Appendix 9.3: Bat Survey Report

Appendix 9.3

Sloy Pumped Hydro Storage Scheme
Bat Survey Report

Document Classification | **Public**

sse Renewables

Sloy Pumped Hydro Storage Scheme
Bat Survey Report

November 2023

CONTROL SHEET

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EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by Scottish and Southern Energy Renewables (SSER) to produce a report assessing the results of the bat activity surveys effort at the woodland adjacent (north of) the Sloy Hydroelectric Power Station, Inverulgas, for the proposed construction of a pumping station and a site establishment and rock storage area.

Static monitoring and dusk/dawn and bat transects surveys were undertaken at monthly intervals between May and August 2023 to determine the levels and type of bat activity and the bat species assemblages on site. The results were utilised to characterise the usage of the site by bats and to assess the significance of the site for bats.

Based on current guidelines, the site displays bat species assemblages significant at a **regional** level of importance. Soprano pipistrelle, common pipistrelle, brown long eared bats and Daubenton's bat were recorded during transect and static monitoring surveys. No bat roosts were confirmed on site and it is suggested that opportunities for bats to roost nearby are found in slate roofed buildings and tree cavities.

Moderate quality foraging and commuting habitats are found throughout the site, with **high** quality habitats being present in the locale. The habitats contain several linear features such as woodland hedges, patches of scrub and watercourses that provide suitable resources for bats.

Potential impacts on bats as results of the proposed works include but are not limited to:

- Loss of/disruption to habitats used by regionally important bat species assemblages.
- Disturbances to commuting and foraging bats if temporary and/or permanent lighting is implemented on site.

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1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Limited was commissioned by Scottish and Southern Energy Renewables (SSER) to produce a report assessing the results of the bat activity survey effort from the northern aspect of the existing Sloy infrastructure and within the woodland adjacent (north of) the Sloy Hydroelectric Power Station for the proposed construction of a pump infrastructrure, site establishment and rock/spoil storage area.

1.2 Legislation

Bats are a European Protected Species (EPS) listed in the EC Directive (92/43) The Conservation of Natural Habitats and of Wild Flora and Fauna (the "Habitats Directive")[1], which is transposed into Scottish law through the Conservation (Natural Habitats &c.) Regulations 1994 (the "Habitat Regulations") as amended[2]. Under this legislation it is an offence to deliberately or recklessly:

- Capture, injure or kill a bat.
- Harass a bat or group of bats.
- Disturb a bat while it is occupying a structure or place used for shelter or protection.
- Disturb a bat while it is rearing or otherwise caring for its young.
- Obstruct access to or otherwise deny a bat use of a hibernating/breeding site or resting place.
- Disturb a bat in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species.
- Disturb a bat in a manner or in circumstances likely to impair its ability to survive, breed/reproduce, and/or rear/otherwise care for its young.
- Disturb a bat while it is migrating or hibernating.
- Possess, control, transport, sell and/or exchange a bat (dead or alive) or any part of a bat.

1.3 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

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[1] Council of the European Communities (1992) Council Directive 92/43/EEC of 21. May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities, 35, 7– 50.
[2] Great Britain. The Conservation (Natural Habitats, &c.) Regulations 1994 No.2716 [online]. Available from: https://www.legislation.gov.uk/uksi/1994/2716/made

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2 METHODS

The survey was designed and undertaken in reference to the Bat Conservation Trust: Bat Surveys Good Practice Guidelines[3].

2.1 Bat Transect Survey

A total of four dusk transect surveys were undertaken across the site to observe and sample the distribution of bat activity and species diversity on-site. A single transect route was walked, with the aim of sampling all accessible habitats on site during each survey.

The surveys were undertaken by EnviroCentre's Ecologists: Steven Duncan, Rebecca Brown and Luigi Cristofaro, who are members of the Chartered Institute for Ecologists and Environmental Managers (CIEEM) and EnviroCentre ecologist Alexandra Darling.

Each transect was walked at a moderate and consistent speed with regular stops approximately every 30 meters. Detection and observation of bat behaviour were recorded during the survey. Each dusk transect survey commenced at sunset and continued for at least two hours. The transects covered all habitats on site. The direction of the transect route alternated between clockwise and counterclockwise with each survey to optimize the coverage of each area of the site during peak bat activity times. The transect route was designed to start/end at the location, on site, of a mature beech tree that had previously been assessed as displaying presence of Potential Roosting Features (PRFs).

Frequency division bat detectors (Bat Box Duet) coupled with remote detectors (Anabat Swift) were utilised during the survey to gather digital sound file samples of bat activity. Anabat Swifts set to transect mode, were used to aid detection and observation of bat activity. At the point of contact, each sound file is assigned a GPS location. Surveyor location was continually recorded by the detector to create a 'track' of the walked transect.

A summary of the surveys schedule, timings and weather conditions can be seen in Table 2-1 below.

Table 2-1 Summary of the Surveys Schedule and Weather Conditions

Survey No.	Date	Survey Start	Survey End	Average Temperature (C)	Cloud Coverage (%)	Precipitation	Wind (Beaufort)
1	25 May 2023	21:44	23:44	14	20%	No	0
2	25 June 2023	22:09	00:09	13	80%	No	0
3	25 July 2023	21:39	23:39	13	70%	No	1
4	24 August 2023	20:34	22:34	12	90%	Light rain	1

[3] Collins, J. (2023) *Bat Surveys for Professional Ecologists – Good Practice Guidelines 4th Edition*. Bat Conservation Trust, London.

2.1.1 Disclaimer

Bat transect surveys are limited in their ability to determine specific bat numbers on site, as the same bat can potentially be observed multiple times throughout the survey. As such, any bat population numbers provided as a result of transect surveys are estimates and not necessarily representative of the true scale of the population of bats on site.

2.2 Static Monitoring Surveys

The following methodology was designed in line with current guidelines regarding the static acoustic monitoring of bats.

Remote acoustic monitoring has been undertaken to provide additional data to inform the assessment of bat activity at the site where significant fragmentation of vegetation is set to occur. The extended time period covered by this type of survey allows for a more accurate assessment of bat species diversity and activity levels to be made.

Three Anabat Swift detectors were deployed and left to record automatically for the hours between half an hour before sunset and half an hour after sunrise, for five consecutive days. The Anabat Swift deployment schedule and location can be seen in Table 2-2 below.

Table 2-2 Anabat Swift deployment schedule

Anabat Swift Position No.	Deployment periods	Coordinates	Description of Location
1	25 May 2023 – 31 May 2023 21 June 2023 – 25 June 2023 25 July 2023 – 30 July 2023 01 August 2023 – 07 August 2023	NN3224209913	Located at the eastern edges of the woodland.
2		NN3221509998	Located at the boundary between the coniferous plantation woodland and the wet birch woodland.
3		NN3216109940	Located at the centre of the coniferous plantation woodland.

Ultrasonic recordings from the five consecutive nights with the highest activity throughout each deployment period and from the transects, were subsequently analysed using the latest Anabat Insight software/Analook W software, where audio data is presented in sonographic and/or zero-crossing format and can be reviewed. Sonograms/zero-crossings were reviewed to identify any bat call ‘pulses’ and/or the presence of non-bat audio data. Non-bat ‘noise’ files were removed from the data set. Confirmed bat calls were assigned the highest achievable level of taxonomic classification such as species (e.g. *Myotis Daubentonii*) or genus (e.g. *Myotis* sp.) based on known parameters (e.g. peak frequency of call, call duration, inter-pulse interval etc).

2.2.1 Disclaimer

It should be noted that the findings described herein for remote monitoring surveys are based on the bat activity recorded at the location immediate to each detector, and therefore only describe localised activity at the Site.

2.3 Assessment

The Impact Assessment was determined based on the habitat value and the bat species assemblages score, as described in the current bat mitigation guidelines[4].

Habitat value was characterised based on the current bat survey guidelines regarding the suitability of commuting and foraging habitats on site, as observable below:

- **High suitability habitat:** Continuous high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edges. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. The site is close to and connected to known roosts.
- **Moderate suitability habitat:** Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
- **Low suitability habitat:** Habitat that could be used by small numbers of commuting bats such as a hedgerow with gaps, or unvegetated stream, but isolated. Suitable but isolated habitat that could be used by small numbers of foraging bats such as a lone tree or a patch of scrub.
- **Negligible suitability habitat:** Negligible habitat features likely to be used by foraging or commuting bats.

To determine the maximum possible score any site could achieve, a score is assigned to each species that could be present where:

- Widespread in (almost) all geographies [score 1].
- Widespread in many geographies, but not as abundant in all [score 2].
- Rarer or restricted distribution [score 3].
- Rarest Annex II species and very rare [score 4].

Once the score for each has been calculated and summed to determine the maximum theoretical score, the threshold score needed for any assemblage to meet each geographic level of importance, can be calculated:

- Assemblage score meets or exceeds 45% of the maximum score: County importance.
- Assemblage score meets or exceeds 55% of the maximum score: Regional importance.
- Assemblage score meets or exceeds 70% of the maximum score: National importance.

The bat mitigation guidelines (2023) scoring system for Scotland and the maximum score thresholds can be observed in **Table 2-3** below.

[4] Reason, P.F. and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Chartered Institute of Ecology and Environmental Management, Ampfield

Table 2-3 Scoring system for bat species assemblages in Scotland

Rarity category	Southern Scotland	Northern Scotland	
	Species[5]	Species	Score
Widespread in (almost) all geographies.	Ppip Ppyg	Ppip Ppyg	Score: 1 each
Widespread in many geographies, but not as abundant in all.	Paur Mnat Mdau	Paur Mnat Mdau	Score: 2 each
Rarer or restricted distribution.	Mmys Nnyc Nlei Pnat	Pnat	Score: 3 each
Rarest Annex II species and very rare.	Mbra		Score: 4 each
Threshold (maximum possible score)	**24**	**11**	

2.4 Constraints

2.4.1 Field Survey

Anabat swifts static monitoring detectors utilise GPS tracking signal to determine their location and set the correct recording time for bats, based on sunset times. However, the GPS signal within the woodland adjacent to the site was often intermittent. As a result, it is possible that some data may have gone unrecorded.

The repeated walked transect route was designed to target the area of birch woodland thought to be prioritised for spoil storage focusing from the southern extent to centrally within the site boundary. Bat activity was observed, but not gathered in a repeated walked transect, in the northern portion of the site and was noted to be commensurate with the wider site i.e. low levels of mainly pipistrelle activity. No roost features were found within this area and the habitat type is similar, albeit with reduced level of Rhododendron and increased saturated ground conditions. Knowledge of the habitats present and the activity of bats across the wider site provide adequate confidence in assessing the behaviour and diversity of bats in the area adjacent to the repeated transect. .

[5] Bat nomenclature - **Ppyg:** *Pipistrellus pygmaeus* (soprano pipistrelle); **Ppip:** *Pipistrellus pipistrellus* (common pipistrelle); **Pnat:** *Pipistrellus nathusii* (nathusius' pipistrelle); **Nnyc:** *Nyctalus noctula* (Noctule); **Nlei:** *Nyctalus lesleri* (Leisler's bat); **Mdau:** *Myotis daubentonii* (Daubeton's bat); **Mnat:** *Myotis nattereri* (natterer's bat); **Mmys:** *Myotis mystacinus* (whiskered bat); **Mbra:** *Myotis brandtii* (Brandt's bat); **Paur:** *Plecotus auritus* (brown long eared bat).

3 RESULTS AND ASSESSMENT

3.1 Bat Transect Survey

A small number of both soprano and common pipistrelle were seen and/or heard foraging around several areas of the site. Most of the activity was concentrated around the southern edges of the woodland, directly adjacent to the power station and at the boundary line between the coniferous plantation woodland and the wet birch woodland to the north, where a small portion of the activity was also observed.

The Bat Survey Plan comprising transect route and bat activity can be found in Appendix A.

A summary of the transect survey can be seen below in Table 3-1.

Table 3-1. Summary of the Species Count from the Bat Transect Surveys, 2023

Month	Species	Count	Location/Observations
May	Soprano pipistrelle Common pipistrelle	9 3	A total nine soprano pipistrelle and three common pipistrelle were recorded foraging or commuting over the survey area. The soprano pipistrelle were recorded respectively southwest of the site, at the woodland edge facing the power station and along the edge between the coniferous plantation woodland and the wet birch woodland to the north. The common pipistrelle were recorded foraging near the tree canopy along the western site boundary bordering the railway road.
Monthly Total		**12**	
June	Soprano pipistrelle	2	A total of two soprano pipistrelle were recorded foraging or commuting over the survey area. The soprano pipistrelle were recorded respectively immediately southwest of the site and northeast of the boundaries between the coniferous plantation woodland and the wet birch woodland.
Monthly Total		**2**	
July	Soprano pipistrelle	4	A total of four soprano pipistrelle were recorded foraging or commuting over the survey area. The soprano pipistrelle were recorded immediately north of the boundary of the coniferous plantation woodland, within the southern section of the wet birch woodland, and near the centre of the site.
Monthly Total		**4**	
August	Soprano pipistrelle Common pipistrelle	6 2	A total of six soprano pipistrelle and two common pipistrelle were recorded foraging or commuting over the survey area. The soprano pipistrelle were recorded respectively immediately south of the site, flying near the woodland edge facing the power station and north of the coniferous plantation woodland, within the wet birch woodland. The common pipistrelle were recorded near the centre of the coniferous plantation woodland.
Monthly Total		**8**	

3.2 Bat Static Monitoring Surveys

Records of soprano pipistrelle, common pipistrelle, brown long-eared bat and Daubenton's bat species were obtained from each Anabat location over the course of the entire survey period (July-September inclusive). Records of soprano and common pipistrelle fluctuated throughout the survey period but in general most of the activity was centred around position one and two.

Bat Activity often peaked within the first hour after sunset and then again around two-three hours after sunset, suggesting that roosts are likely present in the vicinity of the site and that the site is utilised by bats for foraging and commuting purposes. A summary of the Static Detector Surveys can be seen in Table 3-2 below. The Activity Plots displaying the intensity of the activity after sunset is displayed in Appendix B.

Table 3-2. Summary of the bat static detectors survey results

Month	Position	Species Recorded	Total Monthly Count	Average Count/Night
May	Position 1	Soprano pipistrelle	28	6
		Common pipistrelle	45	9
	Position 2	Soprano pipistrelle	575	115
		Common pipistrelle	31	6
		Brown long eared	5	1
		Daubenton's bat	25	5
	Position 3	Soprano pipistrelle	80	16
		Common pipistrelle	5	1
		Brown long eared	1	<1
		Daubenton's bat	9	2
June	Position 1	Daubenton's bat	1	<1
	Position 2	Soprano pipistrelle	344	69
		Common pipistrelle	7	1
		Brown long eared	4	<1
		Daubenton's bat	32	6
	Position 3	Soprano pipistrelle	285	57
		Common pipistrelle	11	2
		Daubenton's bat	12	2
July	Position 1	Soprano pipistrelle	65	13
		Common pipistrelle	51	10
		Brown long eared	3	<1
	Position 2	Soprano pipistrelle	10	2
		Common pipistrelle	1	<1
		Daubenton's bat	1	<1
	Position 3	Soprano pipistrelle	51	10
		Common pipistrelle	9	2
		Daubenton's bat	1	<1
August	Position 1	Soprano pipistrelle	236	47
		Common pipistrelle	94	19
		Brown long eared	2	<1
	Position 2	Soprano pipistrelle	104	21
		Common pipistrelle	3	<1
		Daubenton's bat	1	<1
	Position 3	Soprano pipistrelle	963	193
		Common pipistrelle	74	15
		Daubenton's bat	1	<1

The proportion of each species' registrations at each monitoring location is displayed in Figure 1, below:

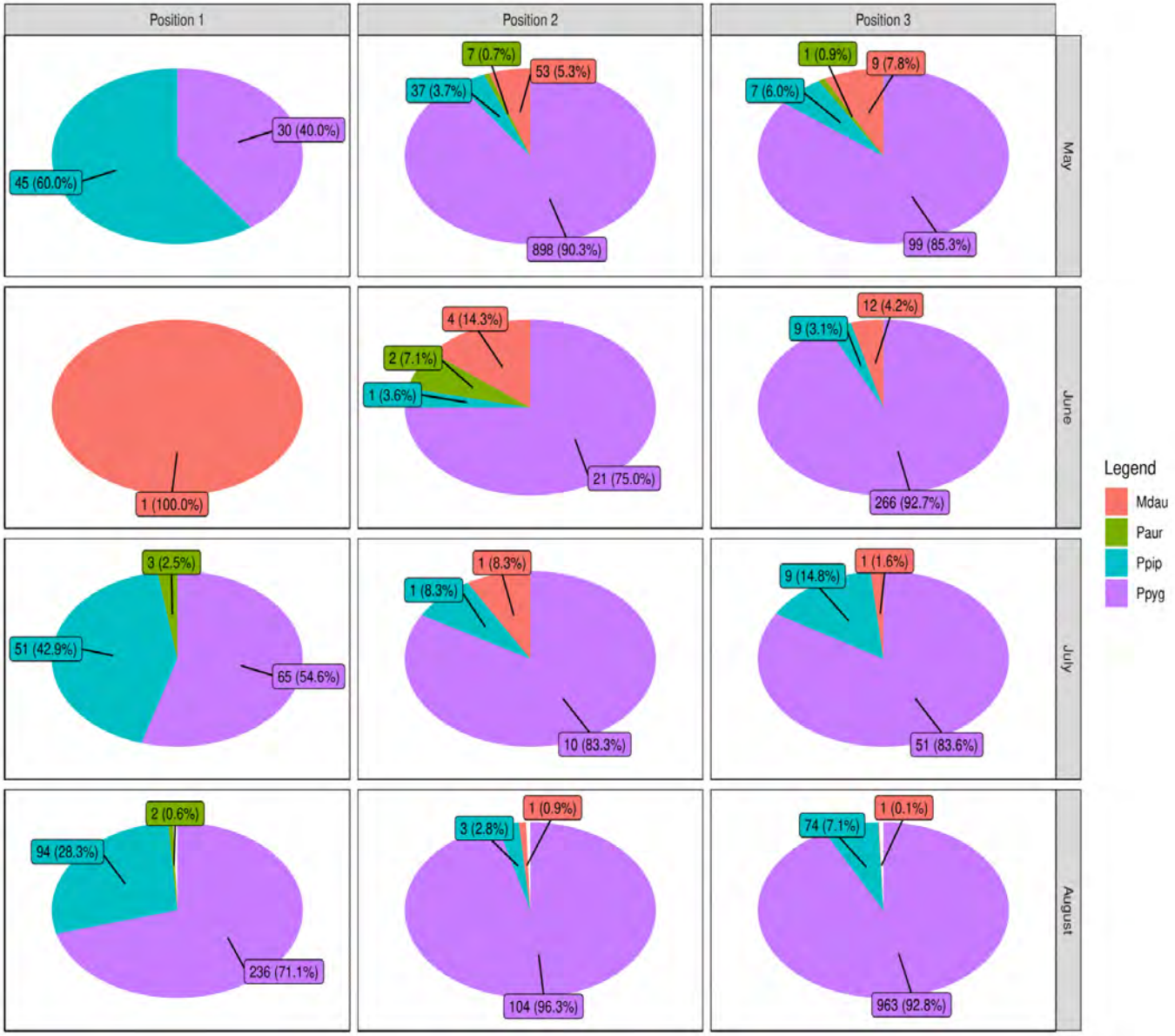

Figure 1: Proportion of each species' registrations at each monitoring location

3.3 Assessment

In reference to the bat species assemblages scoring system (northern Scotland) and based on the value of the habitats where bat activity was recorded, the following value is assigned, as displayed in Table 3-3.

Table 3-3. Bat Species Assemblages Assessment Results

Species	Importance of Commuting and Foraging Habitats	Importance of Assemblage
"Widespread in (almost) all geographies." • Ppyg • Ppip	• The habitats around the static detector position meet the definition of **moderate** suitability for bats. • In the locale, there are habitats that meet the definition of **high** suitability for bats. • It is likely that a number of roosts are present in the vicinity but not necessarily on site. • The habitat is well-connected to nearby woodland sites and to the wider landscape, providing high quality commuting routes for bats.	1 point per species Score: 2/2
"Widespread in many geographies, but not as abundant in all." • Paur • Mdau		2 points per species Score: 4/6
Total assemblage score: 6/11 (55%): **Regional** Importance		

No bat roosting or swarming behaviour was noted during the surveys and no bats were recorded emerging or utilising the tree with PRFs on site. The transect and static monitoring surveys suggest a usage of woodlands and the understorey scrub by multiple bat species for foraging and commuting purposes. The most active area was associated with the woodland's southern edge, where a greater tree diversity, as well as an increase in more mature trees is found. The intensity of bat activity shown on site diminishes near the edges of the wet birch woodland compared to the rest of the site, which suggest that, although still present, fewer bats utilise the wet birch woodland to the north, perhaps due to a lack of a woodland edge or glade formation.

Early mature to mature trees (including some nectar producing trees) located within the power station grounds and near the adjacent woodland edge are providing a favoured foraging area. Mixed woodlands in the near landscape provide suitable invertebrate habitat and, as a result, some resources for foraging bats. The open water and shoreline habitat to the east will also host invertebrate species, including emergent aquatic invertebrates which provide foraging opportunity for species such as the Daubenton's bat.

Based on the bat species assemblage scoring system and on the habitat suitability found on site, it is likely that the impact on local population on bats as a result of the proposed works could be of **regional** significance, however the design suggests this would be temporary based on habitat re-creation and long term improvements should wider habitat management occur.

4 POTENTIAL IMPACTS AND FURTHER SURVEY

4.1 Proposed Works

The proposed works include a new surface building to house electrical switchgear, pump infrastructure and gantry crane which will require excavation adjacent to the existing tailrace, and woodland removal followed by deposition of rock/spoil on site.

Following completion of rock/spoil storage, it is proposed that native woodland recreation will occur through a mixture of planting and natural regeneration, including herbivore exclusion or management, and ongoing monitoring for the eradication of invasive plants.

4.2 Potential Impacts

The following list of potential impact may incur as a result of the proposed works on the site if appropriate mitigation and further surveys are not implemented:

- Loss of /disruption to habitats used by regionally important bat species assemblages.
- Disturbance to commuting and foraging bats if temporary and/or permanent lighting is implemented on site.

4.3 Further Survey

It is suggested that monitoring of bat activity is repeated over time at an agreed frequency, to report any changes in baseline conditions, should works not begin within 24 months of the date of this report.

It is suggested that trees presenting cavities (PRFs) are routinely surveyed during the bat activity season (May -September) for signs of activity, and checked with a digital endoscope immediately prior to removal to confirm presence/absence of roosting bats, to avoid unintended injury or mortality to bats.

It is suggested that a repeat of transect and static recording for bat species occurs at year 1, 3 and 10 post habitat creation to study the comparative use by bats of replaced habitats, to inform the efficacy of the compensatory measure.

5 AVOIDANCE AND MITIGATION

The following strategy is suggested to avoid or minimise negative impacts to bat species using the site:

- All staff will be made aware of the presence of bats in the Inveruglas and Sloy landscape via site induction material.
- Vegetation removal shall be scheduled for winter months when bats are not expected to be utilising the habitats for foraging.
- Surrounding habitats will be retained and adequately protected from the effects of construction or plant machinery movements.
- Lighting used during works will be targeted at the working area and spillage of light to the adjacent habitats, including the open water of Loch Lomond, will be avoided.
- High intensity noise and vibration will be avoided between sunset and sunrise.
- A range of high-quality bat boxes will be installed in retained woodland in the near landscape to increase the roosting resources for bats that may seek to avoid the environs of the site.
- Should a bat be observed on site, especially during daylight hours, the sighting should be reported to the project ecologist to investigate the sighting and adjust any applied avoidance or mitigation strategy to minimise negative effects on bats associated with the habitats.
- Recreation of woodland habitats following the construction phase will aim to promote native broadleaf woodland devoid of invasive plants. Enhancement of woodland and grassland habitat for invertebrates within the spoil storage area and through adjacent land in SSER's control will be applied, with the aim that invertebrate diversity and abundance is increased in line with habitat health and connectivity, which will benefit bats in the medium to long term.

APPENDICES

A BAT SURVEY PLAN

231880 232067 232254 232441

710226 710039 709852

Position 3

Position 2

Position 1

Imagery Source: Bing Maps. Image courtesy of Ordnance Survey © 2023 TomTom

Legend

- Proposed Development Area
- Bat Static Positions
- Bat Observations
- >10 Transect Bat Activity
- 0

Do not scale this map

Client
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Project
Sloy Pumped Hydro Storage Scheme

Title
Bat Survey Plan

Status
FINAL

Drawing No.	Revision	Date
176783-GIS013	2	02 Nov 2023
Drawn	**Checked**	**Approved**
LC	SD	SD

Scale
1:2,100 @ A3

Rev	Date	Amendment	Initials
2	15 Aug 2024	Changed Project Name	LC

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B BAT ACTIVITY PLOTS

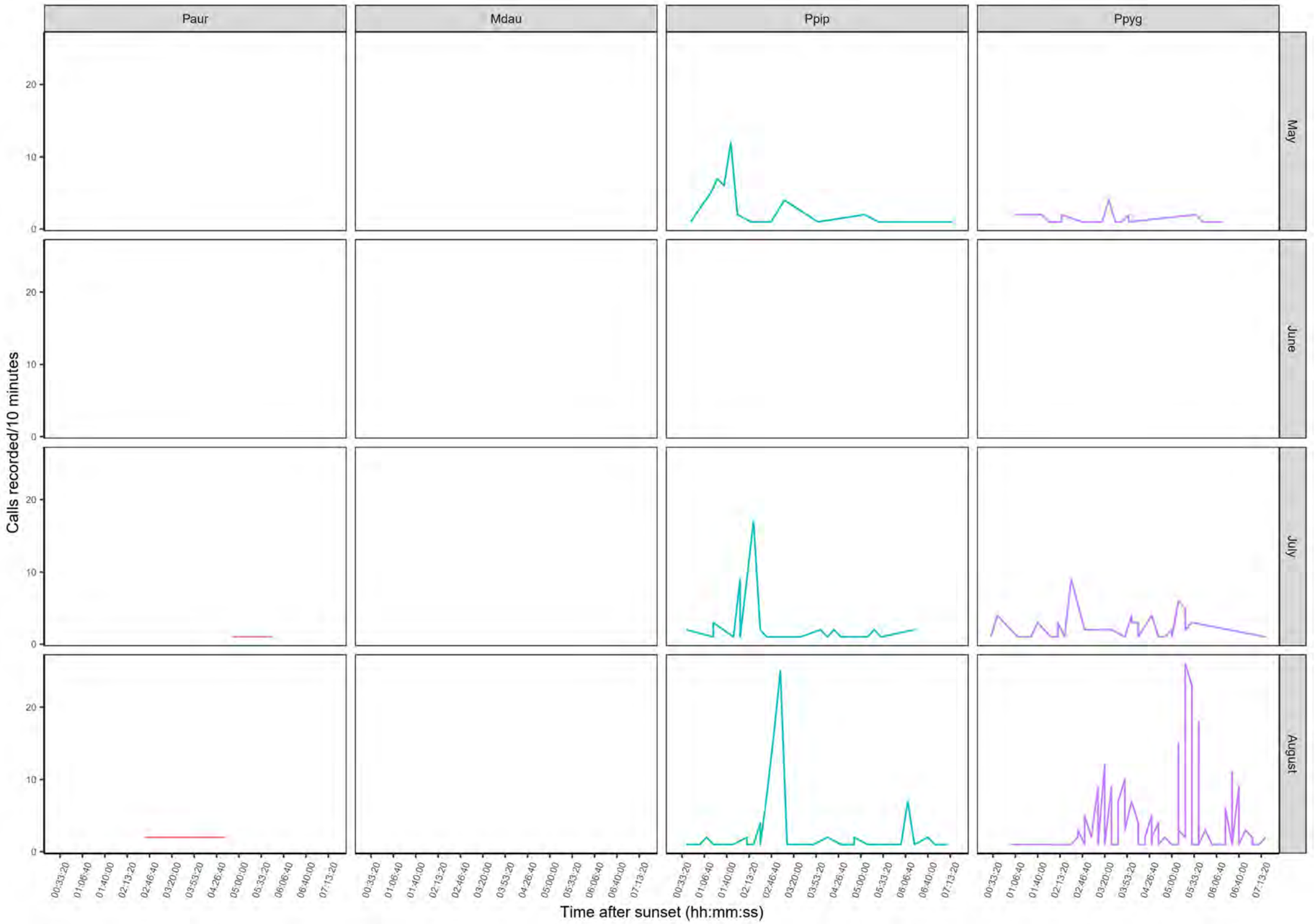

Image Source: RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL

Legend

- Soprano pipistrelle
- Common pipistrelle
- Brown long eared
- Myotis sp.

Do not scale this map

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Sloy Pumped Hydro Storage Scheme

Title
Bat Activity Plots (Position 1)

Status
FINAL

Drawing No.	Revision	Date
176783-GIS014	1	02 Nov 2023
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LC	SD	SD

Rev	Date	Amendment	Initials
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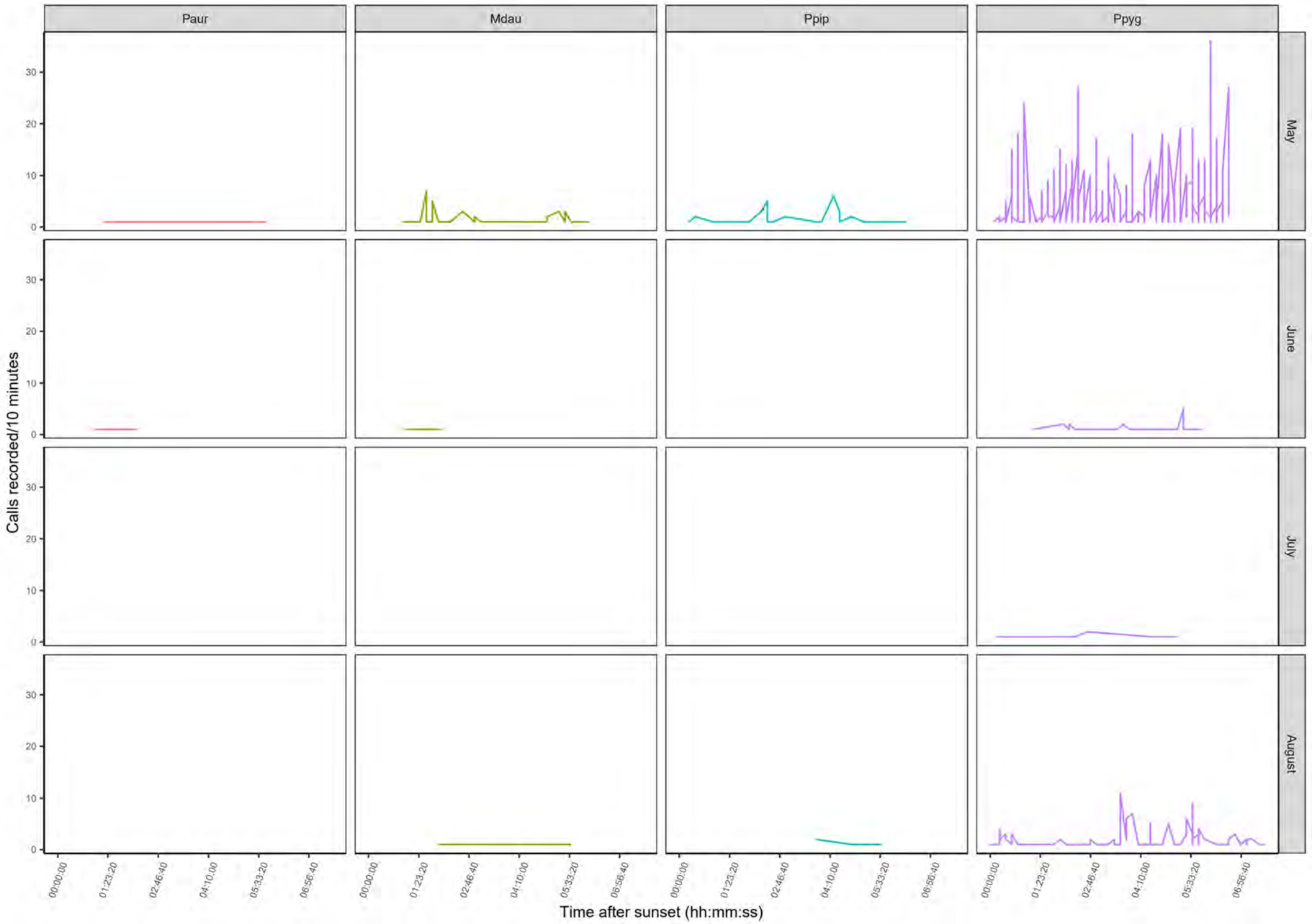

Image Source: RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL

Legend

- Soprano pipistrelle
- Common pipistrelle
- Brown long eared
- Myotis sp.

Do not scale this map

Client
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Project
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Title
Bat Activity Plots (Position 2)

Status
FINAL

Drawing No.	Revision	Date
176783-GIS014	1	02 Nov 2023
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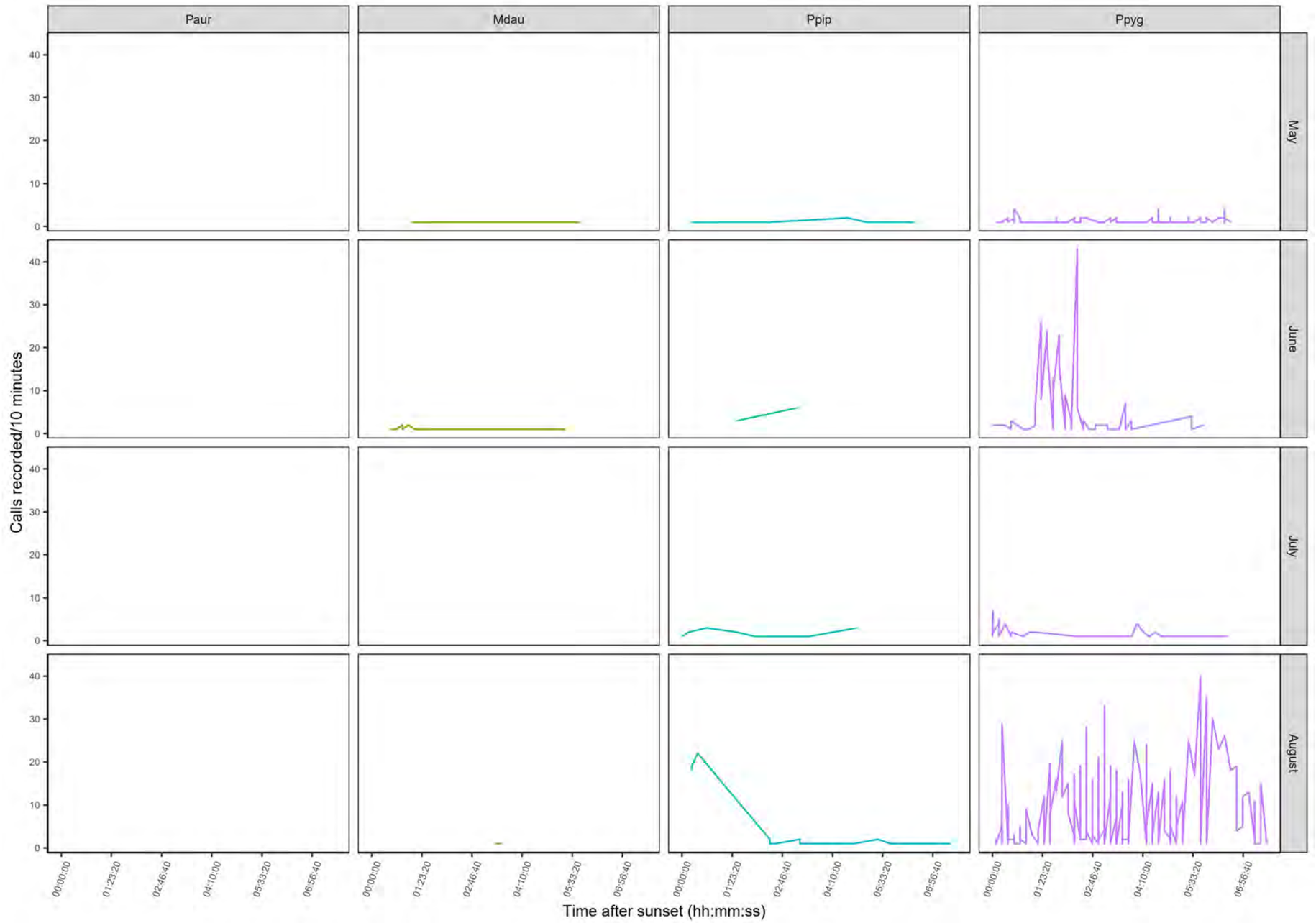

Image Source: RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL

Legend

- Soprano pipistrelle
- Common pipistrelle
- Brown long eared
- Myotis sp.

Do not scale this map

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Title
Bat Activity Plots (Position 3)

Status
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Drawing No.	Revision	Date
176783-GIS014	1	02 Nov 2023
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