15.7	-	-
		21:30	14.5	-	-
		22:30	13.2	-	-
		23:30	12.5	-	-
		00:30	11.8	-	-
		01:30	11.2	-	-
		02:30	9.4	-	-
		03:30	8.1	-	-
		04:30	7.7	-	-
		05:30	7.6	-	-
29.06.23 – 30.06.23	22:06 – 04:31	20:30	15.6	5	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		21:30	14.3	7	0
		22:30	13.8	9	0
		23:30	13.4	8	0
		00:30	13.5	9	0
		01:30	13.7	8	0
		02:30	13.6	7	0
		03:30	13.4	6	0
		04:30	13.3	10	0
		05:30	13.1	9	0
30.06.23 – 01.07.23	22:06 – 04:33	20:30	15.1	6	0
		21:30	14.6	4	0.01
		22:30	13.9	6	0
		23:30	13.8	7	0
		00:30	13.6	6	0
		01:30	13.4	7	0
		02:30	13.2	6	0
		03:30	12.9	9	0
		04:30	12.9	8	0
		05:30	13.0	8	0
01.07.23 – 02.07.23	22:05 – 04:33	20:35	14.3	21	0
		21:30	13.4	15	0
		22:30	12.4	14	0
		23:30	12.4	13	0
		00:30	12.2	13	0
		01:35	11.2	13	0
		02:36	10.6	7	0
		03:30	11.2	7	0
		04:35	11.6	9	0
		05:30	11.2	12	0
02.07.23 – 03.07.23	22:05 – 04:34	20:31	12.6	10	0
		22:30	10.4	9	0
		23:35	9.9	10	0
		00:30	10.4	10	0
		01:30	9.7	8	0
		02:30	9.2	7	0
		03:35	8.9	7	0
		04:30	8.8	7	0
		05:25	10.2	9	0
03.07.23-04.07.23	22:04 – 04:35	20:30	13.5	7	0
		21:30	12.9	9	0
		22:30	12.3	9	0
		23:30	12.2	8	0
		00:30	11.9	8	0
		01:30	11.8	8	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		02:31	11.8	**10**	0
		03:30	11.9	**8**	0
		04:30	11.9	**8**	0
		05:30	12.1	**7**	0.01
04.07.23 – 05.07. 23	22:04 – 04:35	20:35	13.7	3	0
		21:35	13.2	1	0
		22:35	12.5	0	0
		23:35	11.8	0	0
		00:30	11.3	1	0
		01:30	10.7	0	0
		02:26	10.2	0	0
		03:25	10.4	2	0
		04:25	10.2	2	0
		05:25	10.2	2	0
05.07.23 – 06.07.23	22:03 – 04:36	20:30	15.8	4	0
		21:31	14.3	4	0
		22:25	13.3	5	0
		23:25	12.9	4	0
		00:25	11.9	4	0
		01:25	11.3	3	0
		02:25	11.1	3	0
		03:25	10.9	2	0
		04:30	10.6	3	0
		05:30	11.0	4	0
06.07.23 – 07.07.23	22:02 – 04:38	20:26	13.2	**17**	**0.02**
		21:25	12.7	**19**	**0.02**
		22:30	12.7	**17**	**0.03**
		23:31	12.8	**14**	**0.07**
		00:25	13.1	**11**	**0.07**
		01:25	13.4	**10**	**0.01**
		02:25	13.7	**12**	**0.02**
		03:25	14.3	**12**	**0.01**
		04:25	14.8	**12**	**0.01**
		05:30	15.1	**10**	**0.01**
07.07.23 – 08.07.23	22:01 – 04:40	20:25	17.8	2	0
		21:30	16.5	4	0
		22:30	15.3	**9**	0
		23:30	14.7	**10**	0
		00:30	13.9	**11**	0
		01:26	13.4	**12**	0
		02:25	13.0	**12**	0
		03:26	12.8	**14**	0
		04:25	12.2	**11**	0
		05:30	12.2	**12**	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
08.07.23 – 09.07.23	22:00 – 04:41	20:30	17.8	8	0
		21:30	17.8	12	0
		22:30	17.2	7	0
		23:30	16.6	3	0
		00:30	16.4	3	0
		01:30	16.4	1	0
		02:25	16.3	5	0.02
		03:25	16.0	6	0.02
		04:30	15.8	7	0.01
		05:25	15.4	6	0.03
09.07.23 – 10.07.23	21:59 – 04:42	20:25	16.4	2	0
		21:25	15.4	3	0
		22:30	14.6	6	0
		23:25	13.8	8	0
		00:25	13.1	8	0
		01:25	12.4	5	0
		02:25	11.6	4	0
		03:25	11.7	4	0
		04:30	12.3	4	0
		05:30	12.4	3	0
10.07.23 – 11.07.23	21:58 – 04:43	20:25	14.6	10	0.07
		21:25	14.1	11	0.01
		22:25	14.2	10	0.03
		23:30	14.2	16	0
		00:30	13.7	8	0
		01:30	13.6	7	0
		02:25	13.4	8	0
		03:25	13.6	7	0
		04:25	13.7	8	0
		05:25	13.7	6	0.01
11.07.23 – 12.07.23	21:57 – 04:45	20:25	16.1	9	0
		21:30	14.9	10	0
		22:30	14.1	7	0
		23:25	13.2	7	0
		00:30	12.3	2	0
		01:25	11.8	4	0
		02:30	11.4	6	0
		03:25	11.0	7	0
		04:30	10.9	4	0
		05:35	10.8	5	0
12.07.23 – 13.07.23	21:55 – 04:46	20:25	15.8	6	0
		21:25	15.0	5	0
		22:30	14.2	7	0
		23:30	14.2	7	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		00:30	13.9	8	0
		01:30	13.5	7	0
		02:30	13.2	6	0
		03:30	13.0	7	0
		04:30	12.1	4	0
		05:30	11.1	5	0
16.08.23 – 17.08.23	20:51 – 05:49	19:30	12.7	4	0
		20:30	12.1	3.6	0
		21:30	12.1	4	0
		22:30	11.8	3.6	0
		23:30	11.3	3.6	0
		00:30	11.6	2.7	0
		01:30	11.8	2.2	0
		02:30	11.8	0.4	0
		03:30	11.4	1.8	0
		04:30	11.3	2.7	0
		05:30	11.2	4	0
		06:30	10.9	3.6	0
17.08.23 – 18.08.23	20:48 – 05:51	19:30	12.6	**6.3**	0
		20:30	11.3	5.8	0
		21:30	10.7	5.4	0
		22:30	10.6	4.9	0
		23:30	10.4	4.5	0
		00:30	10.6	4	0
		01:30	10.4	4.5	0
		02:30	10.2	5.8	0
		03:30	10.1	4.5	0
		04:30	10	4.5	0
		05:30	9.9	4.9	0
		06:30	9.7	5.4	0
18.08.23 – 19.08.23	20:46 – 05:53	19:30	12.2	**6.7**	0
		20:30	11.8	**8**	0
		21:30	12	**8.9**	0
		22:30	12.1	**8.9**	0
		23:30	11.9	**8.9**	0
		00:30	12.1	**8.5**	0
		01:30	12.2	**8**	**0.4**
		02:30	12.6	**8.5**	**1.2**
		03:30	12.6	**7.6**	**1.4**
		04:30	12.7	**8.9**	**0.2**
		05:30	13.2	**7.6**	0
		06:30	13.4	**6.3**	0
19.08.23 – 20.08.23	20:44 – 05:55	19:30	13.9	4.9	0
		20:30	13.7	3.1	0
		21:30	13.4	4	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		22:30	13.1	4	0
		23:30	12.9	3.6	0
		00:30	12.8	3.1	0
		01:30	12.9	4.5	0
		02:30	12.8	4.5	0
		03:30	12.6	4	0
		04:30	11.9	3.1	0
		05:30	11.6	4	0
		06:30	11.5	4	0
20.08.23 – 21.08.23	20:41 – 05:57	19:30	14	3.1	0
		20:30	13.5	3.1	0
		21:30	12.9	4	0
		22:30	12.4	4.5	0
		23:30	12.5	4.9	0
		00:30	12.3	3.1	0
		01:30	12.1	3.1	0
		02:30	12.3	4	0
		03:30	12.3	4.5	0.2
		04:30	12.1	3.6	0
		05:30	12	3.6	0
		06:30	11.9	4.5	0
21.08.23 – 22.08.23	20:39 – 05:59	19:30	14.1	**7.2**	0
		20:30	13.7	5.4	0
		21:30	13.3	5.8	0
		22:30	12.7	5.4	0
		23:30	12.7	5.8	0
		00:30	12.5	5.8	0
		01:30	12.3	4.9	0
		02:30	12.2	4.9	0.4
		03:30	12.3	4	0
		04:30	12.3	4.5	0
		05:30	12.2	4	0
		06:30	12.2	3.6	0
22.08.23 – 23.08.23	20:36 – 06:01	19:30	11.9	3.1	0
		20:30	11.4	1.8	0
		21:30	11.2	2.7	0
		22:30	11.1	1.8	0
		23:30	11.1	2.7	0
		00:30	10.6	2.7	0
		01:30	8.7	3.6	0
		02:30	8.3	2.7	0
		03:30	**7.5**	0.9	0
		04:30	**7.9**	0.9	0
		05:30	**7.2**	1.3	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		06:30	7.5	1.3	0
23.08.23 – 24.08.23	20:34 – 06:03	19:30	11.1	1.3	0
		20:30	11.2	1.3	0
		21:30	10.6	1.8	0
		22:30	10.8	1.8	0
		23:30	10.9	2.7	0
		00:30	10.9	1.8	0
		01:30	10.8	2.2	0.2
		02:30	10.8	2.2	0.2
		03:30	10.8	2.2	0
		04:30	9.4	4.5	0.4
		05:30	8.7	2.7	0
		06:30	8.8	1.8	0
24.08.23 – 25.08.23	20:31 – 06:05	19:30	9.9	1.8	0
		20:30	9.7	2.2	0
		21:30	9.3	4.5	0
		22:30	9.3	2.2	0
		23:30	9.1	1.8	0
		00:30	8.4	1.8	0
		01:30	8.1	1.3	0
		02:30	7.6	0	0
		03:30	8.4	1.3	0
		04:30	8.4	1.3	0
		05:30	8.2	1.3	0
		06:30	8.1	1.3	0
25.08.23 – 26.08.23	20:29 – 06:07	19:30	9.1	1.8	0
		20:30	9.1	2.2	0
		21:30	8.9	1.3	0
		22:30	8.9	1.8	0
		23:30	8.3	2.2	0
		00:30	8.6	2.7	0
		01:30	7.8	2.7	0
		02:30	7.8	2.2	0
		03:30	7.6	2.2	0
		04:30	7.2	1.3	0
		05:30	7.9	2.2	0
		06:30	8.3	1.8	0
26.08.23 – 27.08.23	20:26 – 06:09	19:30	11.2	0	0.4
		20:30	10.7	1.3	0
		21:30	10.3	1.8	0
		22:30	10.6	2.7	0
		23:30	10.3	3.1	0
		00:30	10.2	3.1	0
		01:30	10.2	2.2	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		02:30	9.9	2.2	0
		03:30	9.4	1.8	0
		04:30	9.4	1.8	0
		05:30	9.6	0.4	0
		06:30	9.3	0.9	0
27.08.23 – 28.08.23	20:24 – 06:11	19:30	11.3	4.5	0
		20:30	10.4	2.7	0
		21:30	10.2	4	0
		22:30	9.7	3.1	0
		23:30	9.4	4	0
		00:30	8.7	4	0
		01:30	**7.6**	3.6	0
		02:30	**7.1**	2.7	0
		03:30	**6.1**	2.2	0
		04:30	**6.2**	1.8	0
		05:30	**6.7**	2.2	0
		06:30	7.4	2.2	0
28.08.23 – 29.08.23	20:21 – 06:13	19:30	10.6	2.7	0
		20:30	9.2	2.2	0
		21:30	8.8	2.2	0
		22:30	9.3	2.7	0
		23:30	9.2	3.1	0
		00:30	9.2	2.7	0
		01:30	9.5	3.1	0
		02:30	9.4	3.6	0
		03:30	9.1	2.2	0
		04:30	9	2.2	0
		05:30	8.9	3.6	0
		06:30	8.6	3.6	0
29.08.23 – 30.08.23	20:18 – 06:15	19:30	9.6	4.9	0
		20:30	8.2	2.7	0
		21:30	**7.6**	2.7	0
		22:30	**7.3**	3.6	0
		23:30	**7**	3.6	0
		00:30	**6.7**	4.5	0
		01:30	**6.5**	4	0
		02:30	**5.2**	1.8	0
		03:30	**5.3**	2.7	0
		04:30	**4.2**	2.2	0
		05:30	**4.2**	2.7	0
		06:30	**4.1**	2.2	0
30.08.23. – 31.08.23	20:16 – 06:17	19:30	10.7	1.8	0
		20:30	9.1	1.3	0
		21:30	9.8	0.4	0

Date	Sunset - Sunrise	Time	Temp (°C)	Windspeed (m/s)	Rainfall (mm)
		22:30	9	1.3	0
		23:30	8.3	1.3	0
		00:30	**7.9**	1.3	0
		01:30	**7.7**	1.3	0
		02:30	**7.2**	0.4	0
		03:30	**7.5**	0	0
		04:30	**7.4**	0	0
		05:30	**7.6**	0.4	0
		06:30	**7.6**	0.9	0
31.08.23 – 01.09.23	20:13 – 06:19	19:30	10.9	3.6	0
		20:30	10.9	3.6	0
		21:30	10.7	3.1	0
		22:30	10.4	2.7	0
		23:30	10.7	3.1	0
		00:30	10.2	2.7	0
		01:30	9.6	2.7	0
		02:30	10.6	1.8	0
		03:30	9.4	1.8	0
		04:30	**7.6**	2.7	0
		05:30	**7.5**	3.1	0
		06:30	**7.7**	4.5	0

Annex G: Ecobat Emergence Time Output

Roost Emergence Time and Bat Observation

Based on: Russ, Jon. 2012. British Bat Calls a Guide to species Identification. Pelagic Publishing.

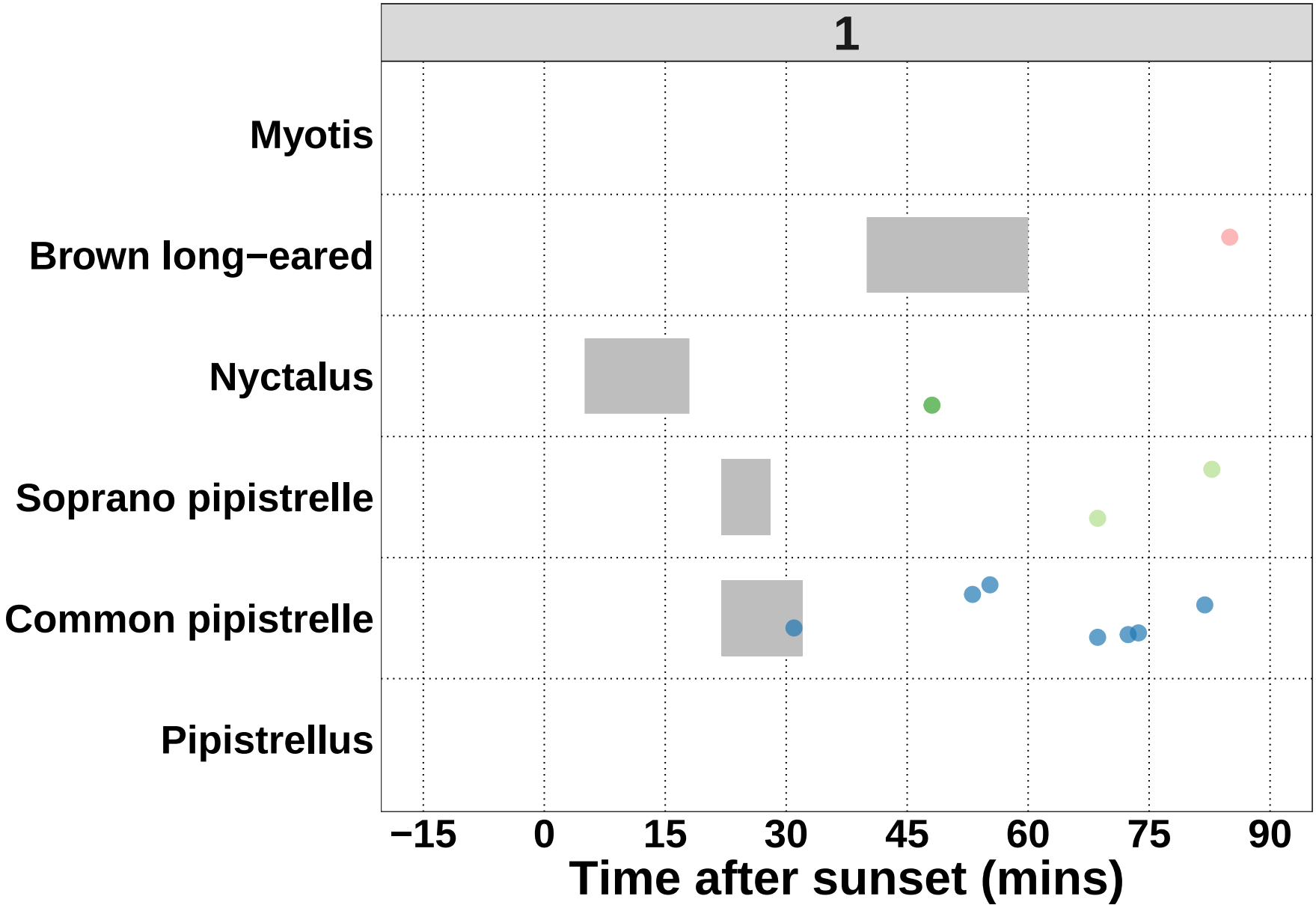
Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

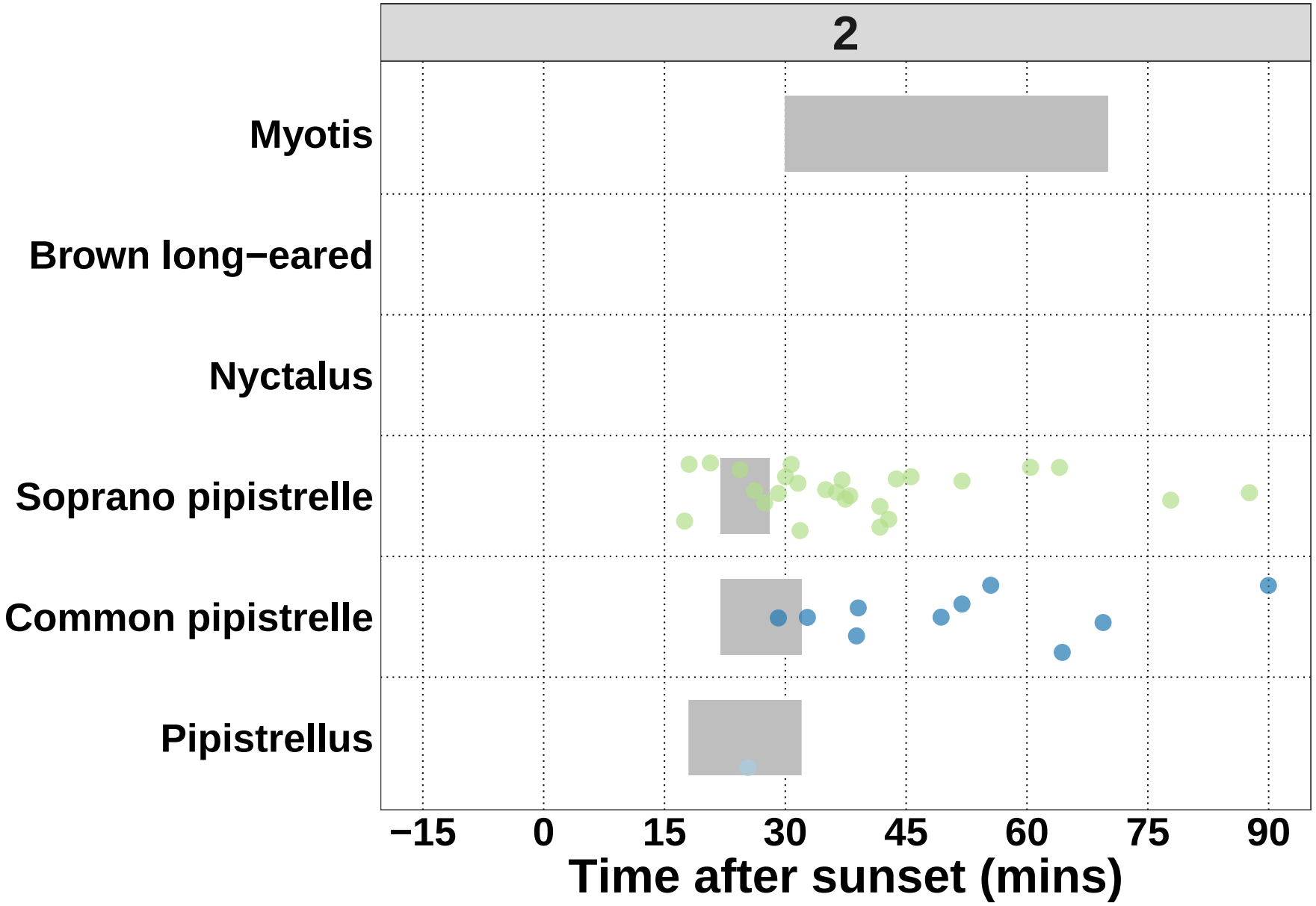
Table 12. Number of bat calls recorded before the upper time of the species-specific emergence time range, and which therefore may potentially indicate the presence of a nearby roost.

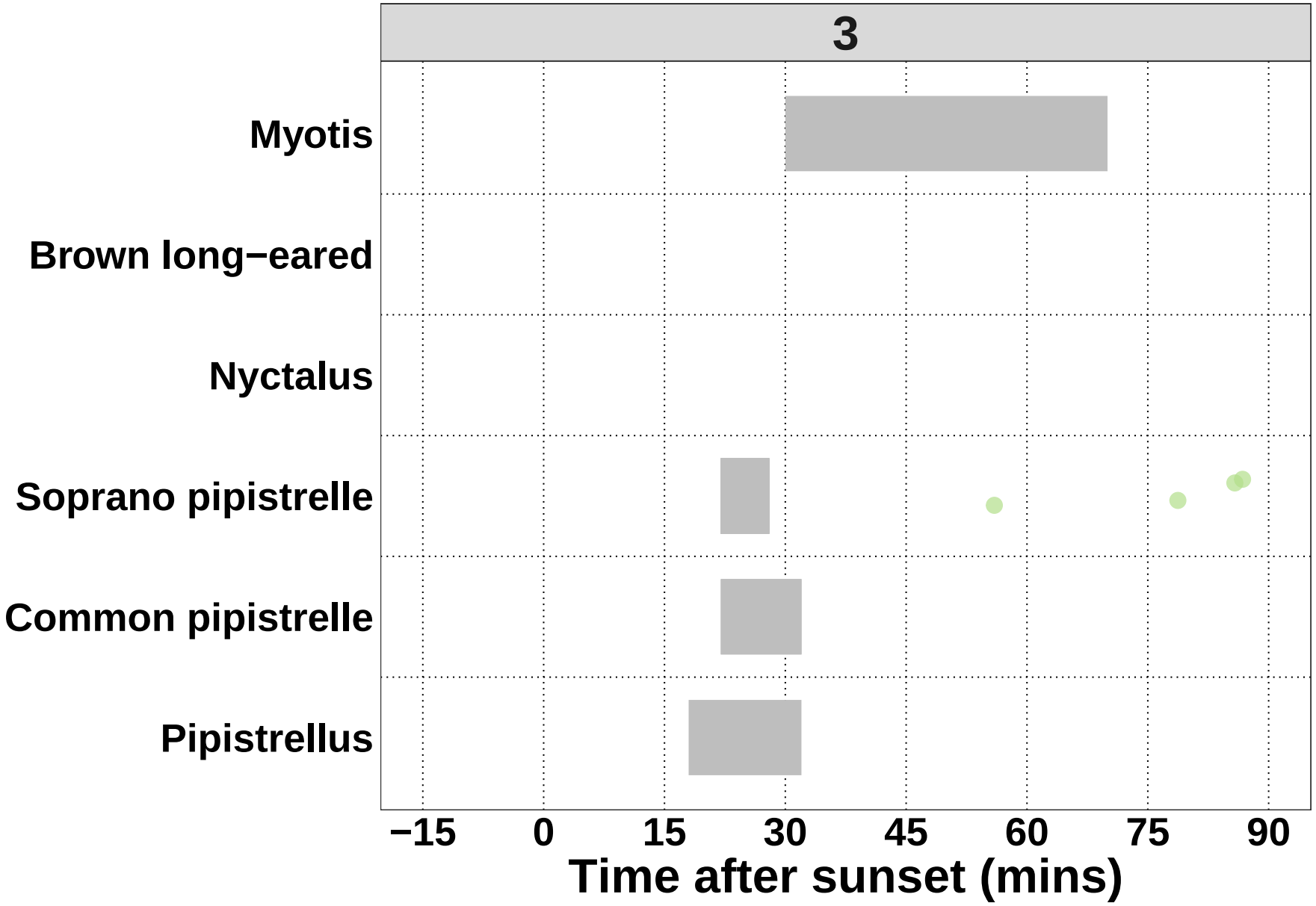
Species	Detector ID	2023-08-16	2023-08-19	2023-08-20	2023-08-23	2023-08-31
Pipistrellus	2	1	0	0	0	0
Common pipistrelle	1	0	0	1	0	0
Common pipistrelle	2	0	0	0	0	1
Common pipistrelle	4	0	0	0	1	0
Common pipistrelle	5	0	0	1	0	0
Common pipistrelle	12	0	1	0	0	0
Soprano pipistrelle	2	0	0	5	0	1
Soprano pipistrelle	4	0	1	0	0	0
Soprano pipistrelle	7	0	2	0	0	0

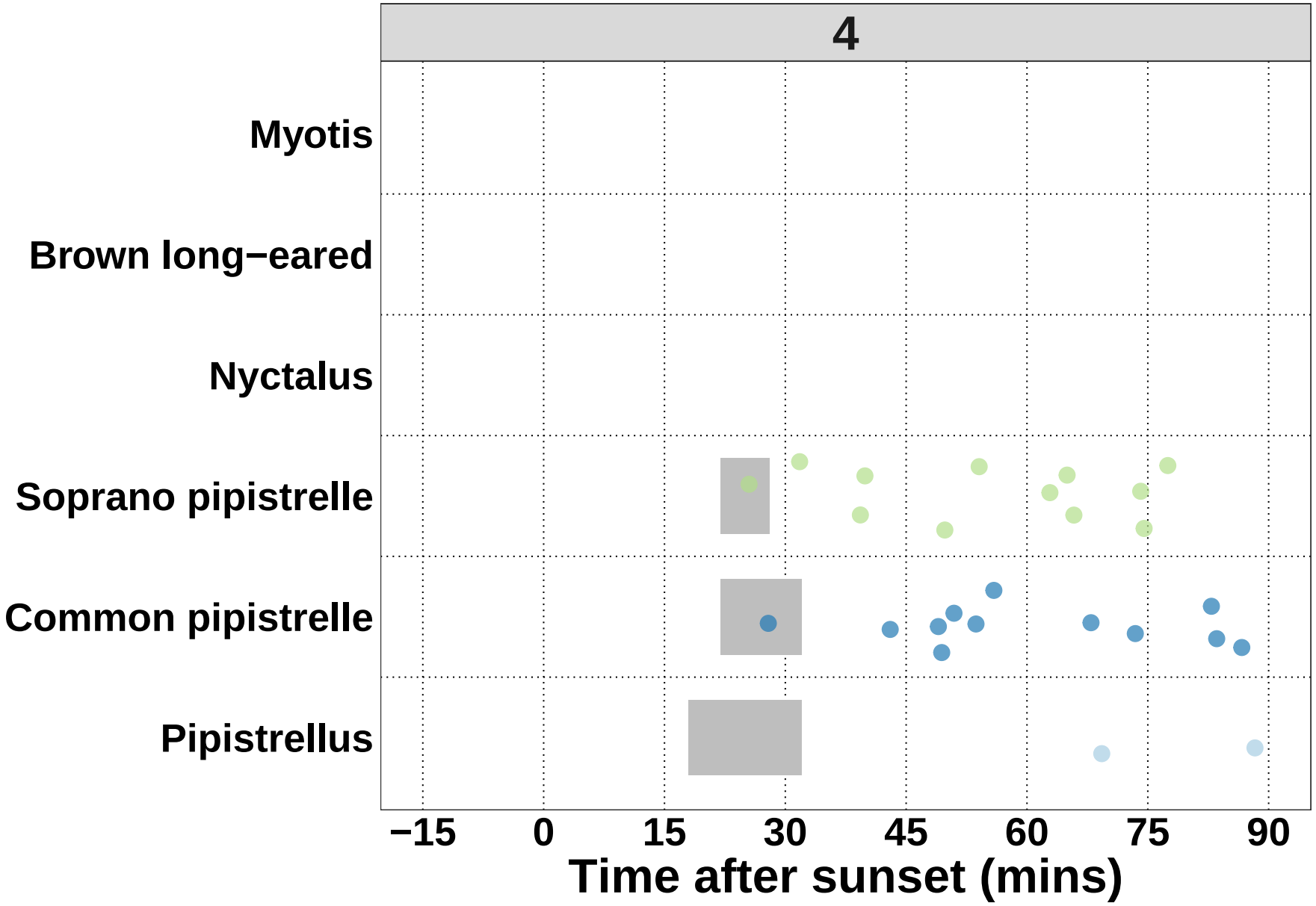
Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

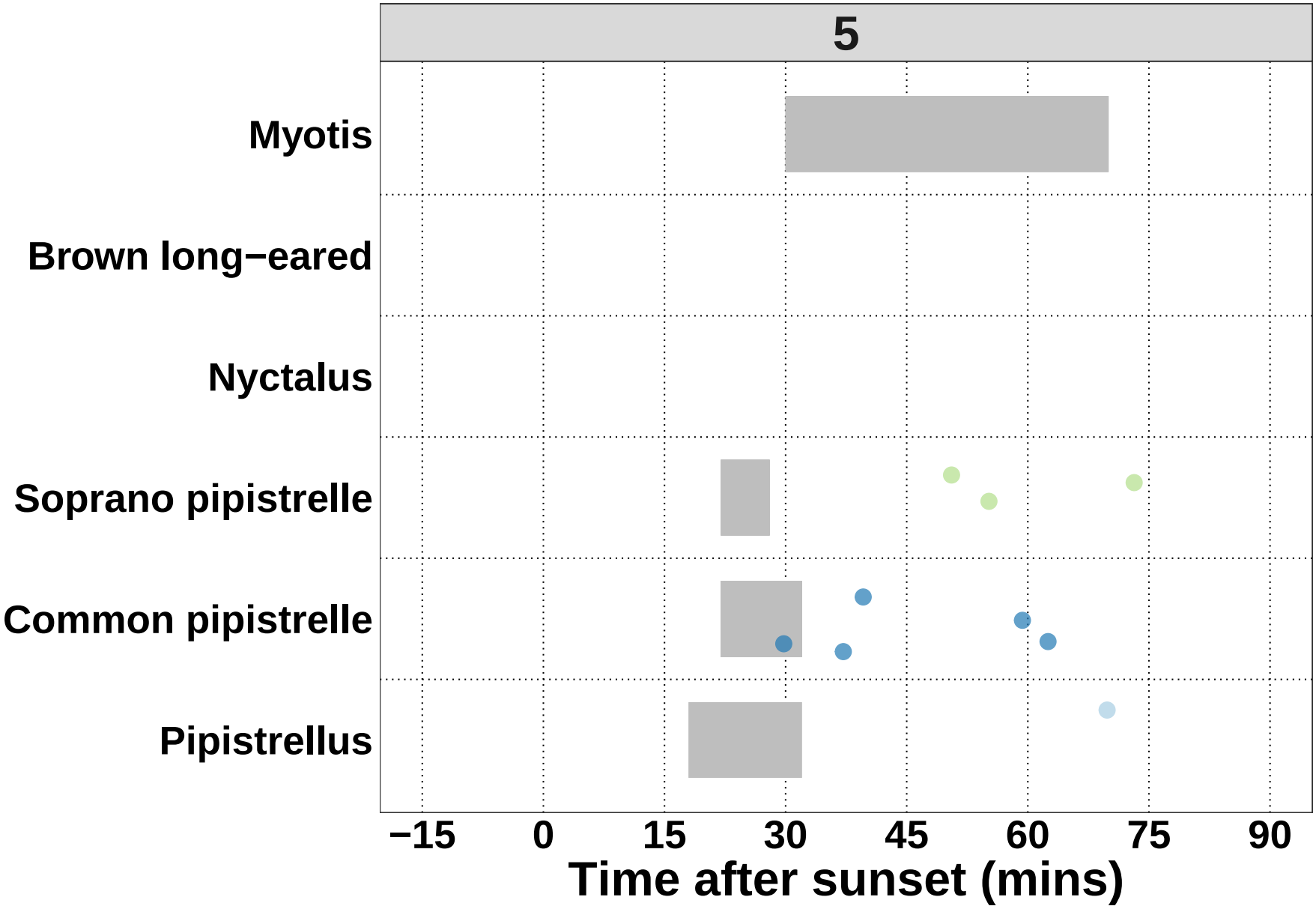
Figure 8. Time from 15 minutes before to 90 minutes after sunset. Species-specific emergence time ranges are shown as grey bars. Bat passes overlapping species-specific grey bars, or occuring earlier than this time range, may potentially indicate the presence of a nearby roost.

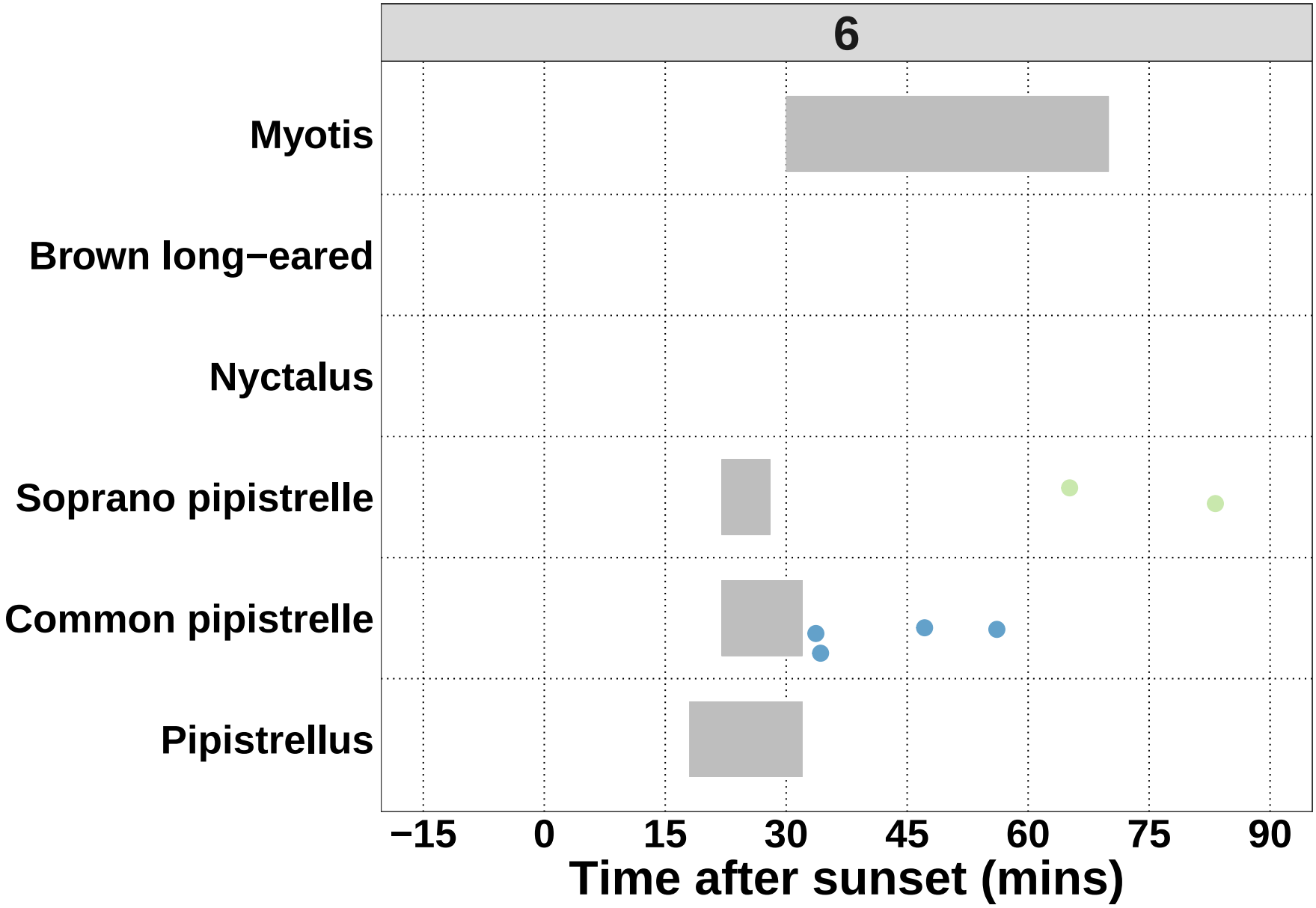

1
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

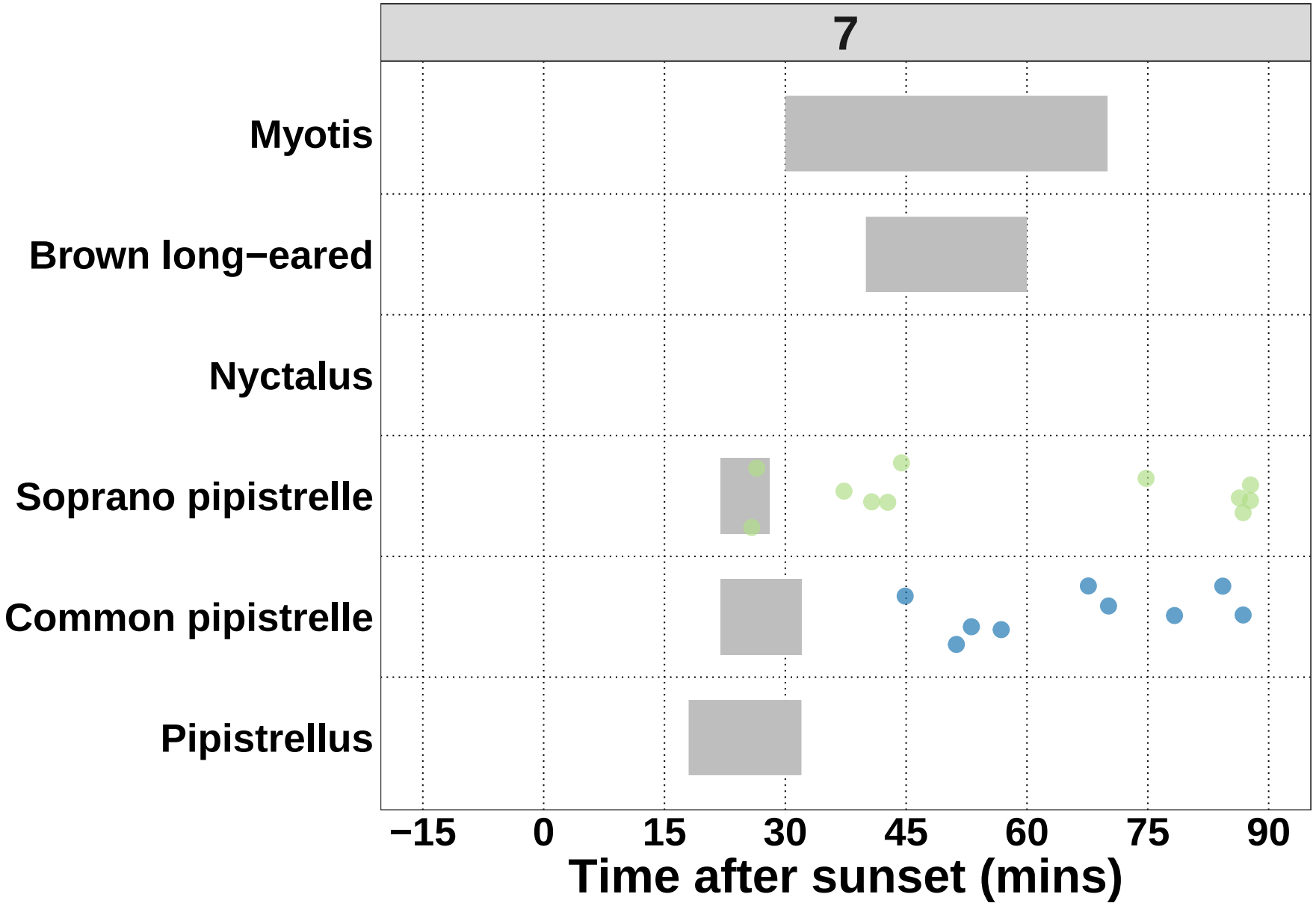

2
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

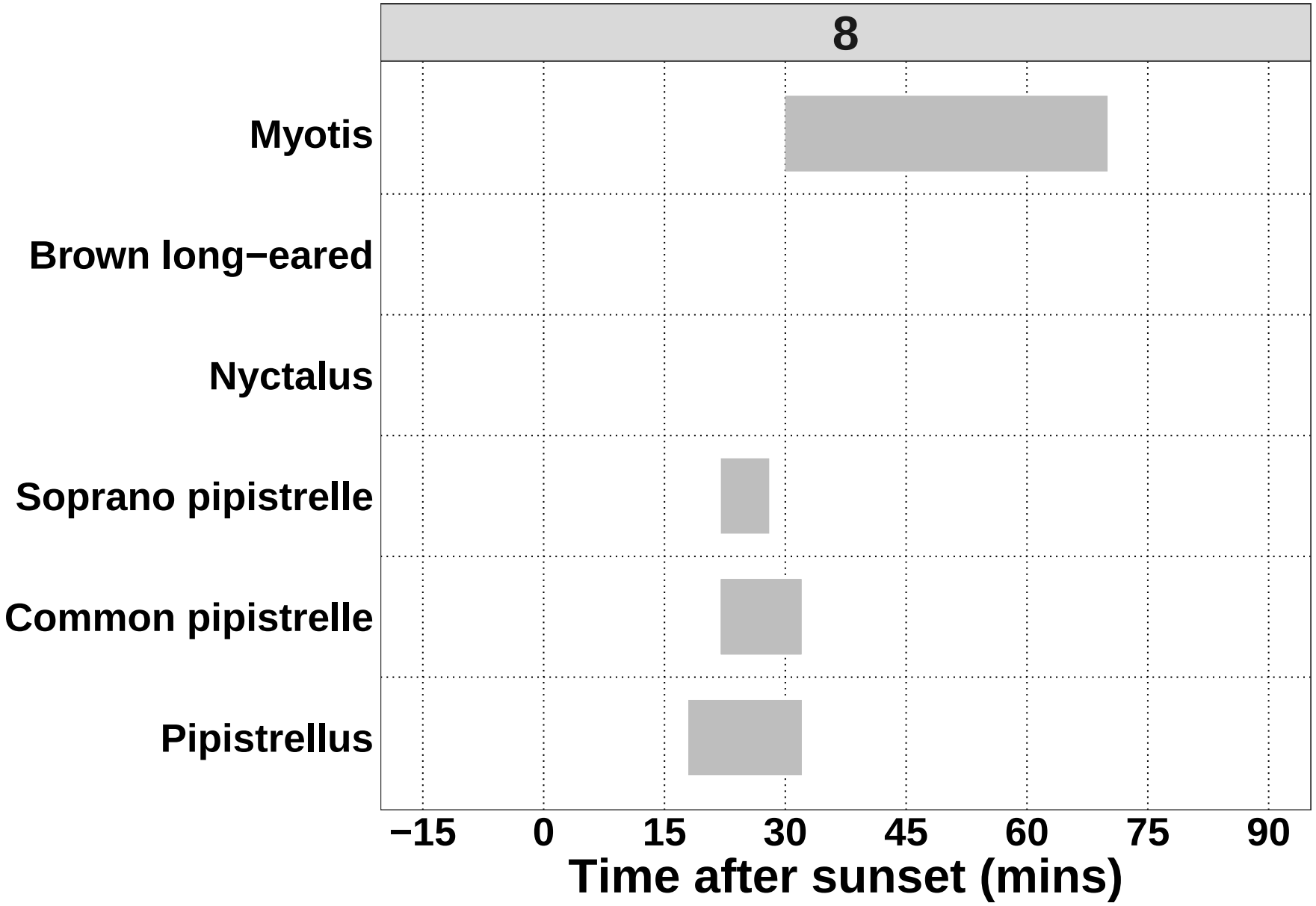

3
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

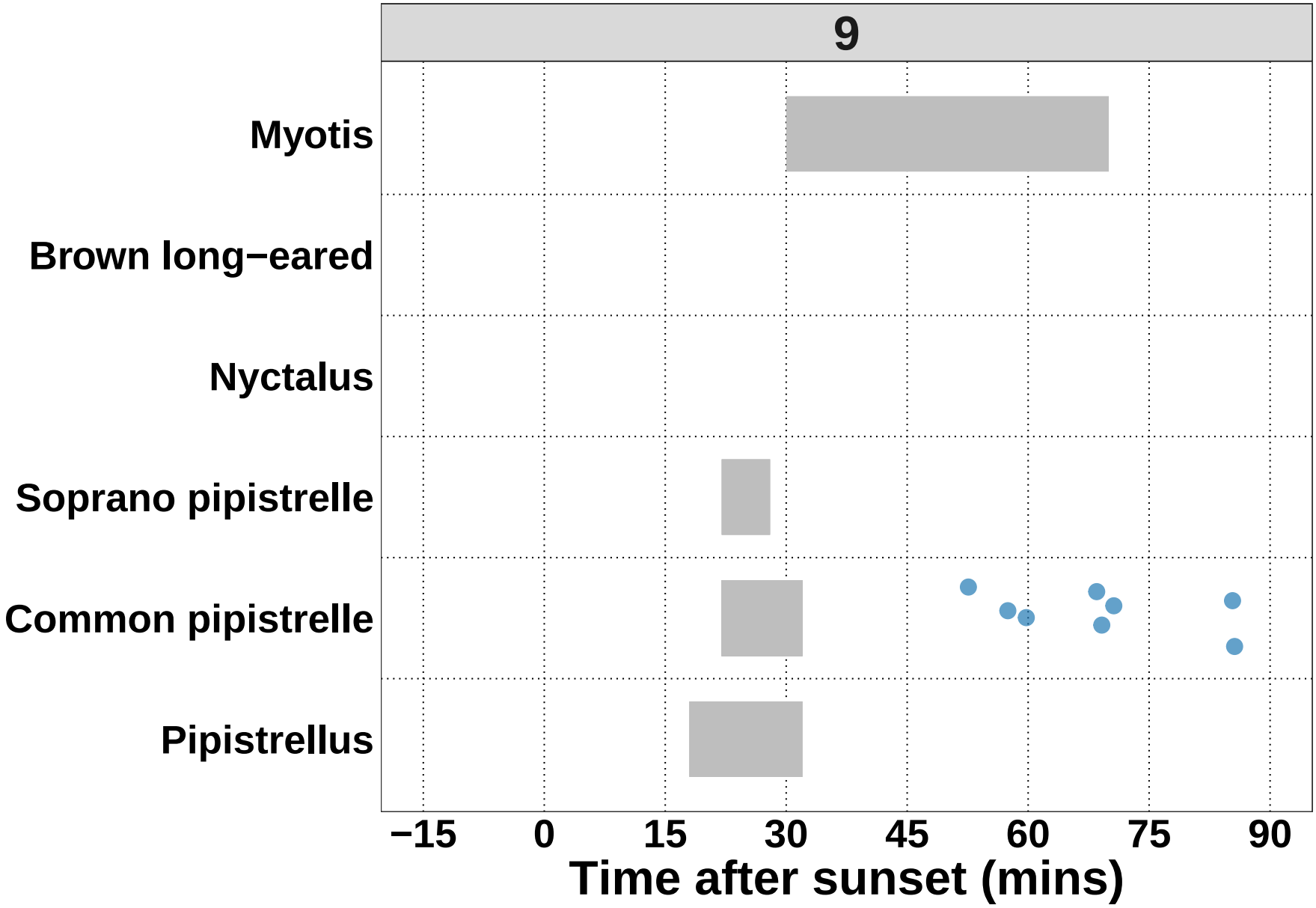

4
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

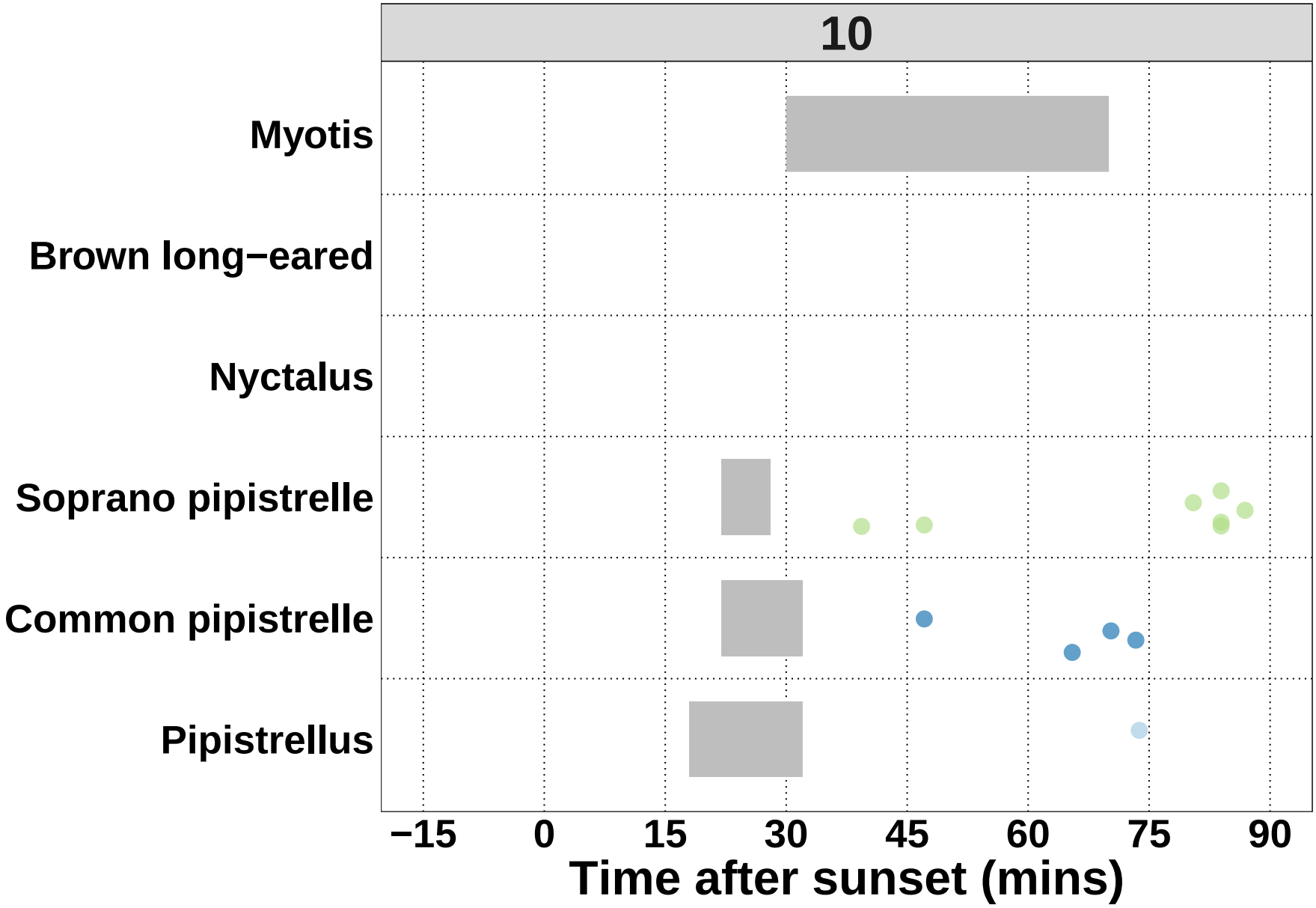

5
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

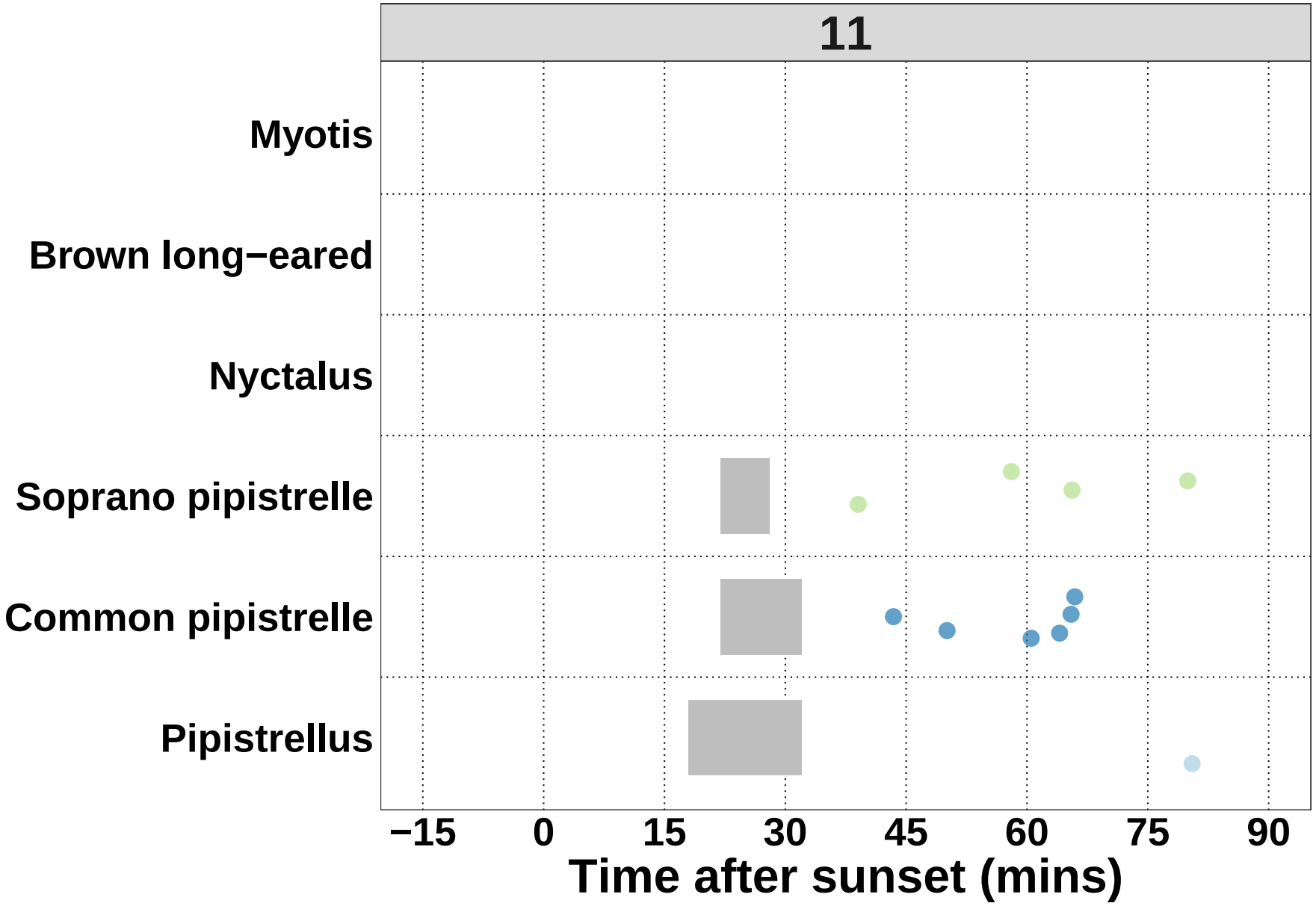

6
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

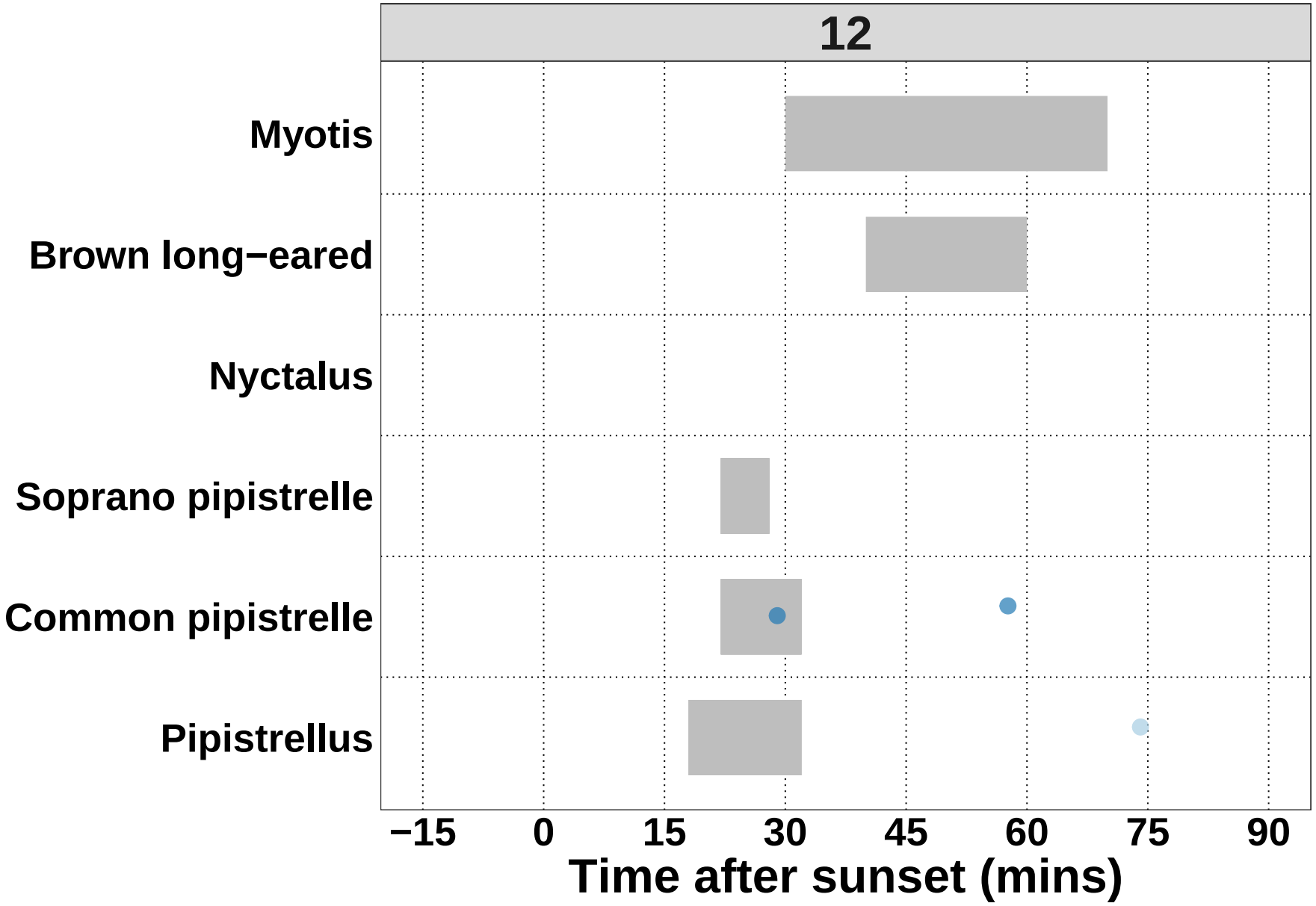

7
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

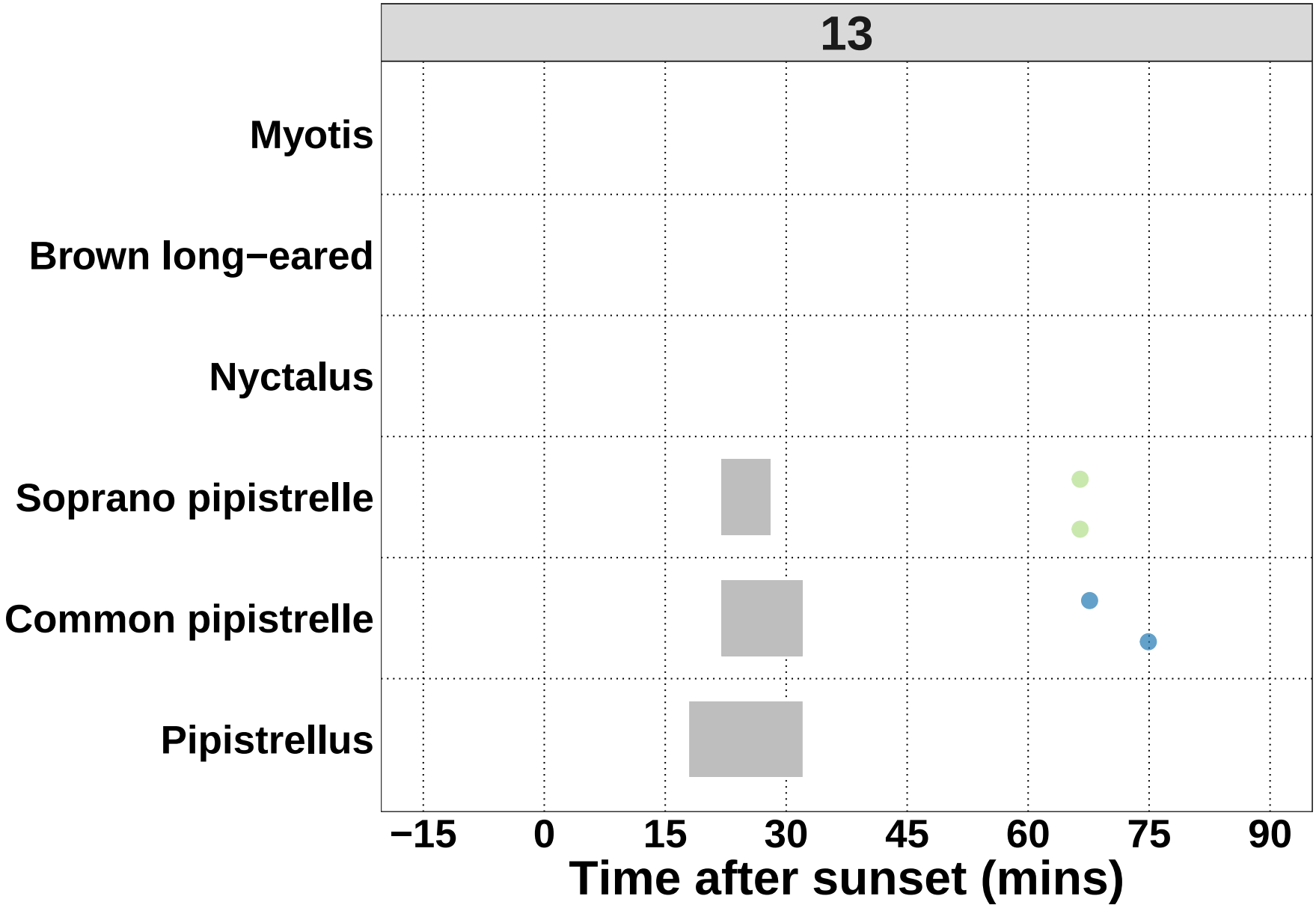

8
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)

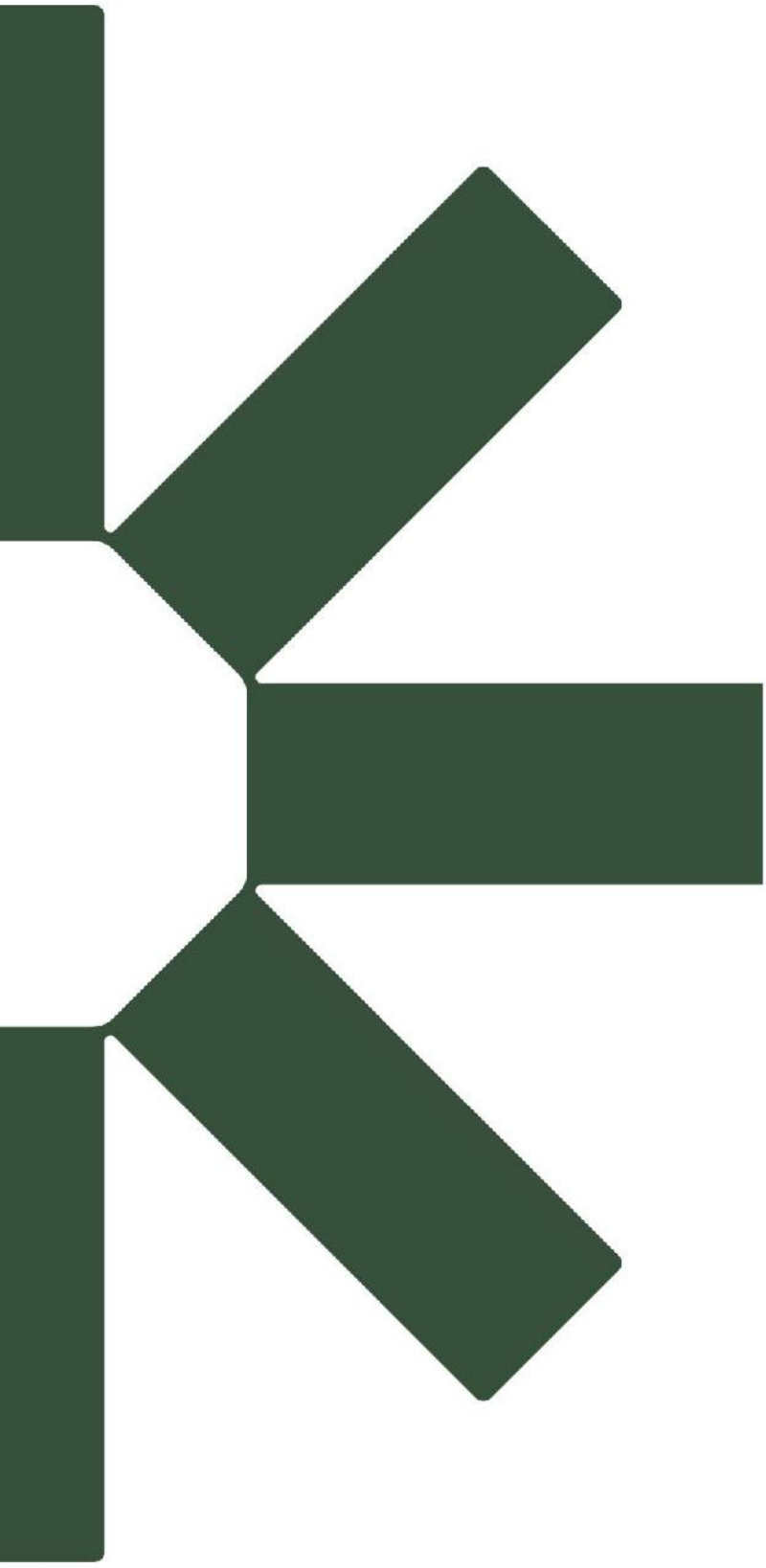

9
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)


10
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)


11
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)


12
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)


13
Myotis
Brown long−eared
Nyctalus
Soprano pipistrelle
Common pipistrelle
Pipistrellus
−15
0
15
30
45
60
75
90
Time after sunset (mins)



Making Sustainability Happen