Appendix 5.3 Bat Survey Methodology and Results

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Appendix 5.3 Bat Survey Methodology and Results

5.1 Methodology

5.1.1 A Proposed Development comprising a maximum of 20 turbines was progressed during the scoping process. However, at the time of survey scope preparation in April 2019, a development with a maximum of 32 turbines was assumed on the basis of a significantly different turbine development area. As such, following Scottish Natural Heritage (SNH) guidelines (SNH, 2019), 17 static detectors were proposed to be deployed in the field study area between May and October 2019. As final turbine locations were not fixed at the time of deployment, detectors were positioned in such a way as to give the best spatial and habitat type coverage possible.

5.1.2 Fifteen static detectors were deployed on 30 May 2019 (13 Anabat Express detectors and two Wildlife Acoustics Inc. Song Meter 2 detectors (SM2s)), shown as BE 1-3 and BE 6-17 on Figure 5.7.1. Due to a change to the Site boundary in June 2019, when much of the north-eastern part of the original development area was removed, eight of the detectors deployed in May were at locations no longer within, or close to, the field study area. Subsequent access restrictions meant that those detectors could not be retrieved and redeployed in time for the June surveys. A ninth detector (BE 7) was moved in June to a location closer to the Site boundary and was used throughout the remainder of the survey period.

5.1.3 Three additional detectors (BE 18-20) were deployed on 26 June 2019. These were additional to the six detectors originally deployed in May at locations lying within the field study area and the one detector moved slightly to lie closer to the Site boundary (BE 7). As such, from June onwards, there were ten detectors at locations within the field study area, nine of them Anabat Express detectors and one of them an SM2, as shown on Figure 5.7.1.

5.1.4 Five additional detectors (BE 21-25) were deployed on 28 August 2019, leaving a total of 15 detectors within the field study area from August to October 2019, as shown on Figure 5.7.2. All detectors were removed from the field study area between 23 and 25 October 2019.

5.1.5 Table 5.3.1 summarises the extent of bat detector coverage within the field study area throughout the full period of May to October 2019:

Table 5.3.1 – Bat Detector Coverage in Field Study Area Throughout Full Surveying Period

Deployment Date	30 May 2019 - 25 June 2019	26 June 2019 – 27 August 2019	28 August 2019 – 25 October 2019
Number of detectors within, or close to, Site boundary	7	10	15
Detector Numbers	BE 1, BE 6, BE 7, BE 10, BE 11, BE 12, BE 16	BE 1, BE 6, BE 10, BE 11, BE 12, BE 16, BE 7, BE 18, BE 19, BE 20,	BE 1, BE 6, BE 10, BE 11, BE 12, BE 16, BE 7, BE 18, BE 19, BE 20, , BE 21, BE 22, BE 23, BE 24, BE 25

5.1.6 Bat call (echolocation) data collected on the detectors was analysed to species level using the Anabat software, AnaLook. This provided an indication of activity levels of the species found to be present in the field study area and those species were then assessed for their vulnerability to collision. Table 5.3.2 details the risk posed to all UK bat species from collision with wind turbines (SNH, 2019). Of the species shown in Table 5.1.2, no horseshoe bats (*Rhinolophus sp*.), serotine (*Eptesicus serotinus*) or barbastelle (*Barbastella barbastellus*) occur in Scotland and noctule

(*Nyctalus noctula*) and Leisler's bat (*N. leisleri*) are not believed to occur as far north in Scotland as the Proposed Development.

Table 5.3.2 – Bat Species and Populations Likely to be at Risk from Wind Turbine Collisions

Low Risk	Medium Risk	High Risk
Myotis species	Serotine	Noctule
Brown long-eared bat (*Plecotus auritus*)	Barbastelle	Leisler's bat
Horseshoe bats (*Rhinolophus* sp.)		Nathusius' pipistrelle (*Pipistrellus nathusii*)
		Common pipistrelle (*P. pipistrellus*)
		Soprano pipistrelle (*P. pygmaeus*)

5.1.7 Combining the level of potential vulnerability with the bat activity recorded in the field study area assists in assessing the potential risk to bat species and informs mitigation requirements. The recommended Ecobat tool (Lintott *et al.*, 2018) was used to compare the bat survey data collected with other data collected from similar areas at the same time of year and in comparable weather conditions in order to produce a percentile score that was then used to classify the level of bat activity. Table 5.3.3 shows the categorised levels of bat activity used.

Table 5.3.3 – Percentile Score and Categorised Level of Bat Activity

Percentile	Bat Activity
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

Limitations

5.1.8 SNH guidance (SNH *et al.*, 2019a) recommends ten nights of bat activity are recorded during each season of spring (April-May), summer (June-mid-August) and autumn (mid-August-October), with ten detectors deployed for the first ten turbines proposed, and sufficient additional detectors to survey one-third of the remaining locations. As such, based on the guidance, 13 detectors should have been used to survey the 18 turbines of the Proposed Development. The number of detectors deployed within the field study area changed throughout the seasons as follows:

- Seven detectors were deployed in the field study area for two nights in May 2019 due to a delay in being able to commence surveys. Eight further detectors were deployed at that time but, due to a Site boundary change, these later fell outwith the field study area, as shown on Figure 5.7.1.

- Ten detectors were deployed within the field study area for over ten nights between June and August 2019 due to access restrictions to redeploy detectors already deployed outwith the field study area in May 2019, as shown on Figure 5.7.1.
- Fifteen detectors were deployed in the field study area for over ten nights between August and October 2019, as shown on Figure 5.7.2.

5.1.9 The field study area is considered to be a low habitat risk based on SNH guidance (SNH *et al.*, 2019) as there are no roosts in the Site boundary or within 900m of the Site boundary, the open moorland habitat is considered to be low quality foraging habitat and the field study area is not connected to the wider landscape by prominent linear features, such as woodland or hedgerows. Most watercourses are small burns connecting the various lochs and lochans in the field study area. The exception is the Allt Saigh in the south of the field study area, which could be used as a linear feature for commuting and foraging bats.

5.1.10 Although the recommended number of detectors were not able to be deployed in spring and summer, and less than ten days of data was recorded during the spring period of April-May, this is not considered to have a significant limitation on the data collected. The detectors that were deployed are considered to have gathered a good temporal and spatial spread of data across the relatively homogenous open moorland habitat that dominates the field study area. The data collected from those detectors sufficiently identifies the species present and how they are distributed across the field study area i.e. most bat activity seems to occur on the margins of the turbine development area.

5.2 Results

Early Survey Period (Late Spring)

Within Field Study Area

5.2.1 Data collected during the early survey period from 30 May to 25 June 2019 identified the following species recorded by detectors within the field study area:

- common pipistrelle; and
- unidentified pipistrelle species[1].

5.2.2 Passes by unidentified pipistrelle species were recorded at BE 10, while only a single common pipistrelle was identified at BE 11. A total of eight passes were recorded across these two detectors, with the highest number of passes identified at BE 10, as detailed in Table 5.3.5 and shown on Figure 5.3.1 below. No bats were recorded on the other detectors within the field study area. The locations of these detectors are shown on Figure 5.7.1.

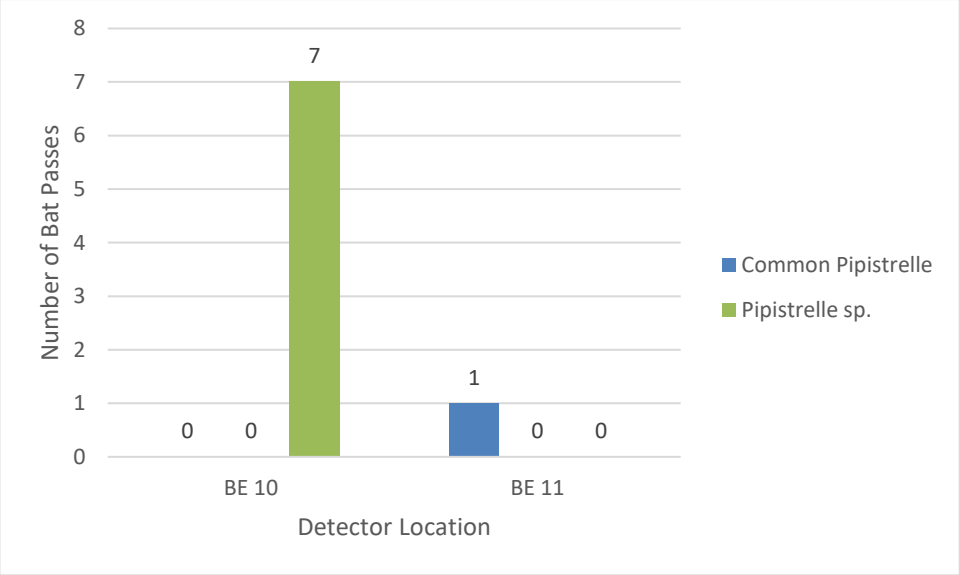
6.1.1

[1] *There is overlap in the frequency ranges between the three pipistrelle species occurring in Scotland and as such sometimes it is not possible to attribute particular calls to a particular species.*

Table 5.3.5 – Bat Passes Within Field Study Area During Early Survey Period

Species	Number of Bat Passes at Each Detector		Total Passes per Species
	BE 10	BE 11	
Common pipistrelle	0	1	**1**
Pipistrelle sp.	7	0	**7**
Total Passes per Detector	**7**	**1**	

Figure 5.3.1 – Bat Passes Within Field Study Area During Early Survey Period



Outwith Field Study Area

5.2.3 Data collected during the early survey period from 30 May to 25 June 2019 identified the following species recorded by detectors in the area outwith the field study area:

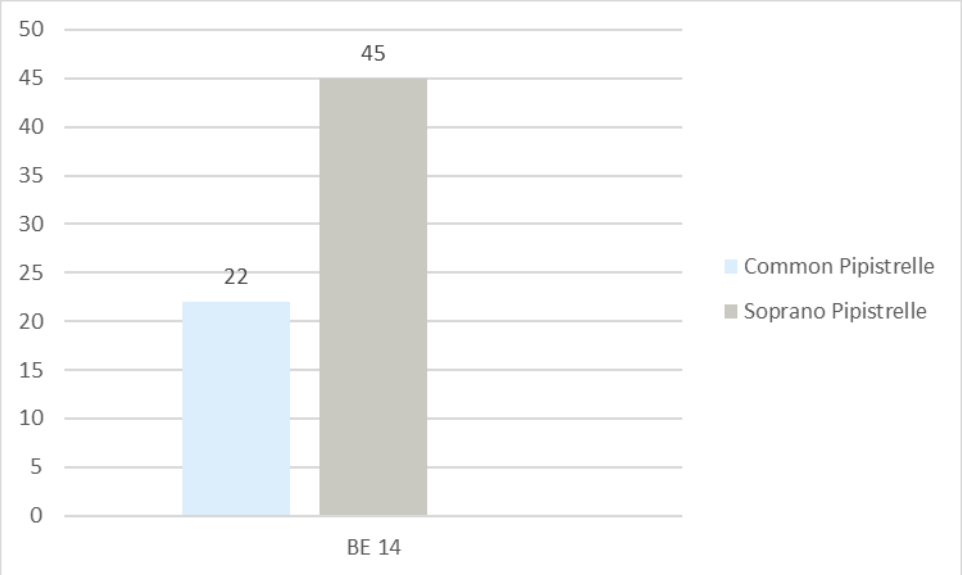
- common pipistrelle; and
- soprano pipistrelle.

5.2.4 Both common pipistrelle and soprano pipistrelle were recorded at BE 14. A total of 67 passes were recorded at this detector, as detailed in Table 5.3.6 and shown on Figure 5.3.2 below. No bats were recorded on the other detectors outwith the field study area. The location of this detector is shown on Figure 5.7.1.

Table 5.3.6 – Bat Passes Outwith Field Study Area During Early Survey Period

Species	Number of Bat Passes at Each Detector	Total Passes per Species
	BE 14	
Common pipistrelle	22	**22**
Soprano pipistrelle	45	**45**
Total Passes per Detector	**67**	

Figure 5.3.2 – Bat Passes Outwith Field Study Area During Early Survey Period



Middle Survey Period (Summer)

Within Field Study Area

5.2.5 Data collected during the middle survey period from 26 June to 27 August 2019 identified the following species recorded by detectors within the field study area:

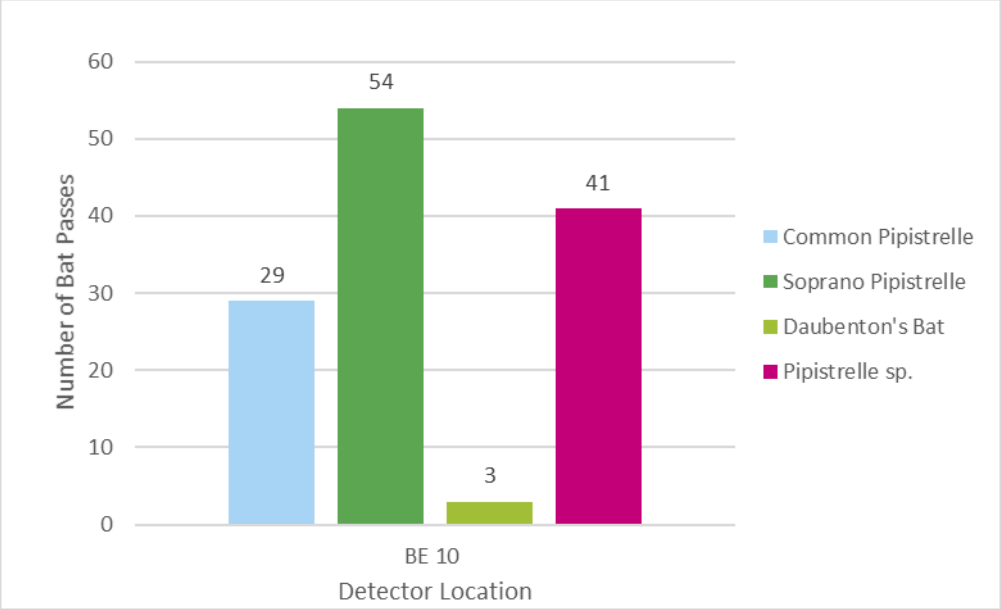
- common pipistrelle;
- soprano pipistrelle;
- Daubenton's bat (*Myotis daubentonii*); and
- unidentified pipistrelle species.

5.2.6 A total of 127 bat passes were recorded during this survey period and all at just one detector location: BE 10. The highest number of passes were by soprano pipistrelle, as detailed in Table 5.3.7 and shown on Figure 5.3.3 below. The location of this detector is shown on Figure 5.7.2.

Table 5.3.7 – Bat Passes at BE 10 Within Field Study Area During Middle Survey Period

Species	Number of Bat Passes
Common pipistrelle	29
Soprano pipistrelle	54
Daubenton's bat	3
Pipistrelle sp.	41
Total Passes	**127**

Figure 5.3.3 – Bat Passes Within Field Study Area During Middle Survey Period



Outwith Field Study Area

5.2.7 The detectors that had been installed in the area outwith the field study area were not operational during the middle survey period, therefore no bat activity was recorded.

Late Survey Period (Autumn)

Within Field Study Area

5.2.8 Data collected during the late survey period from 28 August to 25 October 2019 identified the following five species recorded by detectors within the field study area:

- common pipistrelle;
- soprano pipistrelle;
- brown long-eared bat
- Daubenton's bat; and
- Natterer's bat (*Myotis nattereri*).

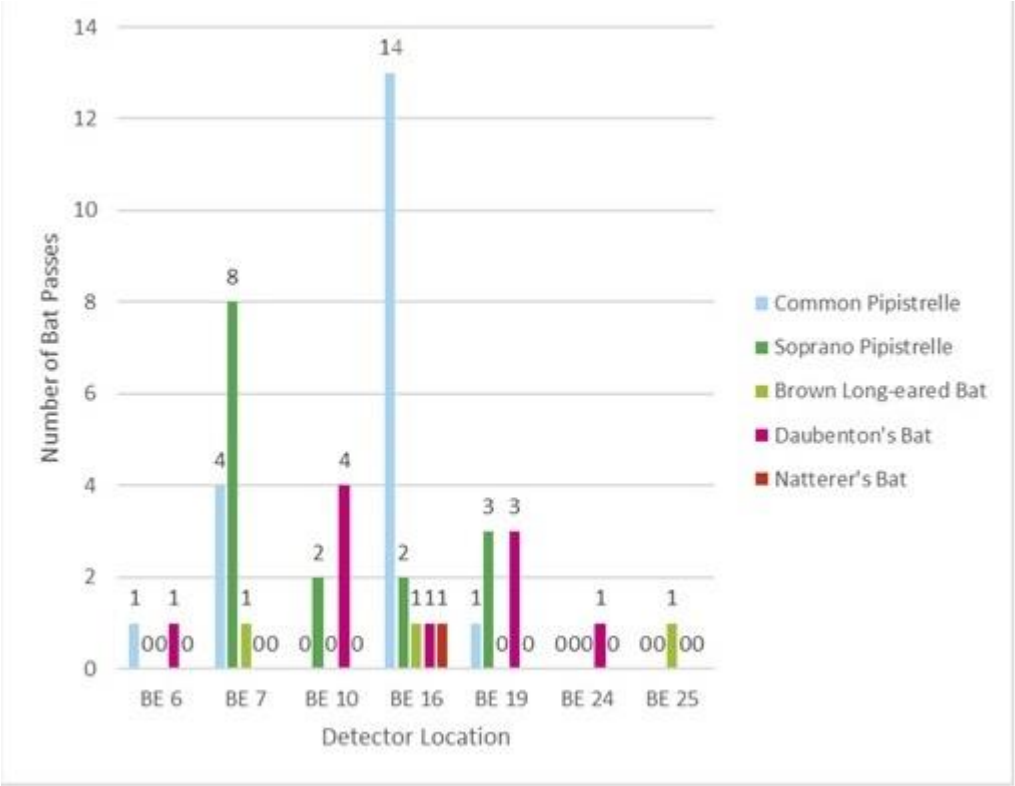
5.2.9 BE 16 was the only detector that recorded all five of these species during the survey period. A total of 48 bat passes were recorded across seven detectors, with the highest number of bat passes recorded at BE 16, as detailed in Table 5.3.8 and shown on Figure 5.3.4 below. No bats were

recorded on the other eight detectors across the field study area. The locations of these detectors are shown on Figure 5.7.2.

Table 5.3.8 – Bat Passes at Detectors Within Field Study Area During Late Survey Period

Species	Number of Bat Passes at Each Detector							Total Passes per Species
	BE 6	BE 7	BE 10	BE 16	BE 19	BE 24	BE 25	
Common pipistrelle	1	4	0	14	1	0	0	**20**
Soprano pipistrelle	0	8	2	2	3	0	0	**15**
Brown long-eared bat	0	1	0	1	0	0	1	**3**
Daubenton's bat	1	0	4	1	3	1	0	**10**
Natterer's bat	0	0	0	1	0	0	0	**1**
Total Passes per Detector	**2**	**13**	**6**	**19**	**7**	**1**	**1**	

Figure 5.3.4 – Bat Passes Within Field Study Area During Late Survey Period



Outwith Field Study Area

5.2.10 No detectors were present outwith the field study area during the late survey period.

Summary

5.2.11 Across all survey periods, the detectors within the field study area that recorded the highest number of bat passes were BE 10, BE 16 and BE 7, with a total of 140, 19 and 13 bat passes, respectively. Although higher in relation to other detector locations surveyed, these totals do not represent high activity levels. The highest species diversity was identified at detector BE 16, with five different species recorded. The most common bat species in the field study area were soprano pipistrelle and common pipistrelle, with 114 and 71 bat passes recorded, respectively.

5.2.12 The highest number of bat passes was recorded within the field study area in August 2019, with 86 individual passes, as shown on Figure 5.3.5 and Figure 5.3.6 below. No bat passes were recorded in May or October. A summary of the number of bat passes per survey period is provided in Table 5.3.9.

Figure 5.3.5 – Total Number of Bat Passes per Month Within Field Study Area

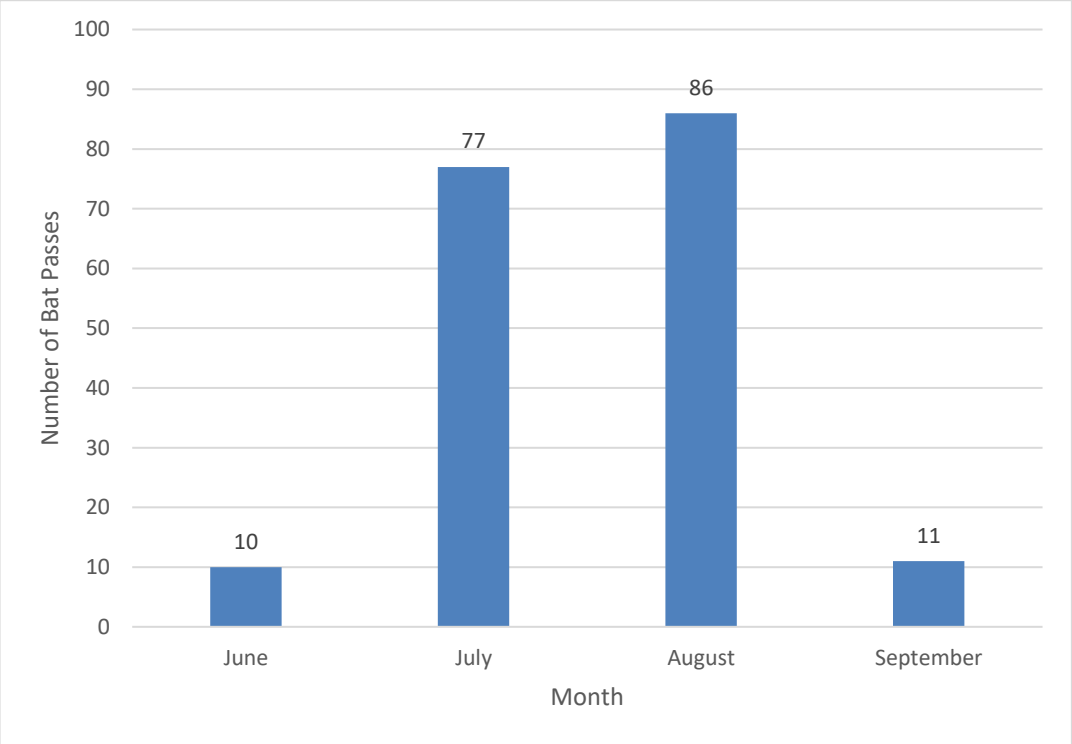


Figure 5.3.6 – Total Number of Bat Passes per Month at Each Bat Detector Within Field Study Area

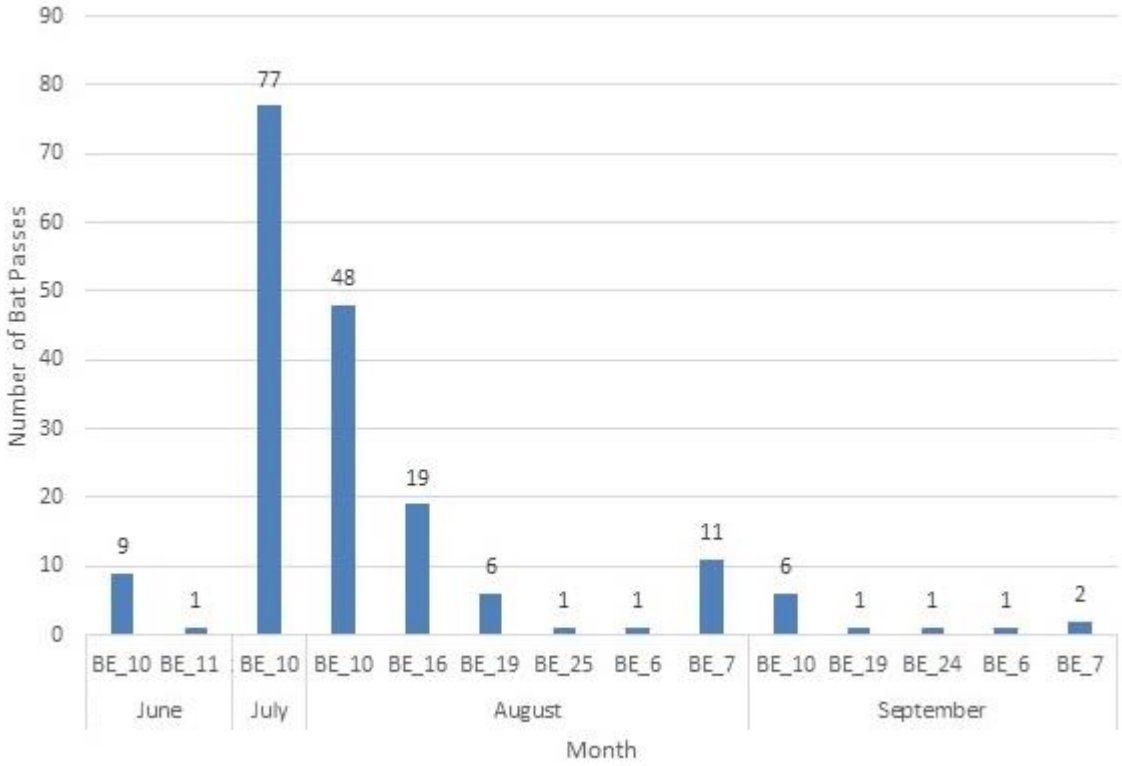


Table 5.3.9 – Summary of Bat Passes at Detectors Within Field Study Area During All Survey Periods

Detector Location	Number of Bat Passes[2]			Total Number of Passes per Detector
	Early Survey Period	Middle Survey Period	Late Survey Period	
BE_6	0	0	1 CP 1 DB	**2**
BE_7	0	0	4 CP 8 SP 1 BLE	**13**
BE_10	7 PS	41 PS 29 CP 54 SP 3 DB	2 SP 4 DB	**140**
BE_11	1 CP	0	0	**1**

6.1.1

[2] *Note on species abbreviations in table: CP = Common pipistrelle, SP = Soprano pipistrelle, PS = Pipistrelle species, BLE = Brown long-eared bat, NB = Natterer's bat and DB = Daubenton's bat.*

Detector Location	Number of Bat Passes[2]			Total Number of Passes per Detector
	Early Survey Period	Middle Survey Period	Late Survey Period	
BE_16	0	0	14 CP 2 SP 1 DB 1 BLE 1 NB	**19**
BE_19	0	0	1 CP 3 SP 3 DB	**7**
BE_24	0	0	1 DB	**1**
BE_25	0	0	1 BLE	**1**
Total Number of Passes per Survey Period	**8**	**127**	**49**	

Ecobat Bat Activity Analysis

5.2.13 Table 5.3.10 shows the number of nights recorded bat activity fell into each activity band for each species on the static detectors within the field study area.

Table 5.3.10 – Number of Nights Per Activity Level

Location	Species	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
BE_6	Daubenton's bat	0	0	0	0	1
	Soprano pipistrelle	0	0	0	0	1
BE_7	Common pipistrelle	0	0	0	0	3
	Soprano pipistrelle	0	0	0	0	8
	Brown long-eared bat	0	0	0	0	1

Location	Species	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
BE_10	Daubenton's bat	0	0	0	2	3
	Pipistrelle sp.	0	6	5	1	3
	Common pipistrelle	0	0	4	3	8
	Soprano pipistrelle	0	1	6	7	9
BE_14	Common pipistrelle	0	0	1	5	11
	Soprano pipistrelle	0	0	9	3	2
BE_16	Daubenton's bat	0	0	0	0	1
	Natterer's bat	0	0	0	0	1
	Common pipistrelle	0	0	0	2	13
	Soprano pipistrelle	0	0	0	0	2
	Brown long-eared bat	0	0	0	0	1
BE_19	Daubenton's bat	0	0	0	1	0
	Common pipistrelle	0	0	0	0	1
	Soprano pipistrelle	0	0	0	0	3
BE_24	Daubenton's bat	0	0	0	0	1

Location	Species	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
BE_25	Brown long-eared bat	0	0	0	0	1

5.2.14 Table 5.3.11 provides the key metrics for each species recorded.

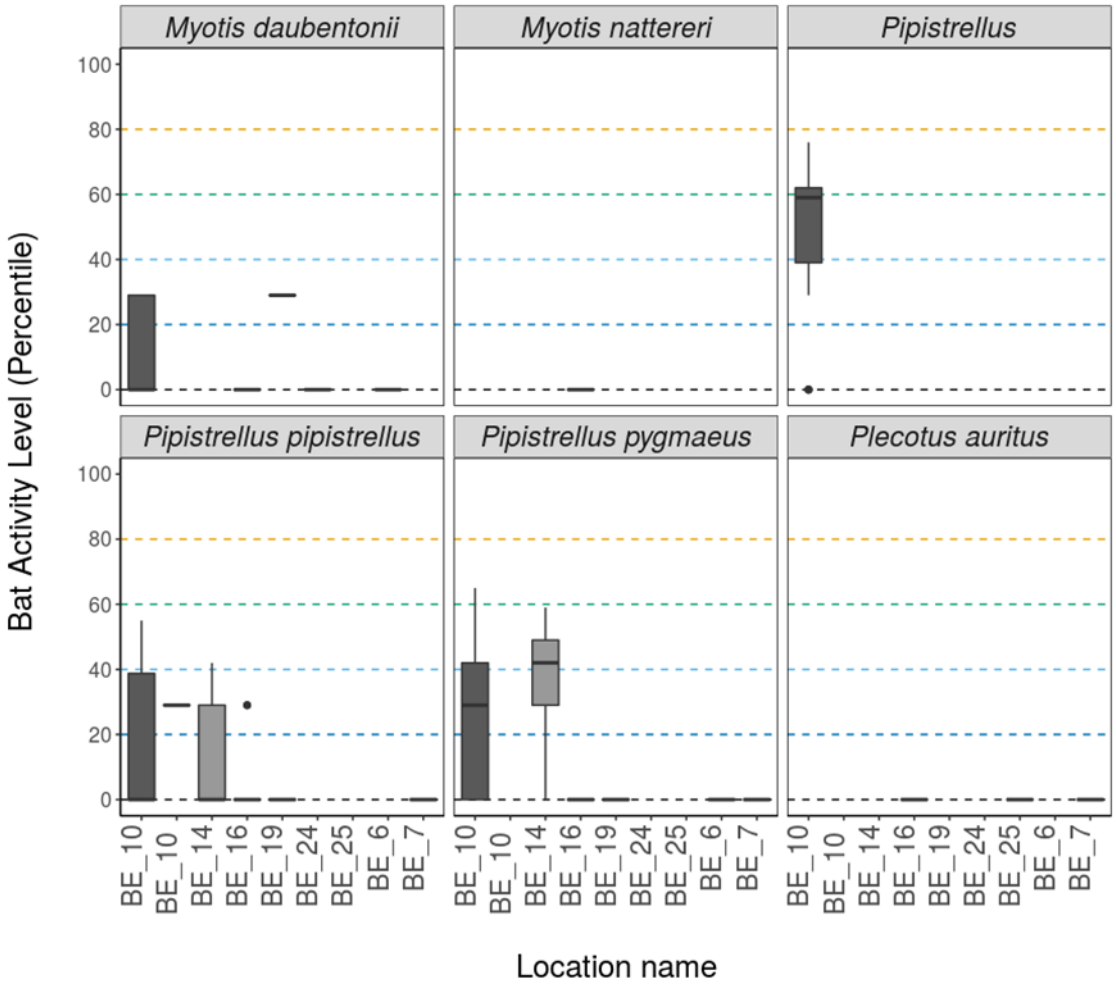
Table 5.3.11 – Key Metrics Per Species

Location	Species	Median Percentile	95% Confidence Indices	Max Percentile	Nights Recorded	Reference Range
BE_6	Daubenton's bat	0	0	0	1	209
	Soprano pipistrelle	0	0	0	1	4273
BE_7	Common pipistrelle	0	0 - 0	0	3	4874
	Soprano pipistrelle	0	0 - 0	0	8	4273
	Brown long-eared bat	0	0	0	1	314
BE_10	Daubenton's bat	0	0 - 0	29	5	209
	Pipistrelle sp.	59	54 - 67	76	15	5859
	Common pipistrelle	0	29 - 48.5	55	14	4874
	Soprano pipistrelle	29	29 - 48.5	65	23	4273
	Common pipistrelle	29	29 - 48.5	29	1	4874
BE_14	Common pipistrelle	0	29 - 29	42	17	4874
	Soprano pipistrelle	42	35.5 - 49	59	14	4273
BE_16	Daubenton's bat	0	0	0	1	209
	Natterer's bat	0	0	0	1	93

Location	Species	Median Percentile	95% Confidence Indices	Max Percentile	Nights Recorded	Reference Range
	Common pipistrelle	0	0 - 0	29	15	4874
	Soprano pipistrelle	0	0 - 0	0	2	4273
	Brown long-eared bat	0	0	0	1	314
BE_19	Daubenton's bat	29	0	29	1	209
	Common pipistrelle	0	0	0	1	4874
	Soprano pipistrelle	0	0 - 0	0	3	4273
BE_24	Daubenton's bat	0	0	0	1	209
BE_25	Brown long-eared bat	0	0	0	1	314

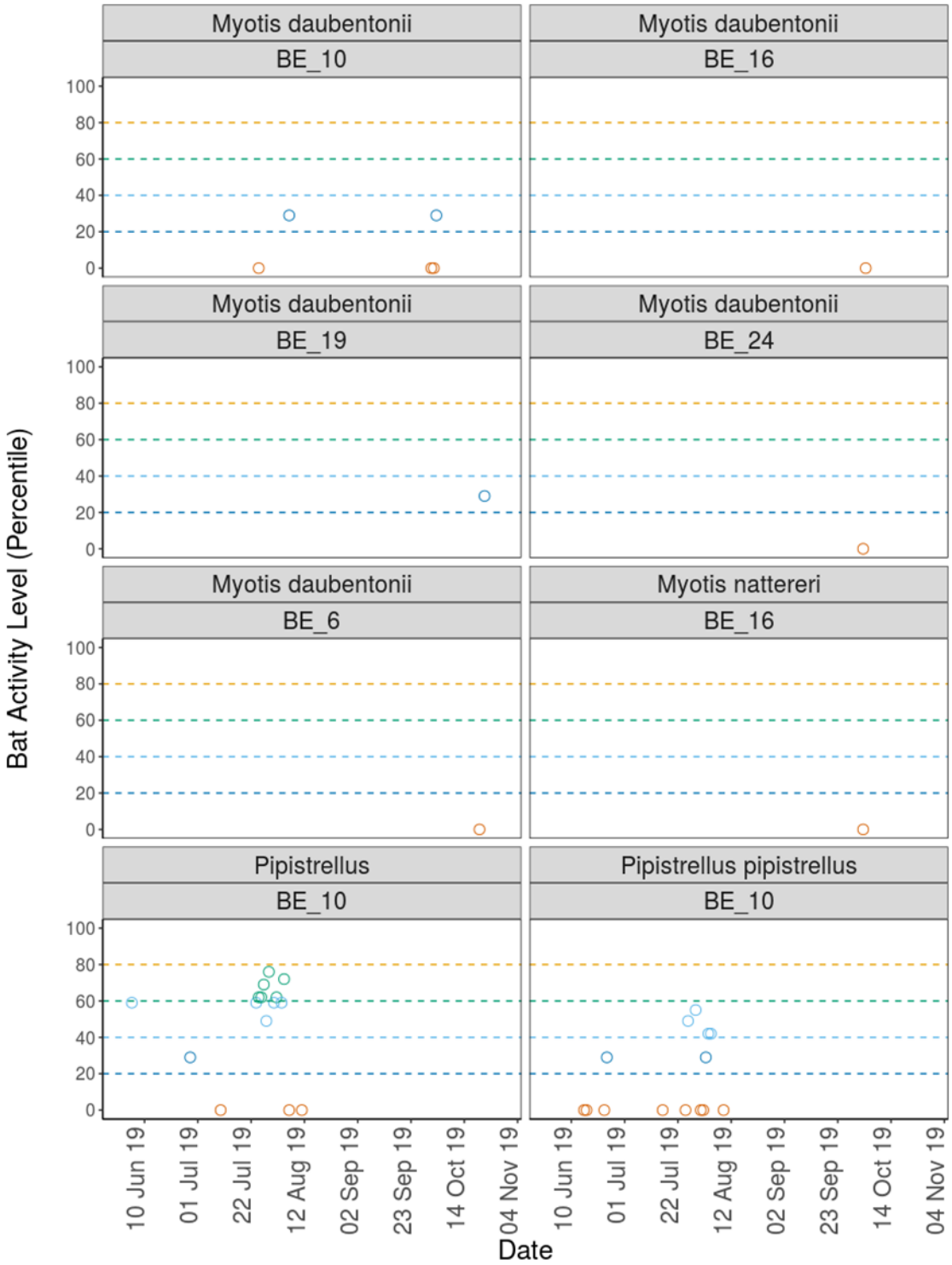
5.2.15 Figure 5.3.7 shows the differences in activity between static detector locations, split by species and location. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity).

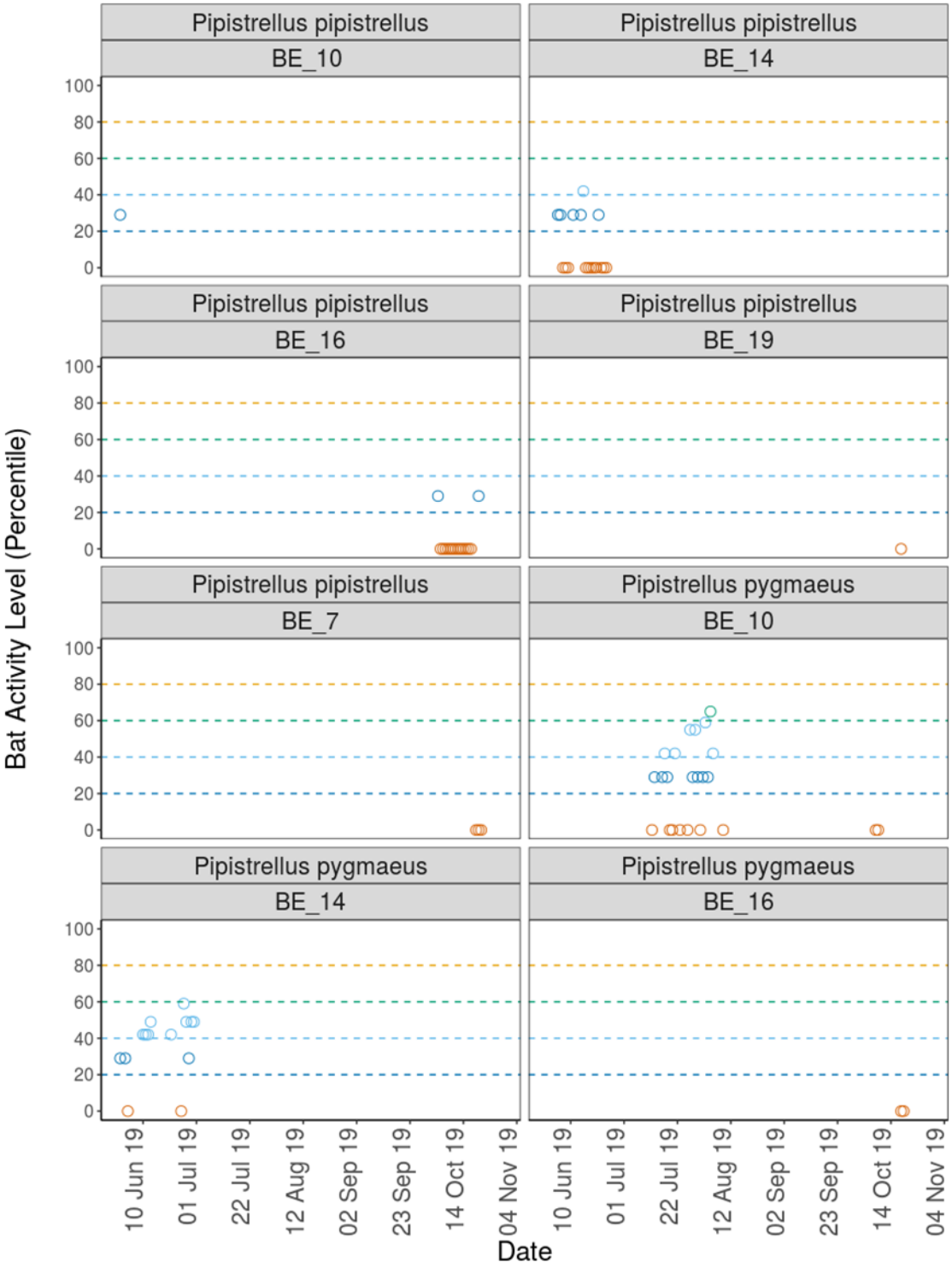
Figure 5.3.7 – Bat Activity Between Detector Locations

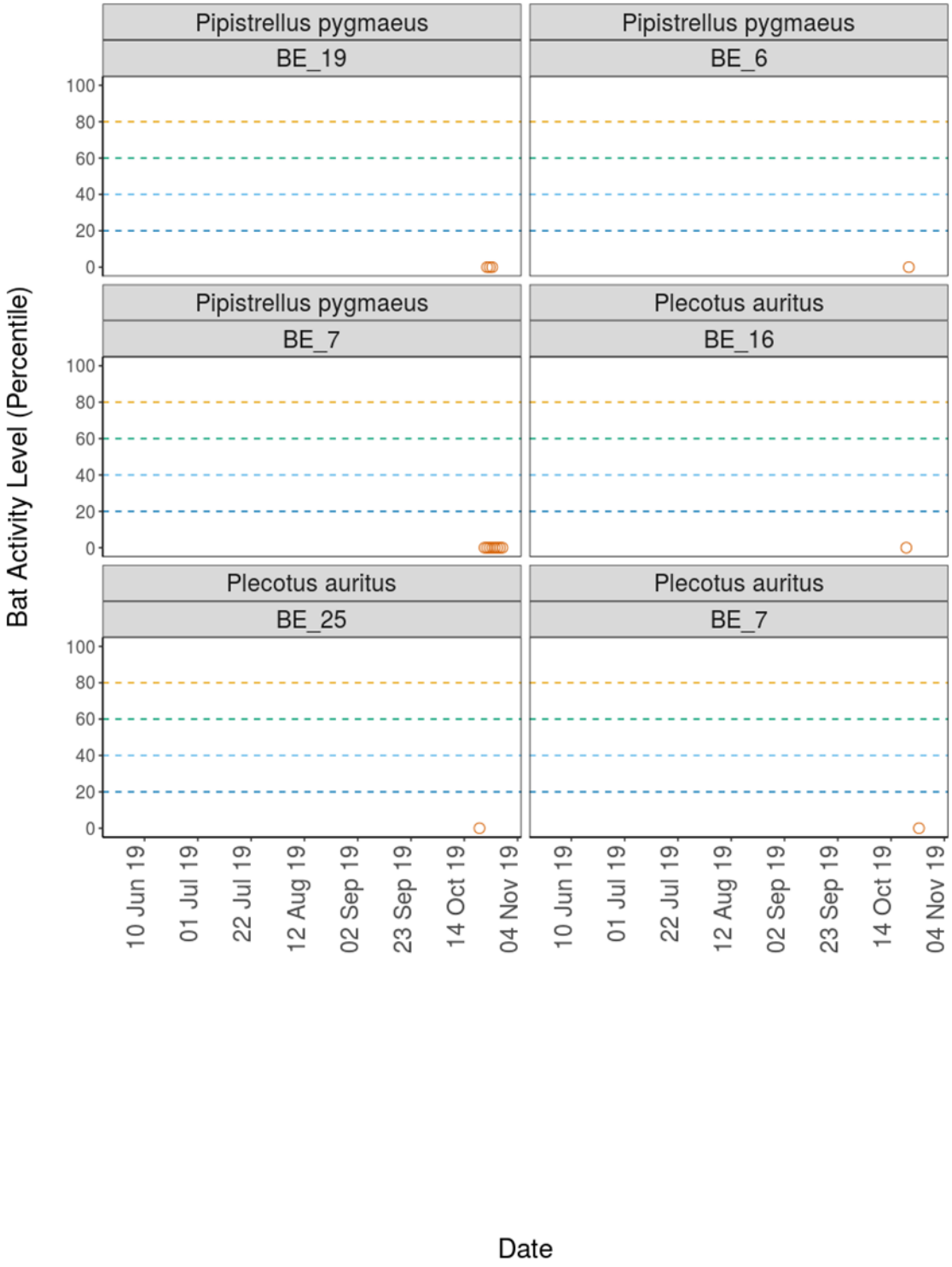


5.2.16 Figure 5.3.8 shows the activity level (percentile) of bats recorded across each night of the bat survey, split by location and species.

Figure 5.3.8 – Bat Activity Per Night




Pipistrellus pipistrellus
BE_10
Pipistrellus pipistrellus
BE_14
Pipistrellus pipistrellus
BE_16
Pipistrellus pipistrellus
BE_19
Pipistrellus pipistrellus
BE_7
Pipistrellus pygmaeus
BE_10
Pipistrellus pygmaeus
BE_14
Pipistrellus pygmaeus
BE_16
Bat Activity Level (Percentile)
0
20
40
60
80
100
10 Jun 19
01 Jul 19
22 Jul 19
12 Aug 19
02 Sep 19
23 Sep 19
14 Oct 19
04 Nov 19
Date


Pipistrellus pygmaeus
BE_19
Pipistrellus pygmaeus
BE_6
Pipistrellus pygmaeus
BE_7
Plecotus auritus
BE_16
Plecotus auritus
BE_25
Plecotus auritus
BE_7
Bat Activity Level (Percentile)
100
80
60
40
20
0
10 Jun 19
01 Jul 19
22 Jul 19
12 Aug 19
02 Sep 19
23 Sep 19
14 Oct 19
04 Nov 19
Date

5.3 References

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