TECHNICAL APPENDIX 9.3

Bat Activity Survey Results

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Clashindarroch II Wind Farm EIA Report

Chapter 9 Technical Appendix:

9.3 Bat Activity Survey Results

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1. INTRODUCTION

1.1 Purpose of this Document

1.1.1 This a technical appendix to Chapter 9 (Ecology) of the Clashindarroch II wind farm (the 'proposed development) EIA Report. It provides the results of bat activity surveys completed by MBEC between June 2015 and October 2019. The results of the assessment of bat roost potential and targeted roost activity surveys are provided in Technical Appendix 9.2.

1.1.2 This is not a 'standalone' document as it refers to text and figures associated with Chapter 9. The results from the bat activity surveys have been fully considered within the impact assessment and proposed mitigation measures presented in Chapter 9 of the EIA Report.

1.2 Background

1.2.1 MBEC was appointed by Vattenfall in May 2015 to carry out a suite of ecological surveys at the site of the proposed wind farm, which is located on the border of Moray and Aberdeenshire, approximately 10km southwest of the town of Huntly, adjacent to the existing Clashindarroch Wind Farm. The surveys were to include bat activity recorded from static automatic detectors and from transects.

1.2.2 The purpose of the surveys was to determine species present within the proposed wind farm area, the extent and level of activity and habitat associations. This information was to inform the wind farm design process and to provide the baseline data to assess the potential impact of the proposed wind farm on bat populations (e.g. the risk of mortality[1] from the operating wind turbines, habitat loss and fragmentation effects) and the need for appropriate mitigation.

1.2.3 Bat wind farm collisions, even at relatively low rates, has the potential to result in significant population-level effects. This is because bats are long-lived and their reproductive rate is low (typically, each adult female produces only one pup per year) so they have limited capacity to compensate from increased rates of mortality.

1.2.4 A map showing an indicative wind turbine layout was provided by Vattenfall in 2015 and this was used to define the extents of the survey areas. The survey effort was refined and updated before the start of the 2016 survey period in order to focus on the emerging wind farm layout at that time. Further surveys during 2019 were undertaken to ensure that bat activity across the final wind farm design is sufficiently characterised for the EIA.

1.3 Site Description

1.3.1 The proposed wind farm is located within an extensive area of predominantly upland conifer plantation known as Clashindarroch Forest, manged by Forests & Land Scotland. Clashindarroch Forest extends to 59 km^2 in total and is dominated by non-native conifers such as Sitka spruce (*Picea sitchensis*), hybrid larch (*Larix* x *eurolepis*),

[1] i.e. death due to collision with the turbine blades during flight. There is also the potential for bats to be killed as a result of barotrauma (i.e. vortices near to turbine blades causing rapid pressure fluctuations rupturing internal structures in the body) but current research indicates that direct trauma from blade strike is the main cause of wind farm bat mortality.

lodgepole pine (*Pinus contorta*) and Japanese larch (*L. kaempferi*) of various age classes and planted at typical commercial stocking densities. The proposed wind farm site lies to the north and east of the existing Clashindarroch wind farm at an elevation of approximately 350 to 400m above sea level, and would be located on ridges and spurs, occupying an area (based on a 500m wide buffer around the proposed wind turbines) of approximately 546 hectares.

1.3.2 The site is intersected by a number of minor watercourses with banksides vegetated with damp neutral grassland communities. There is some un-forested moorland within the wider survey area, the most significant of which is a ridge dominated by dwarf-shrub heath vegetation located to the south of the proposed wind farm, on the Cloichedubh ridge. A more extensive area of upland heath and bog is present at the western edge of the survey area, this includes the south-east slopes of Grumack Hill and the adjacent hill to the south-west of the proposed wind farm.

1.3.3 Roosting opportunities for bats are very limited within the study area. Due to the species composition and the relatively young age of the trees the plantation generally provides very few suitable tree roost features. Although there are small areas of remnant mature broadleaved woodland that could provide roosting opportunities. The key bat species of interest for the assessment (common and soprano pipistrelle) typically roost in buildings. There is a ruined former farm cottage located within the site at Corrydown which has a largely intact roof and which has some potential to be used by bats. The nearest other buildings are c. 1.8km to the north-east of the proposed wind farm.

2. METHODS

2.1 Scope and Survey Effort

2.1.1 Following relevant guidance available at that time (e.g. Wray *et al*. 2010, Hundt 2012, Natural England 2012, EUROBATS 2014) a survey plan was developed to systematically monitor bat activity at representative habitat types within the proposed wind farm development area (as it was defined in 2015).

2.1.2 An initial desk study and site reconnaissance visit in May 2015 confirmed that the following bat species were likely to be present in region and could exploit suitable habitats within the study area:

- Common pipistrelle (*Pipistrellus pipistrellus*);
- Soprano pipistrelle (*P. pygmaeus*);
- Brown long-eared bat (*Plecotus auritus*);
- Natterer's bat (*Myotis nattereri*); and
- Daubenton's bat (*M. daubentonii*)

2.1.3 Bats species adapted to fly in open, less cluttered air-space (i.e. away from vegetation) are considered to be most vulnerable to wind turbine mortality. At that time none of the above species were considered to be highly vulnerable to the impacts of onshore wind farm development (Natural England 2012). However, the two pipistrelle species were considered to be at medium risk from wind turbine mortality due to their behaviour and flight capabilities (i.e. being able to exploit open habitats and potentially hunting for insects within the height band that the wind turbines would be operating within). In more recent guidance, reflecting the findings of Mathews *et al*. (2016), common and soprano pipistrelles are considered to be at high risk of wind turbine impact (SNH *et al.* 2019).

2.1.4 Habitat quality at the majority of the locations where the wind turbines were proposed to be sited (i.e. elevated ridges and spurs, away from riparian zones) in thicket and pole-stage spruce planation, was considered to be relatively poor in terms of foraging suitability. The plantation is generally of negligible value as a roosting resource as the relatively young, densely planted conifers lack suitable features that bats typically use as roost sites. There was no evidence from the desk study of any known bat roosts within or near to the proposed wind farm site. However, one ruined building within the study area, at Corrydown (see Figure 9.7b), was identified as having suitability as a roost site. Separate surveys (see Technical Appendix 9.2) were completed at this structure to confirm if it was in use by bats and if so by which species, the approximate number and to determine the type of roost (e.g. whether it was used by breeding female bats during the summer).

2.1.5 Overall, habitat suitability for bats at the proposed wind turbine locations was considered to be low. The study area as a whole was considered to be low-moderate in sensitivity.

2.1.6 A survey programme that involved sampling bat activity during early summer, mid-summer and late summer/ early autumn was considered to be appropriate for 2015 with the potential to increase survey effort (e.g. monthly sampling) should the results indicate that the site is of greater sensitivity that was anticipated based on the desk study and initial assessments of habitat quality.

2.1.7 Ultimately, a 3-season, paired sampling approach was considered to be appropriate, in this case. This was due to the levels of activity, recorded in 2015, in open areas that were analogous to the proposed wind turbine locations, the relative vulnerability of the species present, the elevation of the site, habitat quality at the proposed wind turbine locations (i.e. on ridges and spurs away from better quality bat habitats along the main riparian corridors within the plantation) and distance from suitable roosting opportunities.

2.1.8 The objective of the survey was to complete sufficient monitoring to determine the species using the site (and the component habitat types) during the main active period and to allow comparisons to be made between levels of bat activity in different habitat categories. This was to help inform an assessment of risk to bats after felling of the plantation. Felling to enable the wind turbines to be built would inevitably alter habitat structure from the pre-felling baseline and therefore influence bat activity.

2.2 Automated Bat Activity Monitoring

2.2.1 Automated ultrasound recording equipment (SongMeter SM2 Bat+[2] bat detectors, referred to as SM2s), to record bat activity, was deployed in a paired-sampling approach at a number locations across the survey area in 2015 and 2016.

2.2.2 The equipment was left at each sampling location for at least five consecutive nights (in practice between 6 and 29 nights were completed for each period sampled each year as this reduces the potential for bad weather[3] to affect the validity of the results).

[2] Wildlife Acoustics, Inc., Concord, MA, USA.

[3] Suitable conditions for bat activity monitoring are temperatures above 8ºC at dusk, maximum ground level wind speed of 5m/s and no or, very light, rainfall.

For each SM2, this sampling regime was repeated three times between May and October inclusive. This survey effort was repeated in 2019 at new paired locations to provide additional information across the proposed development. The automated detector locations for all three years are shown on Figure 9.11.

2.2.3 The survey effort during the 2015, 2016 and 2019 surveys was as follows:

- 4 locations June 2015 (total of 28 nights)
- 6 locations July 2015 (total of 52 nights)
- 6 locations September 2015 (total of 54 nights)
- 8 locations April-May 2016 (total of 97 nights)
- 8 locations May-June 2016 (total of 129 nights)
- 10 locations July-August 2016 (total of 180 nights)
- 12 locations May-June 2019 (total 214 nights)
- 12 locations July-August 2019 (total 201 nights)
- 12 locations September-October (total 131 nights)

2.2.4 Because of the presence of thicket and pole stage spruce plantation at the proposed wind turbine locations it was not possible to monitor bat activity at the actual locations where the turbines would be built. Due to felling required to accommodate the proposed wind farm it was considered more appropriate to sample bat activity within nearby locations that would more closely represent the habitats that would be present after the trees had been felled and the wind turbines had been built and operational. This was to allow the effects of restructuring of the forest to be taken in to consideration in the assessment of potential impacts of the proposed wind farm on bat populations.

2.2.5 The detectors were programmed to be activated 1 hour before sunset and to switch off 1 hour after sunrise. This was to ensure that early emerging and late returning bats could be detected. The SM2s were deployed in pairs, so that one detector monitored activity along forest edges (i.e. analogous to habitat edges that may be created following tree felling before the wind farm is constructed), whilst another simultaneously monitored activity in a more open situation (c. 50m from forest edges), some of which were typical of post-felling habitats. Although it should be noted that the felled areas may differ in extent in comparison to the proposed felling for the wind farm. The size of the clear-fell area can influence bat activity and there may also be changes activity with time since felling (see Kirkpatrick *et al*. 2017).

2.2.6 At each sampling location the microphone (model SMX-U1) was situated at the top of a 2m tall pole in order to maximise the probability of recording bat calls and reducing the likelihood of interference (e.g. high frequency noise from insects and from wind moving low-lying vegetation).

2.2.7 Monitoring of bat activity at height was not undertaken in this case. Various studies have shown that monitoring from ground level, providing sufficient survey effort is expended, can be as effective as 'at-height' monitoring in determining species presence and in characterising levels of bat activity in open environments (see Limpens *et al*. 2013, Mathews *et al*. 2016, Wellig *et al*. 2018). It is possible that some of the species present in the study area (pipistrelles in particular) could be active above the canopy of mature forest stands (e.g. see Müller *et al*. 2013) and outside of the detection range of ground-based equipment, particularly on still nights. However, studies that have monitored pipistrelle activity at different heights in Europe have shown that activity

is generally higher when recorded from ground level than at height, including woodland environments (see Plank *et al*. 2012).

2.2.8 Surveys of bat activity within two pole-stage Sitka spruce plantations in south-west Scotland were completed by MBEC using portable telescopic mast recording bat activity simultaneously at 2m and 15m above ground level. The surveys were over 60 nights in total. More pipistrelle species activity (mean passes per night) was recorded at ground level than at height.

2.2.9 Species that can have higher levels of activity above the typical detection range of ground-based detectors, such as noctule (*Nyctalus noctula*), do not occur within the region of Scotland where the proposed development is located. Activity by the species occurring in the study area would also generally be expected to be lower at proposed wind turbine height (i.e. >40m above ground level) than within the detection range of ground-based equipment.

2.2.10 Bat call sequences (also referred to as 'bat passes') were recorded by the SM2 for later computer analysis. A bat pass was defined in the SM2 software settings as a sequence of echolocation calls is separated from the next sequence by a minimum 1 second gap. Call sequences were automatically assigned to species, genus, unknown or as noise files by Kaleidoscope Pro software (version 4.5.5[4]). The validity of the automated species identifications were checked by manually verifying, using Bat Explorer software (version 2.1.4.0), a proportion of the common species recordings (e.g. common and soprano pipistrelle) and reviewing all of the recordings assigned to less commonly occurring species (e.g. Myotis and Nyctalus bats). This process was based on professional judgement assisted by review of reference recordings and guidance on bat call identification provided in Russ (2012) and Barataud (2015).

2.3 Driven Transects

2.3.1 Driven transects to sample bat activity during the dusk and pre-dawn periods were completed in suitable weather conditions[5] in early, mid and later summer in 2015 and 2016. This survey was repeated in 2019. The surveys were carried out using an Elekon Batlogger M Bat Detector/Recorder.

2.3.2 The purpose of the driven transect survey was to sample bat activity across representative habitats within the proposed wind farm site, to identify the bat species that were present and to establish if the patterns of activity indicated the presence of any well-used commuting routes, important foraging areas, or to determine if any roost sites could be present close to the proposed wind turbine locations (assessed in combination with other bat surveys). The 2019 transects were completed as part of a wider protected species dusk transect survey and were undertaken to check whether the bat activity had changed significantly from the 2015 and 2016 surveys.

2.3.3 A single driven transect route was defined, which followed a number of forestry tracks within the survey area, and was driven at a slow pace (not more than 10mph). The route in 2016 differed slightly from 2015 (see Figures 9.12 and 9.13). In 2015 the main

[4] Kaleidoscope software uses an automatic algorithm to assign a species or genus probability to a call sequence. The algorithm is based on analysis of a reference database of calls applicable to the bat fauna relevant to the region where the survey has been undertaken.

[5] Temperatures above 8°C at sunset, low wind speeds and dry (or light intermittent rain only).

site road was followed from the forestry gate at Bailiesward to existing wind turbine no. 9. In 2016 the transect started further south at a layby (just north of the protected species survey area), followed minor forest tracks (Burn of Bedlaithen, Hareetnach Burn, Hill of Finglenny, Ealaiche Burn) to wind turbine no. 9, then return to layby via the main wind farm site road. The route of the 2019 bat activity transect is shown on Figure 9.14.

2.3.4 Bat call sequences (also referred to as 'bat passes') were recorded and manually identified to species level, where possible, using the Bat Explorer software. This process was based on professional judgement assisted by review of reference recordings and the guidance on bat call identification provided in Russ (2012) and Barataud (2015).

3. RESULTS

3.1 Study & Data Limitations

3.1.1 It is important to note the generic limitations of bat activity monitoring, particularly with respect to determining risk to bat populations from proposed wind farm development.

3.1.2 Data from pre-construction monitoring of bat activity at proposed wind farm sites can be relatively poor at predicting the post-construction risk to bats (Hein *et al*. 2013, Lintott *et al*. 2016, Mathews *et al*. 2016). Although this may be related to survey effort and ensuring that sufficient baseline monitoring has been carried out to accurately encompass the full range of temporal and spatial variability in bat activity through the main active period. Bat fatality rates are highly variable from site to site and is not entirely related to differences in bat activity levels. Low bat activity may indicate low risk sites, but conversely high bat activity does not always correspond to high risk of collision. However, Mathews *et al*. (2016) were able to show positive associations between bat activity indices and bat-wind turbine fatalities. In relation to pipistrelle fatalities, sites (i.e. nearby control locations) in the highest third of activity levels had a 75% probability of pipistrelle fatalities and 93.3% of sites classified as having low-medium activity had no fatalities.

3.1.3 Bat mortality at turbines does not appear to be the result of chance events, however, the key factors that result in sites posing a relatively high risk to bats are still not fully understood. Additionally, the assessment of the significance of such mortality on bat populations is further complicated by the general lack of reliable information on bat population sizes, particularly at the scale at which effects from individual wind farms need to be considered.

3.1.4 It is therefore important that the in interpretation of pre-construction data and in the assessment of potential impacts that a precautionary approach is followed in recognition of the limitations of pre-construction monitoring studies and the uncertainties about the risk to bats from individual wind farm developments.

3.1.5 Based on the guidance applicable at that time (Hundt 2012) the 2015 automated bat activity survey achieved the minimum sampling effort of 5 continuous nights of monitoring per season. However this level of survey effort does not meet with current guidance with respect to recommended minimum number of sampling nights per

season (a minimum of 10 is recommended in current guidance[6]). The 2016 survey achieved a higher sampling effort, with more than 10 nights of monitoring completed in 24 of the 26 survey sessions (406 nights in total). The amount of survey effort overall is considered to be sufficient to accurately determine species presence and to classify the relative levels of bat activity within the broad habitat types present within the proposed wind farm site (see Richardson *et al*. 2019[7]).

3.1.6 The final driven transect to sample bat activity within the proposed wind farm site in 2015 was completed in early October. This is outside of the optimal period for such surveys, and air temperatures were low, however the survey was attempted due to bad weather affecting the previous survey visit in September. A full set of surveys was completed in summer 2016. The spring driven transect in 2019 was completed in sub-optimal conditions (windy). Given that spring driven transects had taken place in two previous years this was not considered a significant limitation. One of the SM2 microphones appears to have failed to work on two occasions at the same sampling point in 2016. This is not considered to result in a significant data short-fall given that this location was covered in 2015 and the number of other sampling points for the same broad habitat type in 2016. The early spring (April-May) temperatures for the first session of SM2 monitoring in 2016 were generally low, with only 13 detector nights out of 97 having a sunset temperature greater or equal to 8ºC. Low temperatures did not affect the survey effort to the same extent in 2015 or 2019.

3.1.7 Further information on the weather conditions during the bat activity survey periods is provided in Appendix 1 (see Tables A1.7, A1.8 and A1.9).

3.2 Summary of Automated Bat Activity Monitoring

3.2.1 The following provides an overview of the results of the 2015, 2016 and 2019 bat activity monitoring. The full results are provided in tables within Appendix 1 and all of the summary plots and charts in Appendix 2.

Bat Species Recorded

3.2.2 The results of the surveys carried out in 2015 and 2016 confirmed the presence of a number of common species within the survey area. By far the most frequently recorded were common (PIPI) and soprano pipistrelle (PIPY) respectively. Common pipistrelle bat passes accounted for 56% of all bat passes in 2015, 65% in 2016 and 59% in 2019. Soprano pipistrelle passes accounted for 44% in 2015, 35% in 2016 and 39% in 2019. Very few passes were attributed to Myotis bats (most likely to be Daubenton's bat or possibly Natterer's bats). Call sequences assigned to brown long-eared bat (*Plecotus auritus*) were also infrequently recorded. The proportion of bat passes assigned to each species / genus for each season in 2015, 2016 and 2019 are shown on Figures 9.3.1a-c below.

[6] Bats and onshore wind turbines: survey, assessment and mitigation (2019). Guidance document prepared jointly by Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust with input from other key stakeholders.

[7] In an extensive review of bat activity monitoring data Richardson *et al*. (2019) determined that 8 nights of data were required to classify a site containing 'high activity' for common and soprano pipistrelle.

3.2.3 As with all bat activity surveys it is important to note that activity levels do not equate to numbers of bats rather they give an indication of relative habitat importance to foraging / commuting bats.

Figure 9.3.1a: Percentage of Bat Activity by Species / Genus, All Sites 2015

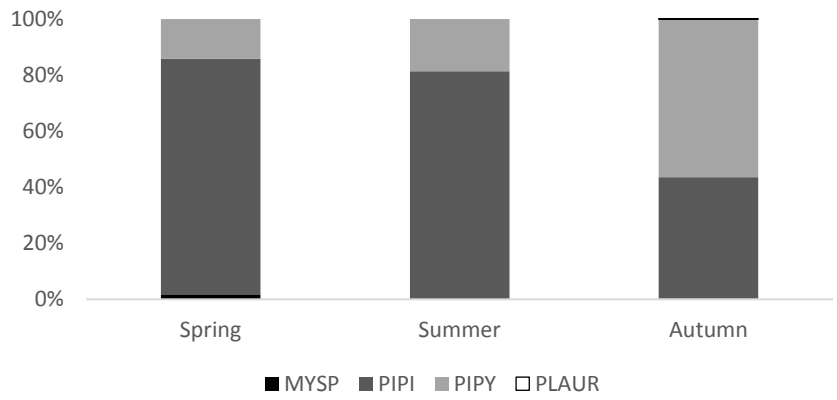


Figure 9.3.1b: Percentage of Bat Activity by Species / Genus, All Sites 2016

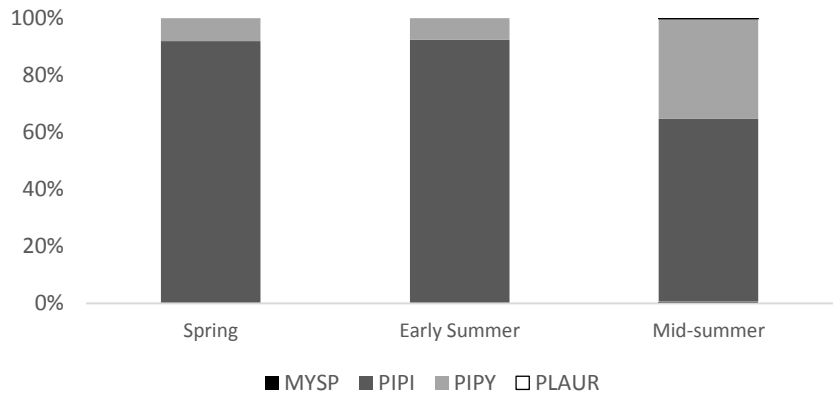
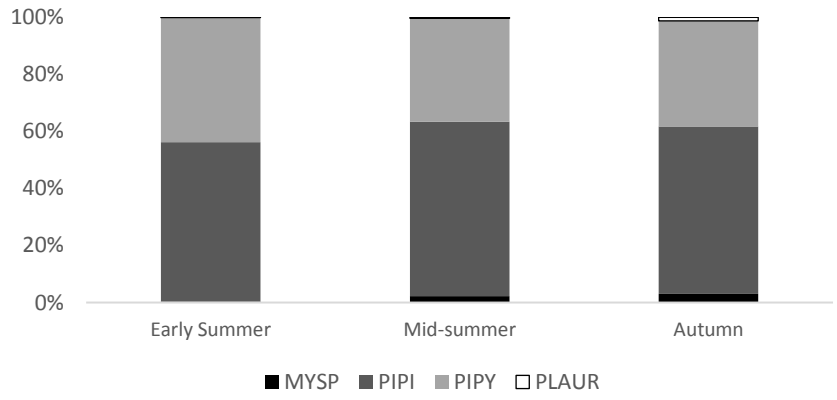


Figure 9.3.1c: Percentage of Bat Activity by Species / Genus, All Sites 2019



Bat Activity by Habitat Type

3.2.4 The levels of activity recorded during the automated bat detector surveys showed a high degree of variability between the different broad habitat types that were sampled. Bat activity recorded by a detector in one location can vary significantly through time due to a number of factors which means that comparisons between the survey years is likely to complicate comparisons between different habitat types. For example, the peaks in activity were much higher in 2015 in comparison to 2016 (this can also be seen by comparing nightly bat pass levels in the above charts). This may have been due to normal variation in bat activity or differences in weather conditions and insect abundance between the years.

3.2.5 The important comparison is between the paired detectors when they were running simultaneously in different nearby habitat types. This helps to control for the wide range of variables that can influence bat activity. Tables 9.3.1, 9.3.2 and 9.3.3 provide a summary of the 2015, 2016 and 2019 bat activity survey results for each set of paired sampling points in each season.

3.2.6 During the 2015 survey period, the locations with peak levels of activity (e.g. site C July and September) were associated with river corridors within the site. These sheltered habitats are likely to provide greater densities of aerial insects (including adult stages of insects that have aquatic larvae) as well as providing good commuting routes for bats to access the area from roost sites present in the wider area (e.g. farm buildings on the edge of the forest). This pattern is reflected, although at a generally lower activity level, in the 2016 and 2019 data.

Table 9.3.1: Summary Results from the 2015 Automated Bat Activity Surveys
(MYsp: Myotis species; PIPI: common pipistrelle; PIPY: soprano pipistrelle; PLAUR: brown long-eared bat)

Site	Month	Habitat Type	No. nights	Median passes per night			
				MYsp	PIPI	PIPY	PLAUR
A	June	Pre-thicket (open)	7	0	1	0	0
B	June	Forest edge (riparian)	7	0	46	0	0
D	June	Moorland (open)	7	0	0	0	0
C	June	Forest edge (riparian)	7	0	7	4	0
A	July	Pre-thicket (open)	7	0	0	0	0
G	July	Forest edge	7	0	0	0	0
D	July	Moorland (open)	6	0	0	0	0
C	July	Riparian (edge)	6	0	318	52.5	0
F	July	Clear-fell (open)	13	0	0	0	0
E	July	Forest edge	13	0	0	0	0
A	September	Pre-thicket (open)	10	0	1	0	0
G	September	Forest edge	10	0	32	0	0
D	September	Moorland (open)	9	0	0	0	0
C	September	Forest edge (riparian)	8	0	139.5	380.5	0
F	September	Clear-fell (open)	8	0	0	0	0

Site	Month	Habitat Type	No. nights	Median passes per night			
				MYsp	PIPI	PIPY	PLAUR
E	September	Forest edge	9	0	9	2	0

Table 9.3.2: Summary Results from the 2016 Automated Bat Activity Surveys
(MYsp: Myotis species; PIPI: common pipistrelle; PIPY: soprano pipistrelle; PLAUR: brown long-eared bat)

Site	Period	Habitat Type	No. nights	Median passes per night			
				MYsp	PIPI	PIPY	PLAUR
A	April-May	Pre-thicket (open)	8	0	0	0	0
G	April-May	Forest edge	14	0	0	0	0
I	April-May	Pre-thicket (open)	14	0	0	0	0
C	April-May	Forest edge (riparian)	14	0	0	0	0
D	April-May	Moorland (open)	15	0	0	0	0
H	April-May	Forest edge	13	0	0	0	0
F	April-May	Clear-fell (open)	11	0	0	0	0
E*	April-May	Forest edge	8	-	-	-	-
A	May-June	Pre-thicket (open)	16	0	0	0	0
G	May-June	Forest edge	17	0	0	0	0
I	May-June	Pre-thicket (open)	19	0	0	0	0
C	May-June	Forest edge (riparian)	18	0	0	0	0
D	May-June	Moorland (open)	17	0	0	0	0
H	May-June	Forest edge	17	0	0	0	0
F	May-June	Clear-fell (open)	12	0	0	0	0
E*	May-June	Forest edge	13	-	-	-	-
I	July-Aug	Pre-thicket (open)	14	0	2.5	1	0
C	July-Aug	Forest edge (riparian)	14	0	32	53.5	0
F	July-Aug	Clear-fell (open)	29	0	0	0	0
E	July-Aug	Forest edge	20	0	5.5	1.5	0
J	July-Aug	Clear-fell (open)	16	0	1	0	0
K	July-Aug	Forest edge	17	0	13	2	0
M	July-Aug	Clear-fell (open)	18	0	0	0	0
L	July-Aug	Forest edge	17	0	12	1	0
N	July-Aug	Moorland (open)	17	0	0	0	0
O	July-Aug	Forest edge	18	0	6.5	1	0

** Microphone failure at some point during this survey*

Table 9.3.3: Summary Results from the 2019 Automated Bat Activity Surveys
(MYsp: Myotis species; PIPI: common pipistrelle; PIPY: soprano pipistrelle; PLAUR: brown long-eared bat)

Site	Period	Habitat Type	No. nights	Median passes per night			
				MYsp	PIPI	PIPY	PLAUR
B	May-June	Clear-fell (open)	17	0	0	0	0
A	May-June	Forest edge	19	0	0	0	0
D	May-June	Pre-thicket (open)	18	0	0	0	0
C	May-June	Forest edge	17	0	0	0	0
F/P	May-June	Riparian (edge)	18	0	0	0	0
E/O	May-June	Forest edge	14	0	0	0	0
G	May-June	Riparian (edge)	20	0	2	1	0
H	May-June	Forest edge	18	0	3	8	0
I	May-June	Pre-thicket (open)	19	0	1	1	0
J	May-June	Forest edge	19	0	1	10	0
K	May-June	Pre-thicket (open)	17	0	1	0	0
L	May-June	Forest edge	18	0	9	1	0
B	July-Aug	Clear-fell (open)	16	0	0.5	0.5	0
A	July-Aug	Forest edge	17	0	0	0	0
F/P	July-Aug	Riparian (edge)	19	0	0	0	0
E/O	July-Aug	Forest edge	18	0	0	0	0
G	July-Aug	Riparian (edge)	16	0	1	0	0
H	July-Aug	Forest edge	17	0	13	8	0
I	July-Aug	Pre-thicket (open)	16	0	3	0	0
J	July-Aug	Forest edge	16	0	3.5	15.5	0
K	July-Aug	Pre-thicket (open)	15	0	2	0	0
L	July-Aug	Forest edge	16	0	14.5	3	0
N	July-Aug	Pre-thicket (open)	17	0	1	0	0
M	July-Aug	Forest edge	18	0	0.5	0	0
B	Sept-Oct	Clear-fell (open)	10	0	0	0	0
A	Sept-Oct	Forest edge	11	0	0	0	0
F/P	Sept-Oct	Riparian (edge)	11	0	1	1	0
E/O	Sept-Oct	Forest edge	11	0	0	1	0
G	Sept-Oct	Riparian (edge)	10	0	2.5	1	0
H	Sept-Oct	Forest edge	11	0	5	12	0
I	Sept-Oct	Pre-thicket (open)	11	0	0	0	0
J	Sept-Oct	Forest edge	10	0	0	0	0
K	Sept-Oct	Pre-thicket (open)	11	0	0	0	0
L	Sept-Oct	Forest edge	11	0	0	0	0

Site	Period	Habitat Type	No. nights	Median passes per night			
				MYsp	PIPI	PIPY	PLAUR
N	Sept-Oct	Pre-thicket (open)	12	0	0	0	0
M	Sept-Oct	Forest edge	12	0	1.5	0	0

3.2.7 The data has been combined across all species and all seasons. 'Open' and 'Edge' locations refer to the following sampling points:

- 2015 Open locations: sampling points A, D, F
- 2015 Edge locations: sampling points B, C, E, G
- 2016 Open locations: sampling points A, D, F, I, J, M, N
- 2016 Edge locations: sampling points C, E, G, H, K, L, O
- 2019 Open locations: sampling points B, D, F/P, G, I, K, N
- 2019 Edge locations: sampling points A, C, E/O, H, J, L, M

3.2.8 The 2015, 2016 and 2019 paired sampling point results are summarised in box plots as Figures 9.3.2a-c. The box plots show the median value (centre line on the boxes), the mean (dot), the interquartile range (upper and lower edges of the box) and whiskers are the maxima and minima bat passes recorded per detector night

3.2.9 Whilst there is a lot of variation in bat activity within and between the sampling points, which is typical of such data, there is an apparently clear pattern for all years. Bat activity is generally being lower in open areas (that is, in the middle of clearfell and pre-thicket areas) in comparison to paired locations within c. 30m of riparian zones / forest edges.

Figure 9.3.2a: Bat Activity at Each Sampling Point for Each Season 2015

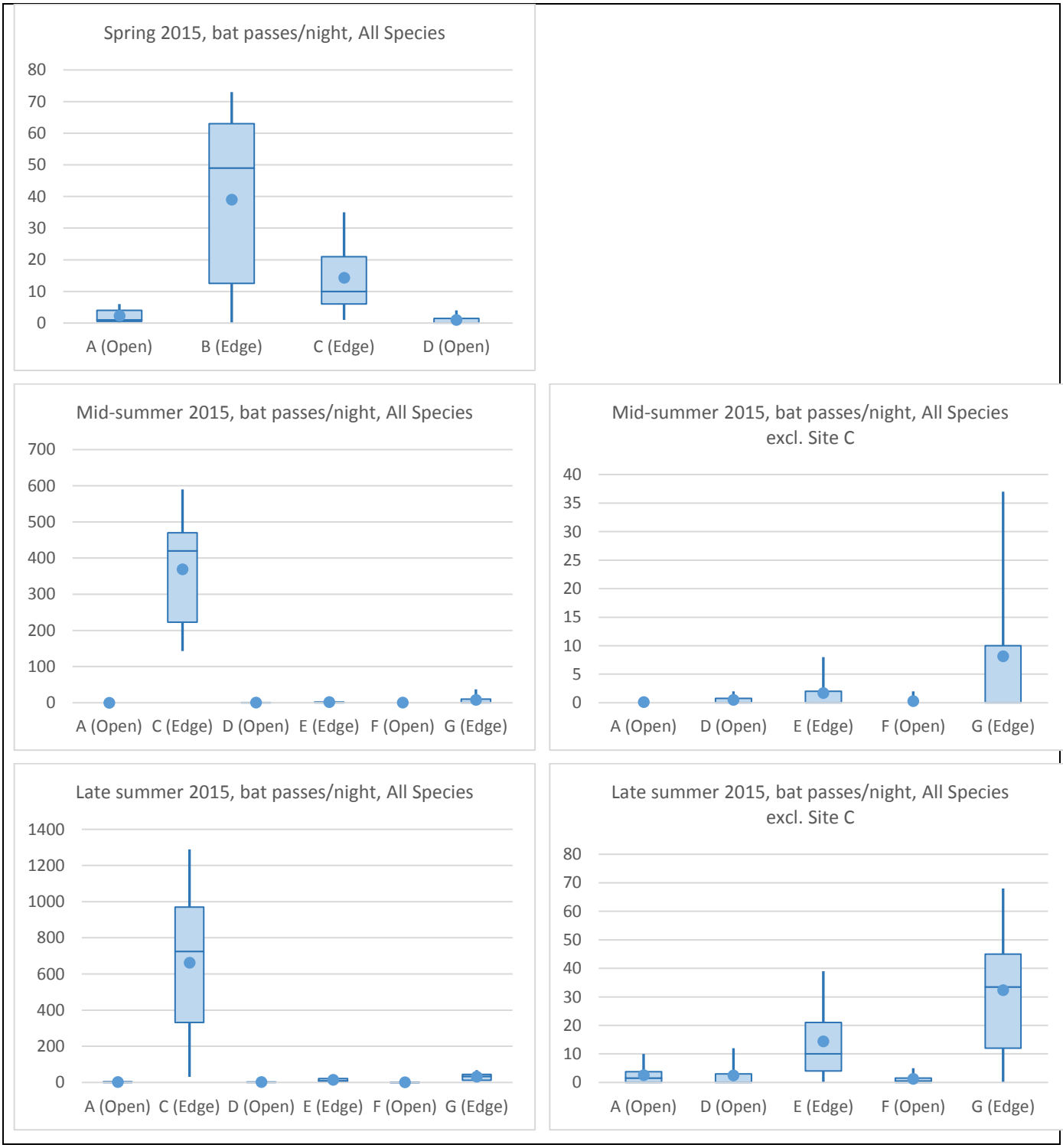


Figure 9.3.2b: Bat Activity at Each Sampling Point for Each Season 2016

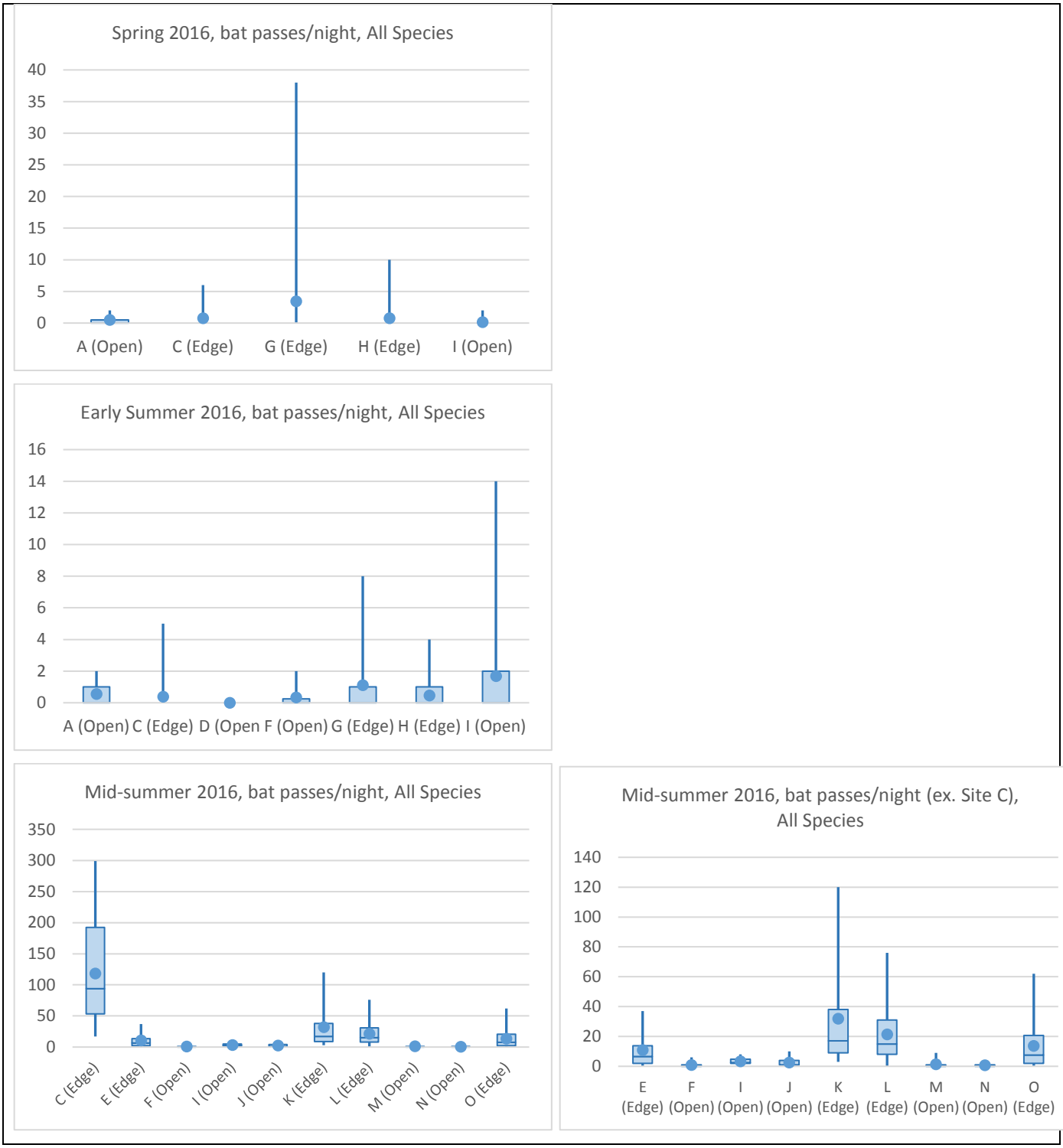
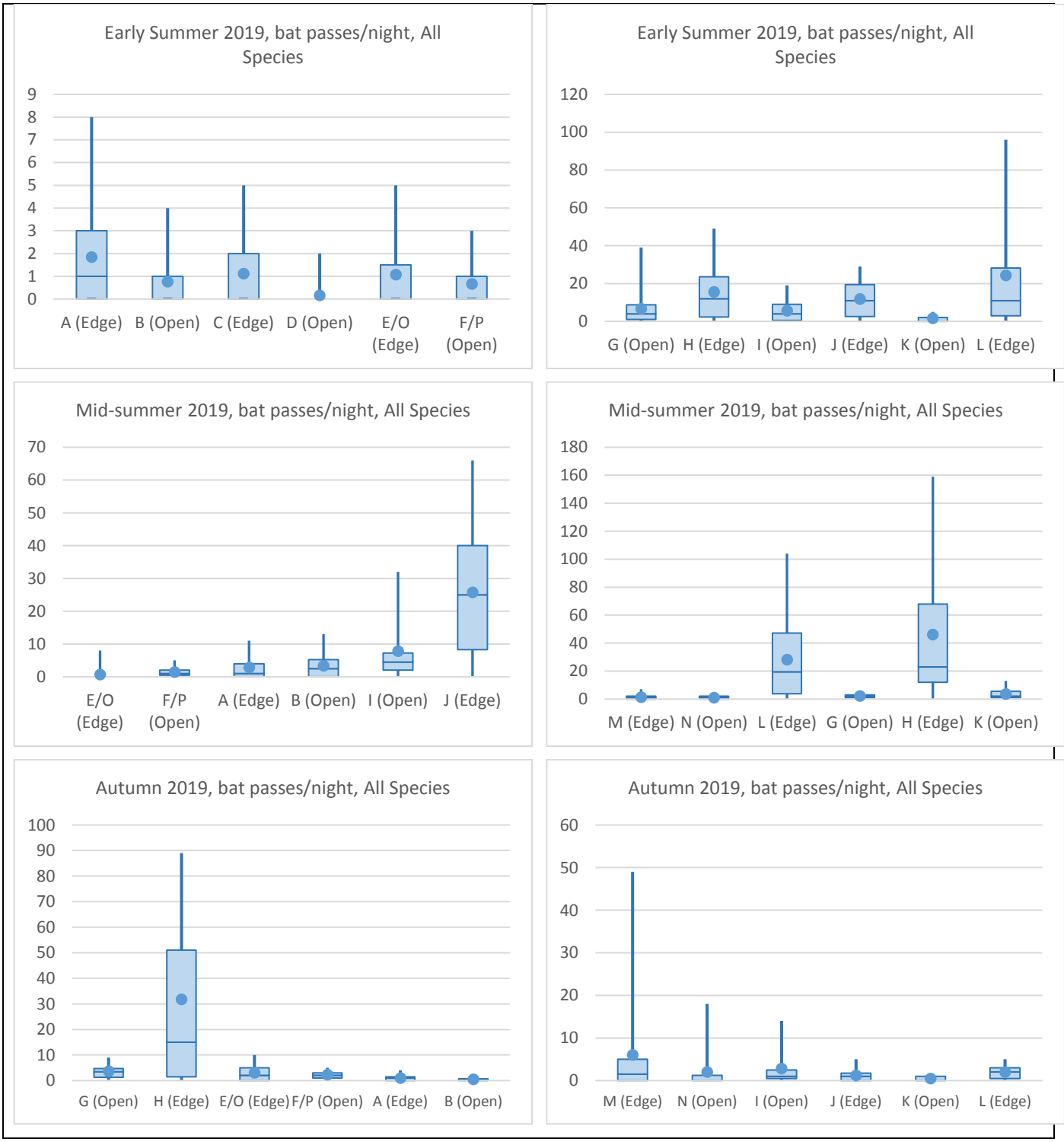


Figure 9.3.2c: Bat Activity at Each Sampling Point for Each Season 2019



Seasonal Variation in Bat Activity

3.2.10 Figures 9.3.3a-c provide an overview of the bat activity recorded across the whole survey period in 2015, 2016 and 2019. Levels of activity were generally higher towards the middle and end of the survey periods in comparison to the spring / early summer.

Figure 9.3.3a: Overall Bat Activity by Season 2015

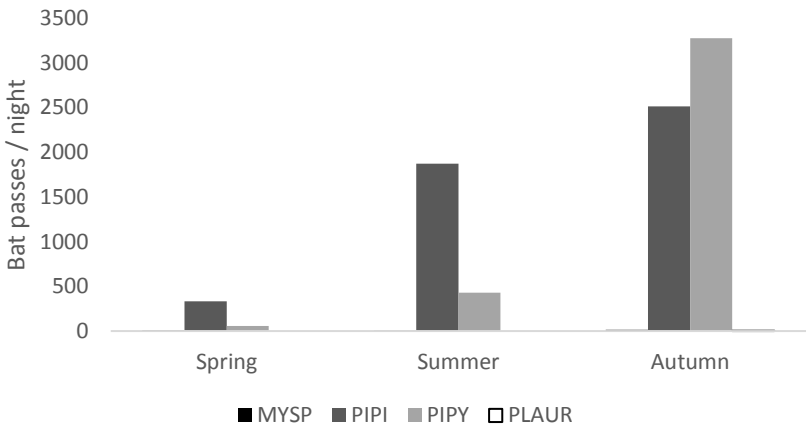
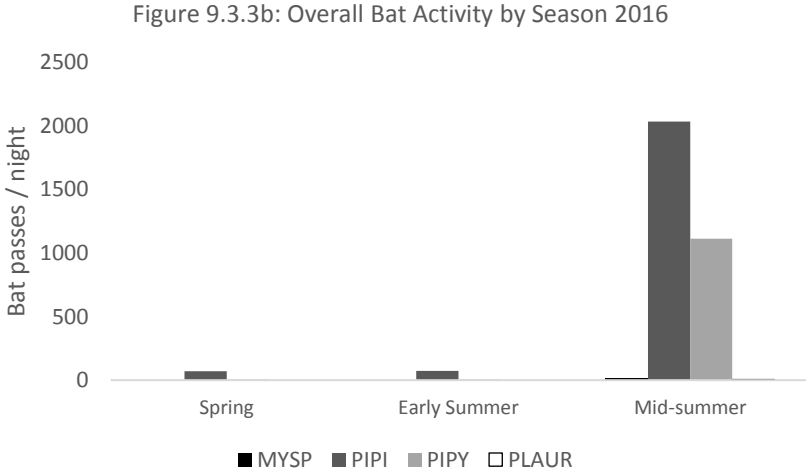
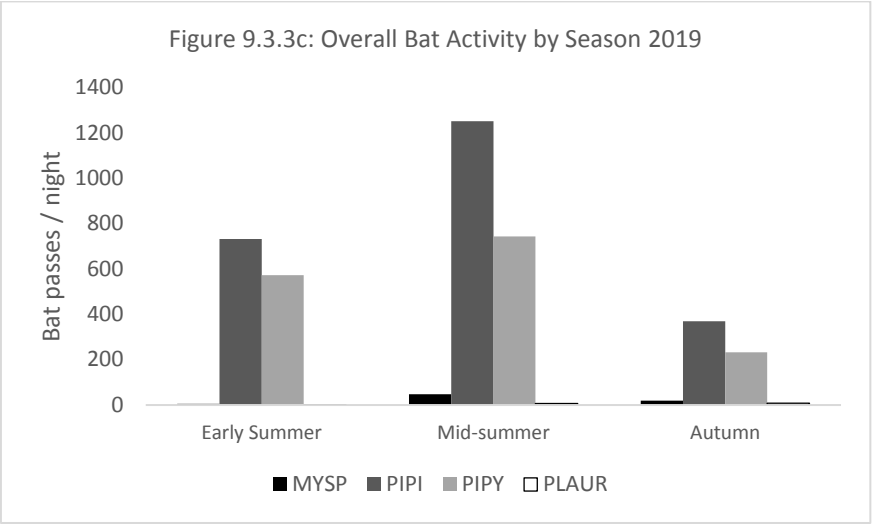


Figure 9.3.3b: Overall Bat Activity by Season 2016





Bat Activity Relative to Sunset

3.2.11 The pattern of bat activity relative to sunset can give an indication of whether the sampling point is near to a bat roost site. Figures 9.3.4a-c show bat activity by common and soprano pipistrelles, across the whole survey period for each survey year, at 15 minute intervals relative to sunset. The peak roost emergence period for common and soprano pipistrelle is between 20 to 30 minutes after sunset (Russ 2012).

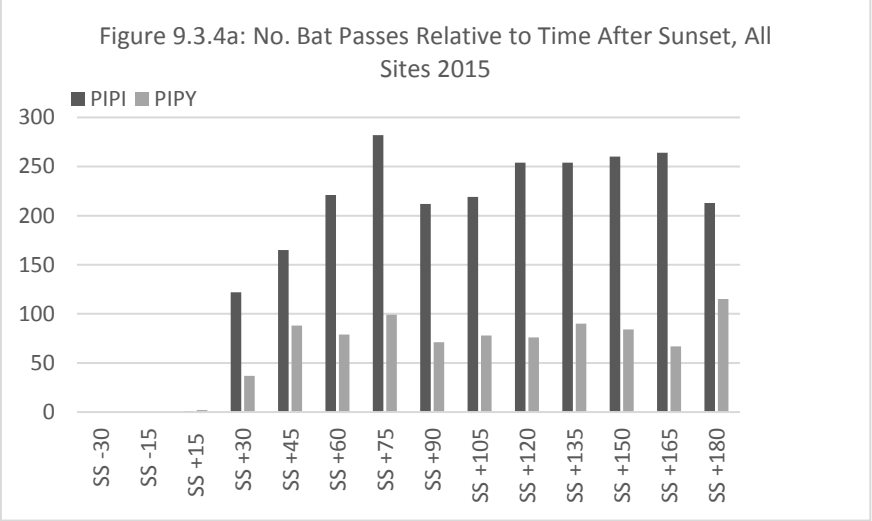


Figure 9.3.4b: No. Bat Passes Relative to Time After Sunset, All Sites 2016

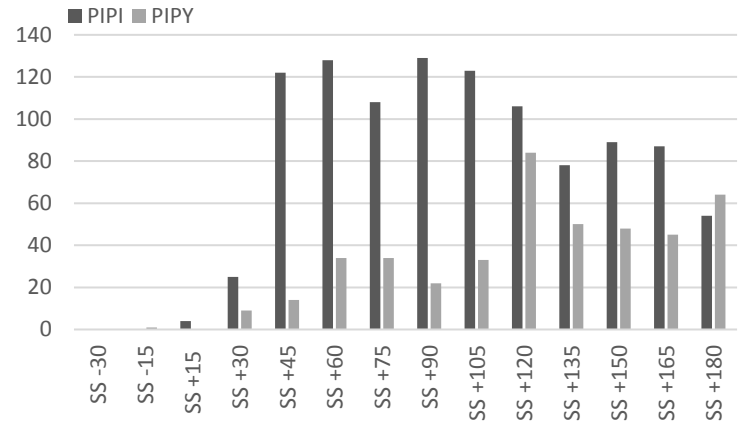
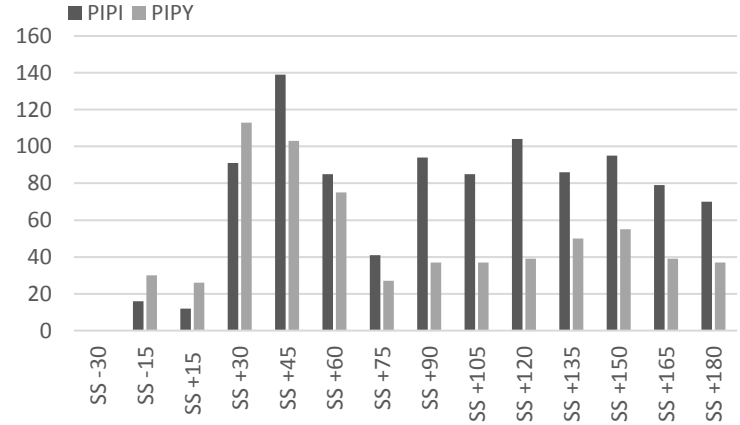


Figure 9.3.4c: No. Bat Passes Relative to Time After Sunset, All Sites 2019



3.2.12 Activity relative to sunset each sampling point are provided in Appendix 2. The results indicate that some of the sampling points could be relatively close to roost sites, for example, site B in 2015, site G in 2016 and sites G and H in 2019.

Bat Activity Relative to Weather Conditions

3.2.13 The relationship between bat activity and air temperature, wind speed and rainfall is summarised for each year in Figures 9.3.5a-c, 9.3.6a-c and 9.3.7. Weather data was provided by Vattenfall from the met mast at Clashindarroch wind farm (hourly temperature at 10 m a.g.l., humidity, air pressure, wind direction and wind speed at 69 m a.g.l.). Temperature data at ground level on site was recorded by the SM2s. Rainfall data (available for 2015 only) was derived for the survey area from the Centre for Ecology and Hydrology (CEH) gridded estimate of daily rainfall from modelled rain gauge data.

3.2.14 There was a fairly clear positive correlation between bat activity and temperature in all years. This is to be expected due to several factors including the influence of air temperature on aerial insect abundance. There is little variation between the open sites

and the edge sites with regard to bat passes per night and sunset temperature (see Appendix 2 for plots comparing open and edge sites)

3.2.15 The wind speed data is from the Clashindarroch wind farm met mast, and is recorded at 69 a.g.l. in an open environment. Consequently the speeds recorded will be higher than within the forest at the proposed development site. However, although the relationship to wind speed was less clearly defined than for sunset temperature, the data indicates that generally there are less bat passes when wind speeds around sunset are high. The relationship is most pronounced with the 2015 data, and to a lesser extent the 2019 data. The 2016 data is a little less clear but is likely to be influenced by the many "no bat passes" nights which are due to the less than ideal temperatures in the early spring survey session in particular. When the 2016 data is split between 'open' sites and 'edge' sites (see Appendix 2), the open, more exposed, sites show the expected negative relationship between number of bat passes per night and wind speed. For the comparatively more sheltered edge sites this relationship is not as clear, as might be expected given that open locations are likely to be more affected by wind. A few unexpectedly high bat pass nights were recorded in relatively windy conditions at edge sites. In particular there are two nights in July (at site C) where there are comparatively high numbers of bat passes (>200) per night associated with windy evenings (>9 m s^{-1}).

3.2.16 The 2015 daily rainfall data was modelled data for the centre of the proposed site, but it shows the higher number of bat passes per night were on drier days and there were generally less passes per night on higher rainfall days. There is little variation in the relationship between the number of bat passes per night and estimated daily rainfall between the open sites and edge site (see Appendix 2).

Figure 9.3.5a: Bat Activity Compared to Sunset Temperature, All Sites 2015

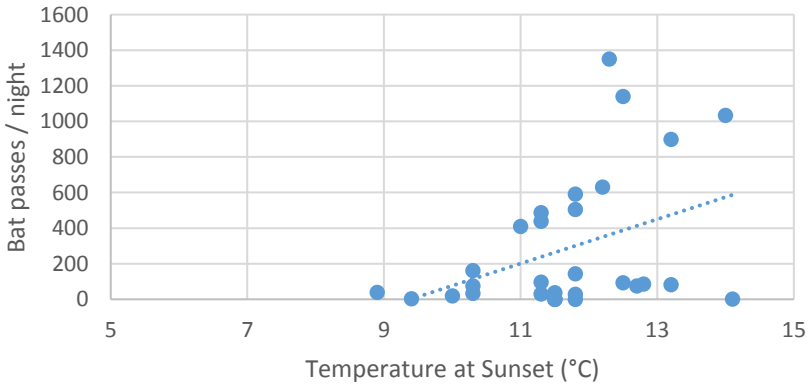


Figure 9.3.5b: Bat Activity Compared to Sunset Temperature, All Sites 2016

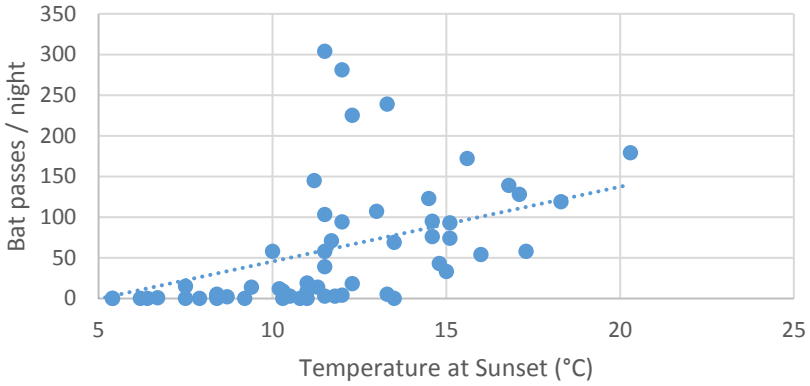


Figure 9.3.5c: Bat Activity Compared to Sunset Temperature, All Sites 2019

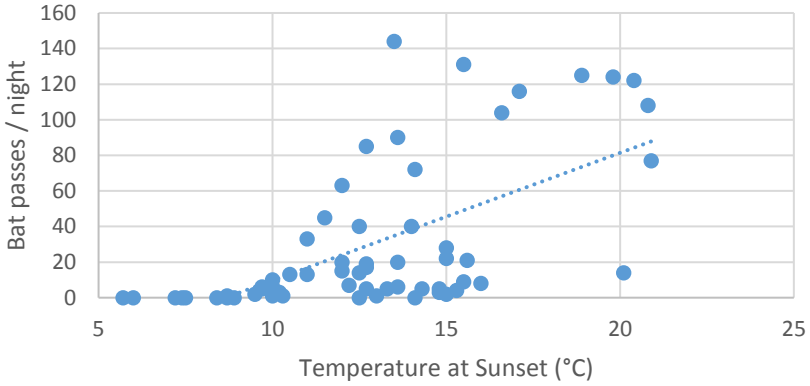


Figure 9.3.6a: Bat Activity Compared to Wind Speed, All Sites 2015

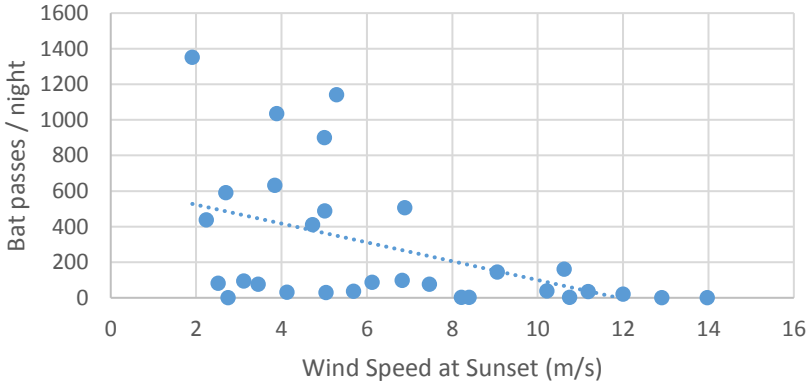


Figure 9.3.6b: Bat Activity Compared to Wind Speed, All Sites 2016

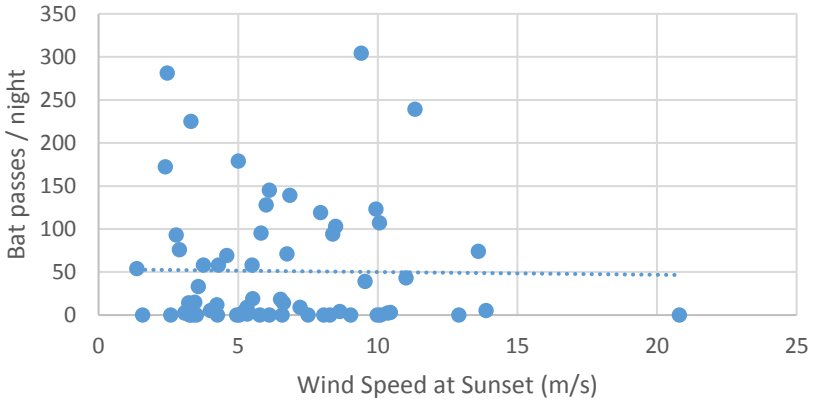


Figure 9.3.6c: Bat Activity Compared to Wind Speed, All Sites 2019

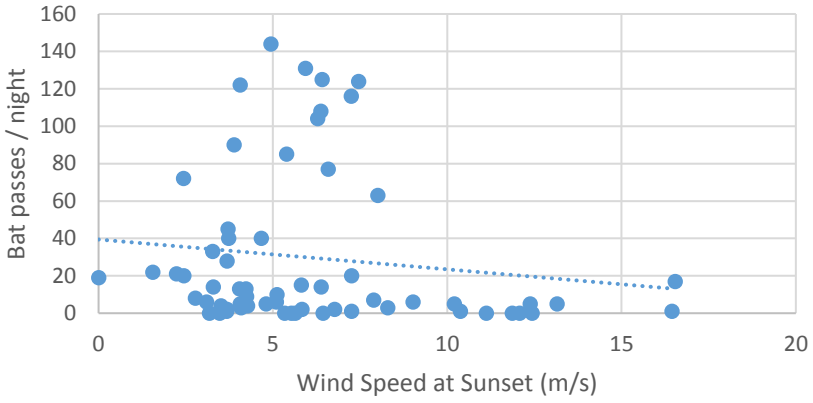
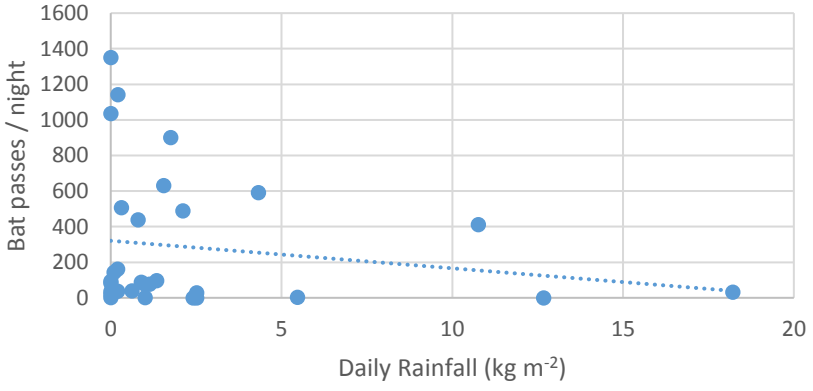


Figure 9.3.7: Bat Activity Compared to Daily Rainfall, All Sites 2015



Ecobat Analysis

3.2.17 Bat activity data for each year was also analysed using the Ecobat tool (Lintott *et al*. 2018, www.ecobat.org.uk). This online data processing tool allows the comparison of bat activity data with data collected from other similar sites in the same geographical region. This helps to provide some level of context to the results, i.e. whether activity levels are comparatively high, moderate or low in comparison to the reference dataset. The creation of the Ecobat tool was supported by the Natural Environment Research Council (NERC).

3.2.18 Table 9.3.4 provides a summary of the results of the Ecobat analysis of comparative levels of bat activity for the 2015, 2016 and 2019 data. The more detailed tabulated results are provided in Appendix 3.

Table 9.3.4: Summary of Ecobat Analysis for Bat Activity Data 2015, 2016 and 2019 (MYsp = Myotis species, PIPI = common pipistrelle, PIPY = soprano pipistrelle, PLAUR = brown long-eared bat)

Species/Genus	High Activity	Moderate/ High Activity	Moderate Activity	Low/ Moderate Activity	Low Activity
MYsp (nights)	0	1	1	16	61
MYsp (% total nights)	0.0	1.3	1.3	20.3	77.2
PIPI (nights)	72	93	121	98	141
PIPI (% total nights)	13.7	17.7	23.1	18.7	26.9
PIPY (nights)	40	65	59	67	129
PIPY (% total nights)	11.1	18.1	16.4	18.6	35.8
PLAUR (nights)	0	0	0	1	19
PLAUR (% total nights)	0.0	0.0	0.0	5.0	95.0

Note: The results presented here are based on data processed the Mammal Society's Ecobat website [www.ecobat.org.uk].

3.2.19 Locations where comparatively high levels of activity were recorded (i.e. >80% of comparison records) were frequently recorded (i.e. >10 nights in total) are highlighted on Figure 9.12 for 2015, Figure 9.13 for 2016 and Figure 9.14 for 2019 data. All of these locations are associated with forest edges and/or riparian zones.

3.2.20 For all species most of the recorded nightly activity was classified as being at 'moderate' levels or below (i.e. 98.8% of Myotis activity, 68.7% of common pipistrelle activity, 70.8% of soprano pipistrelle activity and 100% of brown long-eared activity). Where high / moderate-high levels of activity were recorded these tended to be at locations associated with forest edges or near to watercourses. In 2019 there were 3 nights where high levels of activity by common pipistrelles were associated with 'open habitat' locations (i.e. not at forest edges), this represents 4.2% of all of the nights of high activity during 2019. Both of these locations (G and I) were near to watercourses (see Figure 9.11).

3.3 Driven Transects

3.3.1 The route of the driven bat activity transect surveys completed in 2015, 2016 and 2019 along with the survey times and dates is shown on Figure 9.11. Common and soprano pipistrelle were the only bat species recorded during the transect surveys and the number of passes recorded was relatively low (see Table 3 below). As would be expected, bat activity was greater at lower elevations and near to watercourses (see Figures 9.12, 9.13 and 9.14) following a similar pattern to the SM2 monitoring data.

Table 3: Bat Activity Driven Transect Results Summary 2015, 2016 and 2019

Date	Dawn / dusk	Number of bat passes			Foraging passes
		PIPI	PIPY	PIPsp	
11/06/2015	Dusk	19	1	1	None
23/07/2015	Dusk	15	0	0	None
09/10/2015	Dawn	0	1	0	None
16/05/2016	Dusk	18	9	0	2 x PIPY
28/07/2016	Dusk	12	2	0	None
19/08/2016	Dawn	11	6	0	None
23/05/2019	Dusk	0	0	0	None
03/07/2019	Dusk	16	1	0	None
23/10/2019	Dawn	16	6	0	None

3.4 Conclusions

3.4.1 The survey area was used to varying degrees by commuting and foraging common and soprano pipistrelle bats, both species are considered to be of relatively high risk of mortality from operating wind turbines. Bat activity was comparatively low within open habitats such as clearfell areas and pre-thicket re-stock. In comparison to the more elevated and wind-swept open clear-fell and moorland areas, which are analogous to the locations and habitats where the proposed wind turbines would be located, within the sheltered valleys alongside watercourses and forest edges bat activity was generally much higher.

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APPENDICES

APPENDIX 1: Bat Activity Survey Results

This appendix provides the tabulated results of the bat activity surveys undertaken at the proposed Clashindarroch II Wind Farm site in 2015 and 2016. The results presented here are from the following surveys:

- Bat activity transect surveys 2015,2016 and 2019; and
- Automated bat detector (SM2) surveys 2015 & 2016.

Bat Activity Survey Results

Table A1.1: Bat Activity Driven Transect Details 2015

Visit no.	Date	Surveyor	Sunset / sunrise time	Start time	End time	Transect Direction	Temp - start	Temp - end	Wind direction (speed)	Cloud cover (%) Start	Cloud cover (%) end	Rainfall	Equip. used
1	11/06/15	PB	22:06	21:26	23:30	Forward	11°C	9°C	ENE (2)	100	100	None	Batlogger M
	Notes: Start at turbine 9, follow wind farm site road to forestry gate at Bailiesward (north).												
2	23/07/15	PB	21:43	22:00	00:13	Reverse	10°	9°	W (3)	50	60	None	Batlogger M
	Notes: Start at forestry gates (Bailiesward), drive through site on main wind farm track to turbine 9. [Additional data recorded but not used: retrace route from turbine 9 to forestry gate (north), continue recording on public road until Wellheads Farm].												
3	09/10/15	PC	07:32	05:45	07:12	Reverse	2°	1°	? (1-2)	0	10	None	Batlogger M
	Notes: Start at forestry gate at Bailiesward (north), follow the wind farm site road to turbine 9												

Table A1.2: Bat Activity Driven Transect Details 2016

Visit no.	Date	Surveyor	Sunset / sunrise time	Start time	End time	Transect Direction	Temp - start	Temp - end	Wind direction (speed)	Cloud cover (%) Start	Cloud cover (%) end	Rainfall	Equip. used
1	16/05/16	CR/SR	21:29	21:09	22:48	Forward	8°C	7°C	SW (1)	95	100	None	Batlogger M
	Notes: Parking area at 345760 834820 to turbine 9 via forestry tracks at 10 mph, return to parking via main access road at 15 mph.												
2	28/07/16	PB	22:37	21:45	23:39	Forward	13°C	10°C	n/a (0)	100	90	None	Batlogger M
	Notes: Transect started at 345154 833789 then towards existing wind farm, then left turn on track that runs alongside Burn of Bedlaithen, then on track towards Hill of Finglenny, then north side of Ealaiche Burn towards Finglenny Farm, then south side of Elaiche Burn, left up to VP3, turnaround and back out along the main wind farm access track. Kept speed at 10 mph throughout, including section of main access route and public road as far as Wellheads Farm. [Data north of parking area at 345760 834820 incl. public road data recorded but not used].												
3	19/08/16	CR/KM	05:46	04:13	05:37	Reverse	10.5°C	10°C	SW (2)	100	100	None	Batlogger M
	Notes: Parking area at 345760 834820, then along main windfarm access road to turbine 9 at 15mph. At VP3 at 04:38. Return via forestry tracks at 10 mph (Ealaiche Burn South & North, Hill of Finglenny, north of Hareetnach Burn, Burn of Bedlaithen, main wind farm access track).												

Table A1.3: Bat Activity Driven Transect Details 2019

Visit no.	Date	Surveyor	Sunset / sunrise time	Start time	End time	Transect Direction	Temp - start	Temp - end	Wind direction (speed)	Cloud cover (%) Start	Cloud cover (%) end	Rainfall	Equip. used
1	23/05/19	CR/SR	21:39	21:35	23:30	Forward	10°C	9°C	~ (4-5)	100	100	None	Batlogger M & Thermal Imaging Camera
	Notes: Very windy. Not ideal conditions for bat survey. Started and finished at the proposed borrow pit area (345760 834820). Transect via main access road and forestry tracks to Slack Methland, Raven Hill, Hill of Finglenny, Wind farm entrance, return to proposed borrow pit area via main access road.												
2	03/07/19	PB/CR	22:11	22:00	00:00	Forward	12°C	10°C	~ (2)	100	100	None	Batlogger M & Thermal

Visit no.	Date	Surveyor	Sunset / sunrise time	Start time	End time	Transect Direction	Temp - start	Temp - end	Wind direction (speed)	Cloud cover (%) Start	Cloud cover (%) end	Rainfall	Equip. used
													Imaging Camera
	Notes: Started and finished at the proposed borrow pit area. Transect via main access road and forestry tracks to Slack Methland, Three Sisters (near Corrydown), Main access track, The Shank, Wind farm entrance, main access back to start point. [Data north of proposed borrow pit area to Bailiesward gate recorded but not used].												
3	23/10/19	CR/SR	08:02	06:30	07:37	Reverse	7°C	8°C	~ (1-2)	10	10	None	Batlogger M & Thermal Imaging Camera
	Notes: Started and finished at the proposed borrow pit area. Transect via main access road to The Shank, Wind Farm entrance, Raven Hill, then forestry tracks to Cross Hill, Dam (Slack Methland), Three Sisters (near Corrydown), Main access track, forestry track to Red Hill, main access back to start point at Borrow Pit. [Data north of proposed borrow pit area to Bailiesward gate recorded but not used].												

Automated Bat Detector Location Details

Table A1.4: Automated bat detector locations 2015

ID	Easting	Northing	Type	Description
A	344853	833960	Open	Clearfell, adjacent to forestry track
B	345195	832917	Edge	Confluence of small watercourses, open area adjacent to mature forest
C	343985	831303	Edge	Mature forest
D	343225	830398	Open	Open moor
E	342688	832469	Edge	Marshy grassland between mature forest and felled area
F	342503	832713	Open	A felled area that is just over 440 m altitude, adjacent to open moor
G	344663	833724	Edge	Restock and thicket forestry, adjacent to a track

Table A1.5: Automated bat detector locations 2016

ID	Easting	Northing	Type	Description
A	344853	833960	Open	Pre-thicket
C	343985	831303	Edge	Watercourse
D	343225	830398	Open	Open moorland
E	342676	832496	Edge	Forest Edge
F	342503	832713	Open	Clearfell
G	344663	833724	Edge	Forest Edge
H	343201	830542	Edge	Forest Edge
I	343779	831241	Open	Pre-thicket
J	345045	832877	Open	Clearfell
K	344983	832796	Edge	Forest Edge
L	345020	832185	Edge	Forest Edge
M	345104	832271	Open	Clearfell
N	343290	833134	Open	Open moorland
O	343264	833027	Edge	Forest Edge

Table A1.6: Automated bat detector locations 2019

ID	Easting	Northing	Type	Description
A	343449	832376	Edge	Top edge of clearfell /windthrow larch to northwest of Raven Hill.
B	343386	832419	Open	Open clearfell attached to retained pole.
C	344068	832745	Edge	Edge of thicket / open area. Next to track.
D	344064	832789	Open	Open area with young regrowth within deer fenced area.
E/O	342972	831991	Edge	Edge of regrowth spruce / open area next to overgrown track, southwest of Shank of Baditimmer.
F/P	343000	831922	Open	Area of open grassland with scattered young trees next to Bogrotten Burn. Mic free standing.
G	343703	831724	Open	Open spruce pre-thicket near small watercourse
H	343777	831777	Edge	Edge of high spruce, nr small watercourse
I	343751	832648	Open	Open spruce pre-thicket
J	343824	832481	Edge	Edge of pole stage larch
K	345190	832158	Open	Open spruce pre-thicket
L	345020	832185	Edge	Edge of pole stage spruce / larch
M	344830	833323	Edge	On forest edge north of proposed turbine 6.
N	345036	833861	Open	In area of young regrowth.
O/E	343089	831991	Edge	Attached to large fence post on deer fence (highest point). (Alternative location to site E)
P/F	342984	831913	Open	Attached to fallen branch in open area close to watercourse. (Alternative location to site F)

Survey Weather Details

Weather data for the nights in which the automated detectors were recording was acquired from a number of sources. Vattenfall provided hourly temperature, humidity, pressure, wind direction and wind speed data from the met mast at the existing wind farm (for 10 m a.g.l.). Temperature data throughout the recording period at ground level at the SM2 locations was recorded by the SM2s. Derived daily rainfall data for 2015 was acquired from the Centre for Ecology and Hydrology (CEH) (https://eip.ceh.ac.uk/apps/rainfall/gb.html). This is gridded estimated daily rainfall derived from modelled rain gauge data.

Table A1.7: Weather Details 2015

Date	Sunset Time	Temperature at Sunset (°C) (from SM2)	CEH 2015 Gridded Estimate Daily rainfall kg m^{-2} (for location 345283, 834000)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
04/06/2015	21:59:29	12.8	0.89453715	6.1	95.5	962.0	113	6.1
05/06/2015	22:00:47	10.3	0	7.2	72.3	950.5	0	11.2
06/06/2015	22:02:02	10	0	6.4	84.6	958.5	0	12.0
07/06/2015	22:03:14	9.4	5.466616	3.7	93.9	976.3	171	8.4
08/06/2015	22:04:23	10.3	0.9939302	6.0	93.0	978.7	0	3.4
09/06/2015	22:05:28	12.5	0	8.0	90.4	976.4	0	3.1
10/06/2015	22:06:29	13.2	0	10.4	87.5	970.3	0	2.5
16/07/2015	21:57:05	11.5	12.6773	8.9	99.9	957.8	113	12.9
17/07/2015	21:55:36	11.5	2.5153375	8.6	90.0	941.2	53	14.0
18/07/2015	21:54:05	11.8	2.5153375	7.8	80.1	950.3	0	5.0
19/07/2015	21:52:30	11.8	2.4147239	7.8	99.9	953.6	314	2.7
20/07/2015	21:50:53	11.5	1.006135	10.1	99.1	942.3	0	10.7
21/07/2015	21:49:12	14.1	0	7.6	86.0	952.2	0	8.2
22/07/2015	21:47:29	11.5	0.201227	6.2	85.2	953.5	12	5.7
23/07/2015	21:45:43	11.8	0.1006135	6.5	94.5	954.5	0	9.1
24/07/2015	21:43:55	11.8	4.3263807	8.2	94.8	956.4	0	2.7

Date	Sunset Time	Temperature at Sunset (°C) (from SM2)	CEH 2015 Gridded Estimate Daily rainfall kg m^{-2} (for location 345283, 834000)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
25/07/2015	21:42:03	11.3	0.804908	7.4	87.9	957.4	0	2.2
26/07/2015	21:40:10	10.3	0.201227	7.0	98.5	945.1	313	10.6
27/07/2015	21:38:14	11.3	2.1128833	7.6	98.6	947.5	265	5.0
28/07/2015	21:36:16	11	10.765644	7.4	99.6	950.5	206	4.7
15/09/2015	19:32:27	14	0	9.3	94.6	938.3	0	3.9
16/09/2015	19:29:40	12.2	1.5519031	8.9	100.0	938.5	272	3.8
17/09/2015	19:26:53	12.5	0.20692042	8.2	96.8	945.8	0	5.3
18/09/2015	19:24:06	11.8	0.31038064	9.6	90.3	962.0	168	6.9
19/09/2015	19:21:19	12.3	0	9.3	95.6	967.5	218	1.9
20/09/2015	19:18:31	13.2	1.7588236	10.3	87.6	958.3	61	5.0
21/09/2015	19:15:44	11.3	18.208996	8.3	99.9	946.5	182	4.1
22/09/2015	19:12:57	11.3	1.3449827	8.9	99.4	949.2	0	6.8
23/09/2015	19:10:10	12.7	1.1380622	6.2	92.8	947.5	108	7.5
24/09/2015	19:07:23	8.9	0.6207613	5.2	94.0	947.5	65	10.2

Table A1.8: Weather Details 2016

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
18/04/2016	20:28:47	6.4	2.45	88.12	960	145	12.9
19/04/2016	20:30:57	7.5	3.64	80.39	972	56	3.4
20/04/2016	20:33:08	10	5.55	91.01	971	206	3.8
21/04/2016	20:35:19	6.2	2.21	90.93	971	209	3.3

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
22/04/2016	20:37:29	3.6	0.10	89.26	966	202	3.4
23/04/2016	20:39:40	1.9	-0.76	87.03	962	187	4.9
24/04/2016	20:41:50	5.4	1.13	88.46	957	162	10.1
25/04/2016	20:44:01	1.7	-1.32	100.00	952	216	10.0
26/04/2016	20:46:11	1.7	-1.14	100.00	955	211	6.6
27/04/2016	20:48:22	1.9	-1.34	99.59	952	152	7.5
28/04/2016	20:50:32	2.1	-0.30	98.17	948	293	8.1
29/04/2016	20:52:42	3.6	-0.41	99.84	954	168	8.3
30/04/2016	20:54:51	5.4	1.87	88.71	960	47	9.0
01/05/2016	20:57:01	8.7	7.86	92.28	953	19	10.3
17/05/2016	21:30:19	12	8.45	100.00	946	8	5.2
18/05/2016	21:32:16	8.4	4.35	99.78	953	254	4.0
19/05/2016	21:34:11	8.4	6.21	99.09	946	104	8.6
20/05/2016	21:36:06	11	7.52	91.14	948	23	7.2
21/05/2016	21:37:58	10.2	7.44	87.01	945	90	4.2
22/05/2016	21:39:49	8.4	6.12	90.42	956	135	4.3
23/05/2016	21:41:38	9.4	7.18	92.37	968	252	3.2
24/05/2016	21:43:25	6.7	3.24	90.64	968	240	5.3
25/05/2016	21:45:10	7.9	5.09	100.00	965	227	5.8
26/05/2016	21:46:53	8.4	4.95	99.61	964	265	3.1
27/05/2016	21:48:34	10.5	7.08	95.54	963	0	3.1
28/05/2016	21:50:13	11	8.01	81.18	960	16	5.5
29/05/2016	21:51:49	11.5	8.57	98.14	965	221	3.2
30/05/2016	21:53:23	10.8	7.25	99.62	969	202	3.5

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp ºC (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
31/05/2016	21:54:53	9.2	6.45	99.23	973	199	5.0
01/06/2016	21:56:22	8.4	4.57	98.81	973	209	10.5
02/06/2016	21:57:47	7.5	5.88	99.82	964	177	6.1
03/06/2016	21:59:09	11	7.08	99.30	966	191	2.6
04/06/2016	22:00:29	10.3	4.70	99.85	966	205	1.6
07/07/2016	22:07:03	14.5	11.23	88.28	952	63	9.9
08/07/2016	22:06:04	13.5	9.58	91.71	958	92	4.6
09/07/2016	22:05:01	14.8	12.52	94.98	945	70	11.0
10/07/2016	22:03:54	15	11.67	95.84	941	87	3.6
11/07/2016	22:02:43	12	8.55	97.44	950	135	8.4
12/07/2016	22:01:29	11.5	8.17	90.68	957	133	8.5
13/07/2016	22:00:11	12.3	8.51	98.28	963	158	3.3
14/07/2016	21:58:50	12	8.26	96.28	966	0	2.5
15/07/2016	21:57:26	15.1	12.27	93.64	957	0	13.6
16/07/2016	21:55:58	11.5	9.44	93.91	958	0	9.4
17/07/2016	21:54:27	13.3	10.81	72.64	959	107	11.3
18/07/2016	21:52:54	17.3	15.08	89.09	963	80	4.3
19/07/2016	21:51:17	20.3	17.46	88.86	958	0	5.0
20/07/2016	21:49:37	17.1	13.97	99.46	954	83	6.0
21/07/2016	21:47:55	18.3	13.27	91.06	960	10	8.0
22/07/2016	21:46:09	16	12.82	99.55	963	30	1.4
23/07/2016	21:44:21	16.8	12.31	92.38	962	0	6.9
24/07/2016	21:42:31	14.6	11.04	99.29	955	67	5.8
25/07/2016	21:40:38	13	10.52	92.73	958	19	10.1

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp ºC (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
26/07/2016	21:38:43	11.5	9.42	97.53	956	81	5.5
27/07/2016	21:36:45	11.7	9.71	93.03	955	40	6.7
28/07/2016	21:34:45	15.6	10.83	89.34	953	143	2.4
29/07/2016	21:32:43	11.2	9.01	95.58	954	141	6.1
30/07/2016	21:30:38	11.5	7.99	99.27	955	120	9.5
31/07/2016	21:28:32	11.3	8.58	97.59	959	117	6.6
01/08/2016	21:26:24	15.1	8.85	99.93	957	173	2.8
02/08/2016	21:24:14	12.3	11.22	99.56	948	0	6.5
03/08/2016	21:22:02	14.6	11.93	99.93	940	191	2.9
04/08/2016	21:19:48	10.3	9.01	99.32	957	181	5.3
05/08/2016	21:17:32	11.8	8.85	99.56	963	130	5.4
06/08/2016	21:15:15	13.3	12.43	95.91	957	64	13.9
07/08/2016	21:12:57	13.5	9.82	86.80	943	99	20.8

Table A1.9: Weather Details 2019

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp ºC (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
23/05/2019	21:40:19	8.7	5.79	97.10	953.50	0.00	16.45
24/05/2019	21:42:08	9.7	6.17	93.83	960.64	0.00	9.02
25/05/2019	21:43:55	8.4	5.45	99.89	954.50	293.00	3.47
26/05/2019	21:45:39	8.9	6.84	99.27	943.50	0.00	11.86
27/05/2019	21:47:22	7.2	3.42	97.94	951.58	239.82	3.18
28/05/2019	21:49:02	5.7	2.53	79.62	958.49	0.00	5.53

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
29/05/2019	21:50:40	10.5	7.17	89.58	952.03	0.00	4.04
30/05/2019	21:52:16	6	4.06	99.60	959.53	0.00	5.34
31/05/2019	21:53:48	12.5	9.06	99.10	954.60	0.00	12.08
01/06/2019	21:55:19	12.5	9.98	79.18	956.15	0.00	3.29
02/06/2019	21:56:46	13.3	9.91	84.75	939.23	0.00	13.15
03/06/2019	21:58:11	12	7.38	92.12	947.61	0.00	5.82
04/06/2019	21:59:32	10	7.47	99.94	949.33	309.37	5.12
05/06/2019	22:00:51	7.4	6.38	99.36	951.50	266.04	5.64
06/06/2019	22:02:06	9.5	6.33	99.21	951.50	0.00	6.77
07/06/2019	22:03:18	12	8.26	98.64	952.41	0.00	2.45
08/06/2019	22:04:26	10	6.81	99.05	955.67	0.00	5.83
09/06/2019	22:05:31	10	7.60	99.94	961.53	74.93	3.10
10/06/2019	22:06:32	10.2	6.21	95.80	966.50	0.00	4.09
12/06/2019	22:08:23	8.7	5.23	99.42	958.37	0.00	12.43
13/06/2019	22:09:13	7.5	5.10	99.11	944.54	0.00	6.44
14/06/2019	22:09:59	11.5	6.29	99.34	953.65	0.00	3.71
15/06/2019	22:10:40	14.1	8.97	99.89	952.27	0.00	2.44
16/06/2019	22:11:18	12.7	8.08	93.21	951.33	0.00	5.39
17/06/2019	22:11:51	12	6.23	90.12	952.66	0.00	8.01
18/06/2019	22:12:20	15.5	8.62	86.40	952.12	0.00	5.93
19/06/2019	22:12:45	13.6	8.75	82.54	948.48	0.00	3.89
20/06/2019	22:13:06	12.7	5.52	90.44	951.81	0.00	10.20
21/06/2019	22:13:22	12.5	7.33	78.29	963.61	0.00	3.73
22/06/2019	22:13:34	13.5	10.28	79.96	965.60	0.00	4.95

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
23/06/2019	22:13:41	16.6	8.85	96.13	966.72	0.00	6.28
24/06/2019	22:13:44	11	8.95	99.45	965.51	0.00	4.22
25/06/2019	22:13:42	11	6.95	99.68	972.57	0.00	3.27
26/06/2019	22:13:36	17.1	9.74	94.46	975.50	0.00	7.25
27/06/2019	22:13:26	20.4	11.76	99.74	974.41	0.00	4.06
28/06/2019	22:13:11	20.8	13.31	80.28	963.33	0.00	6.37
29/06/2019	22:12:52	15.6	13.73	99.45	951.46	0.00	2.24
30/06/2019	22:12:28	12.7	9.78	87.39	948.36	0.00	16.53
01/07/2019	22:12:01	10	7.15	99.82	963.55	0.00	3.52
02/07/2019	22:11:28	10	6.17	87.98	969.63	0.00	7.26
03/07/2019	22:10:52	14.3	9.89	92.16	967.39	0.00	12.38
04/07/2019	22:10:12	13	11.03	93.97	960.51	0.00	10.38
05/07/2019	22:09:27	14.1	7.59	99.37	954.48	0.00	11.12
06/07/2019	22:08:38	10.3	6.02	99.52	959.70	32.22	3.67
07/07/2019	22:07:46	9.7	6.92	98.39	964.75	0.00	4.06
08/07/2019	22:06:49	14	10.20	88.54	963.13	0.00	4.67
09/07/2019	22:05:48	15.5	13.52	99.82	960.42	0.00	4.24
10/07/2019	22:04:44	16	13.52	99.52	955.46	0.00	2.78
11/07/2019	22:03:36	15.3	12.79	99.91	955.34	0.00	4.27
12/07/2019	22:02:25	15	11.15	99.30	964.76	0.00	3.69
13/07/2019	22:01:09	13.6	9.63	99.64	968.76	0.00	5.10
14/07/2019	21:59:51	12.7	0.00	0.00	0.00	0.00	0.00
15/07/2019	21:58:29	15	13.50	98.46	963.22	0.00	3.68
16/07/2019	21:57:04	15	14.12	89.45	959.22	0.00	1.56

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
17/07/2019	21:55:35	14.8	12.60	97.43	948.34	0.00	8.30
18/07/2019	21:54:03	13.6	10.63	90.69	949.50	0.00	7.26
19/07/2019	21:52:29	14.8	11.62	99.97	947.30	0.00	4.80
20/07/2019	21:50:51	12.2	10.75	92.76	953.56	0.00	7.89
24/07/2019	21:43:53	19.8	15.87	84.17	956.50	0.00	7.46
25/07/2019	21:42:01	20.9	16.86	88.58	955.24	0.00	6.58
26/07/2019	21:40:08	20.1	15.17	97.83	955.65	0.00	6.38
27/07/2019	21:38:12	18.9	14.20	99.87	955.68	0.00	6.41
28/07/2019	21:36:13	20.3	15.52	99.90	953.35	53.94	5.06
29/07/2019	21:34:13	18.1	14.68	97.42	953.17	0.00	2.57
30/07/2019	21:32:10	19.9	15.21	84.42	955.63	0.00	3.86
31/07/2019	21:30:05	17.6	13.15	99.88	960.94	0.00	3.04
01/08/2019	21:27:58	15.8	11.59	99.89	966.57	258.56	4.01
02/08/2019	21:25:50	15.5	11.86	96.03	965.51	161.14	1.18
03/08/2019	21:23:39	16.8	12.23	99.92	961.07	0.00	2.79
04/08/2019	21:21:26	16.1	13.56	99.62	952.99	0.00	6.77
05/08/2019	21:19:12	16.3	12.04	99.78	946.40	0.00	6.46
06/08/2019	21:16:56	15	11.56	100.00	942.20	252.52	3.77
07/08/2019	21:14:39	13	11.29	100.00	947.82	0.00	6.47
08/08/2019	21:12:19	14	9.96	99.62	955.40	255.30	5.91
09/08/2019	21:09:59	12.5	11.68	99.23	937.46	88.77	3.08
19/09/2019	19:21:14	15	12.88	84.52	971.24	22.27	5.01
20/09/2019	19:18:27	13.6	16.87	49.39	964.43	0.00	9.98
21/09/2019	19:15:40	12.2	9.93	91.45	954.30	0.00	4.88

Date	Sunset Time	Temperature at Sunset (°C) (from SM2 text file)	Temp °C (10m a.g.l.)	Humidity (%)	Pressure	Wind Direction	Wind Speed (ms^{-1}) at 69m a.g.l.
22/09/2019	19:12:53	14.6	11.56	99.92	948.71	0.00	5.16
23/09/2019	19:10:05	12.8	9.73	99.03	949.19	0.00	8.53
24/09/2019	19:07:18	14	12.00	100.00	943.37	0.00	7.39
25/09/2019	19:04:31	13	10.95	99.75	942.12	0.00	5.62
26/09/2019	19:01:45	12.3	9.10	96.27	937.52	0.00	7.27
27/09/2019	18:58:58	11.3	8.21	98.43	939.50	16.89	2.85
28/09/2019	18:56:12	10.3	8.94	99.65	946.54	0.00	5.29
29/09/2019	18:53:25	11.2	8.26	99.28	947.18	0.00	4.57
30/09/2019	18:50:39	7.7	4.36	99.77	950.83	235.46	4.99
04/10/2019	18:39:39	9.4	4.67	96.74	956.65	289.79	5.15
05/10/2019	18:36:54	9.5	7.29	99.60	956.22	0.00	5.21
06/10/2019	18:34:11	9.2	7.29	99.89	959.58	0.00	4.77
07/10/2019	18:31:27	9.5	6.76	87.27	942.45	0.00	6.27
08/10/2019	18:28:44	9.7	6.70	95.37	932.50	0.00	9.75
09/10/2019	18:26:02	8.9	7.35	87.55	933.61	0.00	15.38
10/10/2019	18:23:20	10.2	6.32	98.26	938.33	0.00	8.49
11/10/2019	18:20:39	9.2	6.80	88.80	934.50	0.00	16.20
12/10/2019	18:17:58	7.9	5.72	86.15	945.56	0.00	4.80
13/10/2019	18:15:18	9.2	6.38	95.35	946.38	258.58	2.15
14/10/2019	18:12:39	10.2	6.80	90.17	951.48	0.00	2.05

Automated Bat Detector (SM2) Results 2015 - 2019

Table A1.10a: Automated bat detector summary results 2015 (paired SM2s) - part 1

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	Number of bat passes*					Mean bat passes per night	Median bat passes per night	Max bat passes per night	Min bat passes per night
							MYSP	PIPI	PIPY	PLAUR	Total				
Spring	A	Clearfell	04/06/2015	11/06/2015	7	7		16			16	2.3	1	6	0
	B	Edge	04/06/2015	11/06/2015	7	7	5	263	5		273	39.0	49	73	0
	C	Edge	04/06/2015	11/06/2015	7	7	1	51	48		100	14.3	10	35	1
	D	Open	04/06/2015	11/06/2015	7	7		4	3		7	1.0	0	4	0
Spring Total					**28**		**6**	**334**	**56**	**0**	**396**	**14.1**			
Summer	A	Clearfell	16/07/2015	23/07/2015	7	7		1			1	0.1	0	1	0
	G	Edge	16/07/2015	23/07/2015	7	7		57			57	8.1	0	37	0
	C	Edge	23/07/2015	29/07/2015	6	6		1799	417		2216	369.3	420	590	143
	D	Open	23/07/2015	29/07/2015	6	6		2	1		3	0.5	0	2	0
	E	Edge	16/07/2015	29/07/2015	13	13	2	12	8		22	1.7	0	8	0
	F	Clearfell	16/07/2015	29/07/2015	13	13		1	3		4	0.3	0	2	0
Summer Total					**52**		**2**	**1872**	**429**	**0**	**2303**	**44.3**			
Autumn	A	Clearfell	15/09/2015	25/09/2015	10	10	3	23			26	2.6	1.5	10	0
	G	Edge	15/09/2015	25/09/2015	10	10	4	301	19		324	32.4	33.5	68	0
	C	Edge	15/09/2015	23/09/2015	8	8	5	2091	3199		5295	661.9	724.5	1289	31
	D	Open	15/09/2015	24/09/2015	9	9		12	10		22	2.4	0	12	0
	E	Edge	15/09/2015	24/09/2015	9	9	1	82	46	1	130	14.4	10	39	0
	F	Clearfell	15/09/2015	23/09/2015	8	8	2	4	4		10	1.3	0.5	5	0
Autumn Total					**54**		**15**	**2513**	**3278**	**1**	**5807**	**107.5**			
Total					**134**		**23**	**4719**	**3763**	**1**	**8506**	**63.5**			

*****MYsp = *Myotis* species, PIPI = *Pipistrellus pipistrellus*, PIPY = *Pipistrellus pygmaeus*, PLAUR = *Plecotus auritus*

Table A1.10b: Automated bat detector summary results 2015 (paired SM2s) - part 2

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	MY sp passes per night		PIPI passes per night		PIPY passes per night		PLAUR passes per night	
							Median	Max	Median	Max	Median	Max	Median	Max
Spring	A	Clearfell	04/06/2015	11/06/2015	7	7	0	0	1	6	0	0	0	0
	B	Edge	04/06/2015	11/06/2015	7	7	0	3	46	72	0	2	0	0
	C	Edge	04/06/2015	11/06/2015	7	7	0	1	7	16	4	23	0	0
	D	Open	04/06/2015	11/06/2015	7	7	0	0	0	3	0	1	0	0
Spring Total					**28**									
Summer	A	Clearfell	16/07/2015	23/07/2015	7	7	0	0	0	1	0	0	0	0
	G	Edge	16/07/2015	23/07/2015	7	7	0	0	0	37	0	0	0	0
	C	Edge	23/07/2015	29/07/2015	6	6	0	0	318	522	52.5	140	0	0
	D	Open	23/07/2015	29/07/2015	6	6	0	0	0	2	0	1	0	0
	E	Edge	16/07/2015	29/07/2015	13	13	0	1	0	5	0	3	0	0
	F	Clearfell	16/07/2015	29/07/2015	13	13	0	0	0	1	0	2	0	0
Summer Total					**52**									
Autumn	A	Clearfell	15/09/2015	25/09/2015	10	10	0	2	1	10	0	0	0	0
	G	Edge	15/09/2015	25/09/2015	10	10	0	2	32	67	0	8	0	0
	C	Edge	15/09/2015	23/09/2015	8	8	0	3	139.5	1096	380.5	927	0	0
	D	Open	15/09/2015	24/09/2015	9	9	0	0	0	8	0	4	0	0
	E	Edge	15/09/2015	24/09/2015	9	9	0	1	9	21	2	20	0	1
	F	Clearfell	15/09/2015	23/09/2015	8	8	0	1	0	2	0	3	0	0
Autumn Total					**54**									
Total					**134**									

*****MYsp = *Myotis* species, PIPI = *Pipistrellus pipistrellus*, PIPY = *Pipistrellus pygmaeus*, PLAUR = *Plecotus auritus*

Table A1.11a: Automated bat detector (SM2) results summary 2016 – part 1 (red indicates microphone failure during this survey period)

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	Number of bat passes*					Mean bat passes per night	Median bat passes per night	Max bat passes per night	Min bat passes per night
							MYSP	PIPI	PIPY	PLAUR	Total				
Early Spring	A	Pre-thicket	18/04/2016	26/04/2016	8	1	0	3	1	0	4	0.5	0	2	0
	G	Forest Edge	18/04/2016	02/05/2016	14	2	0	48	0	0	48	3.4	0	38	0
	C	Watercourse	18/04/2016	02/05/2016	14	2	0	9	2	0	11	0.8	0	6	0
	I	Pre-thicket	18/04/2016	02/05/2016	14	2	0	1	1	0	2	0.1	0	2	0
	D	Open moorland	18/04/2016	03/05/2016	15	3	0	0	0	0	0	0.0	0	0	0
	H	Forest Edge	18/04/2016	01/05/2016	13	1	0	8	2	0	10	0.8	0	10	0
	E	Forest Edge	18/04/2016	26/04/2016	8	1	Mic Failure				0	0.0			
	F	Clearfell	18/04/2016	29/04/2016	11	1	0	0	0	0	0	0.0	0	0	0
Early Spring Total					**97**		**0**	**69**	**6**	**0**	**75**	**0.8**			
Spring	A	Pre-thicket	17/05/2016	02/06/2016	16	14	0	9	0	0	9	0.6	0	2	0
	G	Forest Edge	17/05/2016	03/06/2016	17	14	0	19	0	0	19	1.1	0	8	0
	C	Watercourse	17/05/2016	04/06/2016	18	15	0	7	0	0	7	0.4	0	5	0
	I	Pre-thicket	17/05/2016	05/06/2016	19	16	0	28	4	0	32	1.7	0	14	0
	D	Open moorland	16/05/2016	02/06/2016	17	15	0	0	0	0	0	0.0	0	0	0
	H	Forest Edge	16/05/2016	02/06/2016	17	15	0	8	0	0	8	0.5	0	4	0
	E	Forest Edge	17/05/2016	30/05/2016	13	11	Mic Failure				0	0.0			
	F	Clearfell	17/05/2016	29/05/2016	12	10	0	2	2	0	4	0.3	0	2	0
Spring Total					**129**		**0**	**73**	**6**	**0**	**79**	**0.6**			
Summer	C	Watercourse	07/07/2016	21/07/2016	14	14	2	768	889	0	1659	118.5	94	299	17
	I	Pre-thicket	07/07/2016	21/07/2016	14	14	0	34	11	0	45	3.2	2.5	8	0
	E	Forest Edge	07/07/2016	27/07/2016	20	20	4	160	52	1	217	10.9	6.5	37	0
	F	Clearfell	07/07/2016	05/08/2016	29	29	0	17	8	0	25	0.9	0	6	0
	J	Clearfell	19/07/2016	04/08/2016	16	16	1	33	6	0	40	2.5	1	10	0
	K	Forest Edge	19/07/2016	05/08/2016	17	17	1	496	44	1	542	31.9	17	120	3

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	Number of bat passes*					Mean bat passes per night	Median bat passes per night	Max bat passes per night	Min bat passes per night
							MYSP	PIPI	PIPY	PLAUR	Total				
	L	Forest Edge	19/07/2016	05/08/2016	17	17	4	296	62	1	363	21.4	15	76	0
	M	Clearfell	19/07/2016	06/08/2016	18	18	0	17	5	1	23	1.3	0	9	0
	N	Open moorland	21/07/2016	07/08/2016	17	17	0	7	3	0	10	0.6	0	2	0
	O	Forest Edge	21/07/2016	08/08/2016	18	18	6	206	34	0	246	13.7	7.5	62	0
Summer total					**180**		**18**	**2034**	**1114**	**4**	**3170**	**17.6**			
Total					**406**		**18**	**2176**	**1126**	**4**	**3324**	**8.2**			

MYsp = *Myotis* species, PIPI = *Pipistrellus pipistrellus*, PIPY = *Pipistrellus pygmaeus*, PLAUR = *Plecotus auritus

Table A1.11b: Automated bat detector (SM2) results summary 2016 – part 2 (red indicates microphone failure during this survey period)

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	MY sp passes per night		PIPI passes per night		PIPY passes per night		PLAUR passes per night	
							Median	Max	Median	Max	Median	Max	Median	Max
Early Spring	A	Pre-thicket	18/04/2016	26/04/2016	8	1	0	0	0	2	0	1	0	0
	G	Forest Edge	18/04/2016	02/05/2016	14	2	0	0	0	38	0	0	0	0
	C	Watercourse	18/04/2016	02/05/2016	14	2	0	0	0	4	0	2	0	0
	I	Pre-thicket	18/04/2016	02/05/2016	14	2	0	0	0	1	0	1	0	0
	D	Open moorland	18/04/2016	03/05/2016	15	3	0	0	0	0	0	0	0	0
	H	Forest Edge	18/04/2016	01/05/2016	13	1	0	0	0	8	0	2	0	0
	E	Forest Edge	18/04/2016	26/04/2016	8	1								
	F	Clearfell	18/04/2016	29/04/2016	11	1	0	0	0	0	0	0	0	0
Early Spring Total					**97**									
Spring	A	Pre-thicket	17/05/2016	02/06/2016	16	14	0	0	0	2	0	0	0	0

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	MY sp passes per night		PIPI passes per night		PIPY passes per night		PLAUR passes per night	
							Median	Max	Median	Max	Median	Max	Median	Max
	G	Forest Edge	17/05/2016	03/06/2016	17	14	0	0	0	8	0	0	0	0
	C	Watercourse	17/05/2016	04/06/2016	18	15	0	0	0	5	0	0	0	0
	I	Pre-thicket	17/05/2016	05/06/2016	19	16	0	0	0	12	0	2	0	0
	D	Open moorland	16/05/2016	02/06/2016	17	15	0	0	0	0	0	0	0	0
	H	Forest Edge	16/05/2016	02/06/2016	17	15	0	0	0	4	0	0	0	0
	E	Forest Edge	17/05/2016	30/05/2016	13	11								
	F	Clearfell	17/05/2016	29/05/2016	12	10	0	0	0	1	0	1	0	0
Spring Total					**129**									
Summer	C	Watercourse	07/07/2016	21/07/2016	14	14	0	1	32	184	53.5	186	0	0
	I	Pre-thicket	07/07/2016	21/07/2016	14	14	0	0	2.5	5	1	3	0	0
	E	Forest Edge	07/07/2016	27/07/2016	20	20	0	2	5.5	26	1.5	13	0	1
	F	Clearfell	07/07/2016	05/08/2016	29	29	0	0	0	4	0	2	0	0
	J	Clearfell	19/07/2016	04/08/2016	16	16	0	1	1	10	0	2	0	0
	K	Forest Edge	19/07/2016	05/08/2016	17	17	0	1	13	116	2	9	0	1
	L	Forest Edge	19/07/2016	05/08/2016	17	17	0	2	12	53	1	22	0	1
	M	Clearfell	19/07/2016	06/08/2016	18	18	0	0	0	7	0	2	0	1
	N	Open moorland	21/07/2016	07/08/2016	17	17	0	0	0	2	0	1	0	0
	O	Forest Edge	21/07/2016	08/08/2016	18	18	0	3	6.5	61	1	9	0	0
Summer total					**180**									
Total					**406**									

*****MYsp = *Myotis* species, PIPI = *Pipistrellus pipistrellus*, PIPY = *Pipistrellus pygmaeus*, PLAUR = *Plecotus auritus*

Table A1.12a: Automated bat detector (SM2) results summary 2019 – part 1

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8°	Number of bat passes*					Mean bat passes per night	Median bat passes per night	Max bat passes per night	Min bat passes per night
							MYSP	PIPI	PIPY	PLAUR	Total				
Spring	A	Edge	23/05/2019	11/06/2019	19	15		20	15		35	1.8	1	8	0
	B	Open	23/05/2019	09/06/2019	17	13		10	3		13	0.8	0	4	0
	C	Edge	23/05/2019	09/06/2019	17	13	1	18			19	1.1	0	5	0
	D	Open	23/05/2019	10/06/2019	18	14		3			3	0.2	0	2	0
	E/O	Edge	23/05/2019	06/06/2019	14	10		9	6		15	1.1	0	5	0
	F/P	Open	23/05/2019	10/06/2019	18	14	1	9	2		12	0.7	0	3	0
	G	Open	12/06/2019	02/07/2019	20	19	1	89	44		134	6.7	4	39	0
	H	Edge	12/06/2019	30/06/2019	18	17		94	186		280	15.6	12	49	0
	I	Open	12/06/2019	01/07/2019	19	18	1	46	60		107	5.6	4	19	0
	J	Edge	12/06/2019	01/07/2019	19	18	1	35	190		226	11.9	11	29	0
	K	Open	12/06/2019	29/06/2019	17	16		23	4	1	28	1.6	2	5	0
	L	Edge	12/06/2019	30/06/2019	18	17		376	62		438	24.3	11	96	0
Spring Total					**214**		**5**	**732**	**572**	**1**	**1310**	**6.1**			
Summer	A	Edge	03/07/2019	20/07/2019	17	17	3	36	10		49	2.9	1	11	0
	B	Open	03/07/2019	19/07/2019	16	16	19	22	13		54	3.4	2.5	13	0
	E/O	Edge	02/07/2019	20/07/2019	18	18	1	9	3		13	0.7	0	8	0
	F/P	Open	02/07/2019	21/07/2019	19	19	12	12	3		27	1.4	1	5	0
	G	Open	24/07/2019	09/08/2019	16	16	3	21	11		35	2.2	2	6	0
	H	Edge	24/07/2019	10/08/2019	17	17	1	504	279		784	46.1	23	159	0
	I	Open	24/07/2019	09/08/2019	16	16	3	106	14	2	125	7.8	4.5	32	0
	J	Edge	24/07/2019	09/08/2019	16	16	3	90	317	2	412	25.8	25	66	0
	K	Open	24/07/2019	08/08/2019	15	15		42	11	1	54	3.6	2	13	0
	L	Edge	24/07/2019	09/08/2019	16	16	2	370	78	1	451	28.2	19.5	104	0
	M	Edge	03/07/2019	21/07/2019	18	18		22	2	1	25	1.4	1	7	0

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	Number of bat passes*					Mean bat passes per night	Median bat passes per night	Max bat passes per night	Min bat passes per night
							MYSP	PIPI	PIPY	PLAUR	Total				
	N	Open	03/07/2019	20/07/2019	17	17		16	2		18	1.1	1	4	0
Summer Total					**201**		**47**	**1250**	**743**	**7**	**2047**	**10.2**			
Autumn	A	Edge	04/10/2019	15/10/2019	11	10		3	7	1	11	1.0	1	4	0
	B	Open	04/10/2019	14/10/2019	10	9		3	2		5	0.5	0	2	0
	E/O	Edge	19/09/2019	30/09/2019	11	11	4	11	18	1	34	3.1	2	10	0
	F/P	Open	19/09/2019	30/09/2019	11	11	3	14	9		26	2.4	2	5	0
	G	Open	19/09/2019	29/09/2019	10	10	3	21	13		37	3.7	3.5	9	0
	H	Edge	19/09/2019	30/09/2019	11	11		193	157		350	31.8	15	89	0
	I	Open	04/10/2019	15/10/2019	11	10	3	19	7	2	31	2.8	1	14	0
	J	Edge	04/10/2019	14/10/2019	10	9		3	9		12	1.2	1	5	0
	K	Open	04/10/2019	15/10/2019	11	10	1	2	1	1	5	0.5	0	1	0
	L	Edge	04/10/2019	15/10/2019	11	10	5	11	4	2	22	2.0	2	5	0
	M	Edge	19/09/2019	01/10/2019	12	11		67	4	1	72	6.0	1.5	49	0
	N	Open	19/09/2019	01/10/2019	12	11		22	2		24	2.0	0	18	0
Autumn total					**131**		**19**	**369**	**233**	**8**	**629**	**4.8**			
Total					**546**		**71**	**2351**	**1548**	**16**	**3986**	**7.3**			

*****MYsp = *Myotis* species, PIPI = *Pipistrellus pipistrellus*, PIPY = *Pipistrellus pygmaeus*, PLAUR = *Plecotus auritus*

Table A1.12b: Automated bat detector (SM2) results summary 2019 – part 2

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8°	MY sp passes per night		PIPI passes per night		PIPY passes per night		PLAUR passes per night	
							Median	Max	Median	Max	Median	Max	Median	Max
Spring	A	Edge	23/05/2019	11/06/2019	19	15	0	0	0	5	0	4	0	0
	B	Open	23/05/2019	09/06/2019	17	13	0	0	0	3	0	1	0	0
	C	Edge	23/05/2019	09/06/2019	17	13	0	1	0	5	0	0	0	0
	D	Open	23/05/2019	10/06/2019	18	14	0	0	0	2	0	0	0	0
	E/O	Edge	23/05/2019	06/06/2019	14	10	0	0	0	5	0	3	0	0
	F/P	Open	23/05/2019	10/06/2019	18	14	0	1	0	2	0	1	0	0
	G	Open	12/06/2019	02/07/2019	20	19	0	1	2	28	1	10	0	0
	H	Edge	12/06/2019	30/06/2019	18	17	0	0	3	17	8	42	0	0
	I	Open	12/06/2019	01/07/2019	19	18	0	1	1	12	1	18	0	0
	J	Edge	12/06/2019	01/07/2019	19	18	0	1	1	6	10	28	0	0
	K	Open	12/06/2019	29/06/2019	17	16	0	0	1	4	0	1	0	1
	L	Edge	12/06/2019	30/06/2019	18	17	0	0	9	82	1	17	0	0
Spring Total					**214**									
Summer	A	Edge	03/07/2019	20/07/2019	17	17	0	1	0	10	0	4	0	0
	B	Open	03/07/2019	19/07/2019	16	16	0	12	0.5	5	0.5	3	0	0
	E/O	Edge	02/07/2019	20/07/2019	18	18	0	1	0	5	0	3	0	0
	F/P	Open	02/07/2019	21/07/2019	19	19	0	4	0	5	0	1	0	0
	G	Open	24/07/2019	09/08/2019	16	16	0	1	1	3	0	4	0	0
	H	Edge	24/07/2019	10/08/2019	17	17	0	1	13	144	8	74	0	0
	I	Open	24/07/2019	09/08/2019	16	16	0	2	3	28	0	4	0	1
	J	Edge	24/07/2019	09/08/2019	16	16	0	1	3.5	16	15.5	65	0	1
	K	Open	24/07/2019	08/08/2019	15	15	0	0	2	8	0	5	0	1
	L	Edge	24/07/2019	09/08/2019	16	16	0	2	14.5	78	3	26	0	1

Season	Site	Habitat Type	Start	End	Nights out	No nights sunset temp >= 8º	MY sp passes per night		PIPI passes per night		PIPY passes per night		PLAUR passes per night	
							Median	Max	Median	Max	Median	Max	Median	Max
	M	Edge	03/07/2019	21/07/2019	18	18	0	0	0.5	7	0	1	0	1
	N	Open	03/07/2019	20/07/2019	17	17	0	0	1	4	0	1	0	0
Summer Total					**201**									
Autumn	A	Edge	04/10/2019	15/10/2019	11	10	0	0	0	2	0	4	0	1
	B	Open	04/10/2019	14/10/2019	10	9	0	0	0	1	0	1	0	0
	E/O	Edge	19/09/2019	30/09/2019	11	11	0	1	0	4	1	5	0	1
	F/P	Open	19/09/2019	30/09/2019	11	11	0	2	1	3	1	2	0	0
	G	Open	19/09/2019	29/09/2019	10	10	0	2	2.5	4	1	5	0	0
	H	Edge	19/09/2019	30/09/2019	11	11	0	0	5	50	12	46	0	0
	I	Open	04/10/2019	15/10/2019	11	10	0	1	0	14	0	5	0	2
	J	Edge	04/10/2019	14/10/2019	10	9	0	0	0	2	0	5	0	0
	K	Open	04/10/2019	15/10/2019	11	10	0	1	0	1	0	1	0	1
	L	Edge	04/10/2019	15/10/2019	11	10	0	2	0	5	0	2	0	1
	M	Edge	19/09/2019	01/10/2019	12	11	0	0	1.5	46	0	3	0	1
	N	Open	19/09/2019	01/10/2019	12	11	0	0	0	16	0	2	0	0
Autumn total					**131**									
Total					**546**									

*****MYsp = *Myotis* species, PIPI = *Pipistrellus pipistrellus*, PIPY = *Pipistrellus pygmaeus*, PLAUR = *Plecotus auritus*

APPENDIX 2: Full Set of Bat Activity Summary Plots and Charts

This appendix provides a full set of bat activity summary plots and charts derived from SM2 data from 2015, 2016 and 2019:

Figure A.2.1a Percentage of Bat Activity by Species / Genus by Site 2015

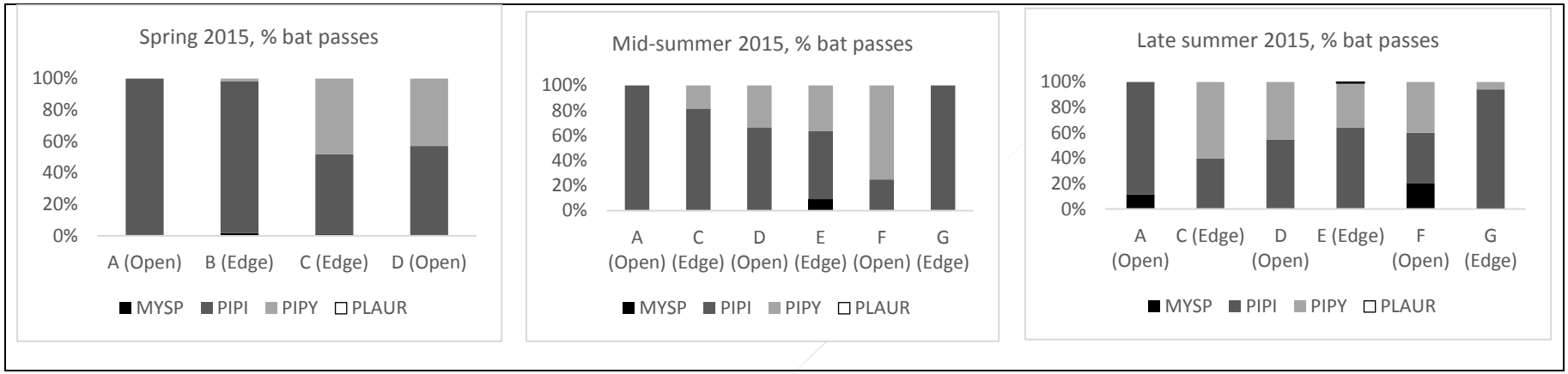


Figure A.2.1b Percentage of Bat Activity by Species / Genus by Site 2016

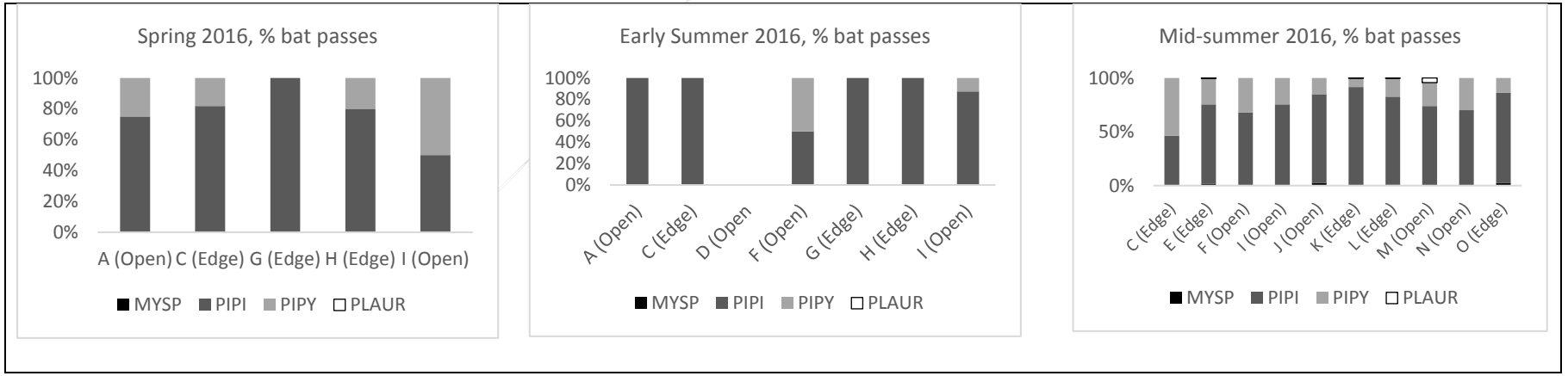


Figure A.2.1c Percentage of Bat Activity by Species / Genus by Site 2019

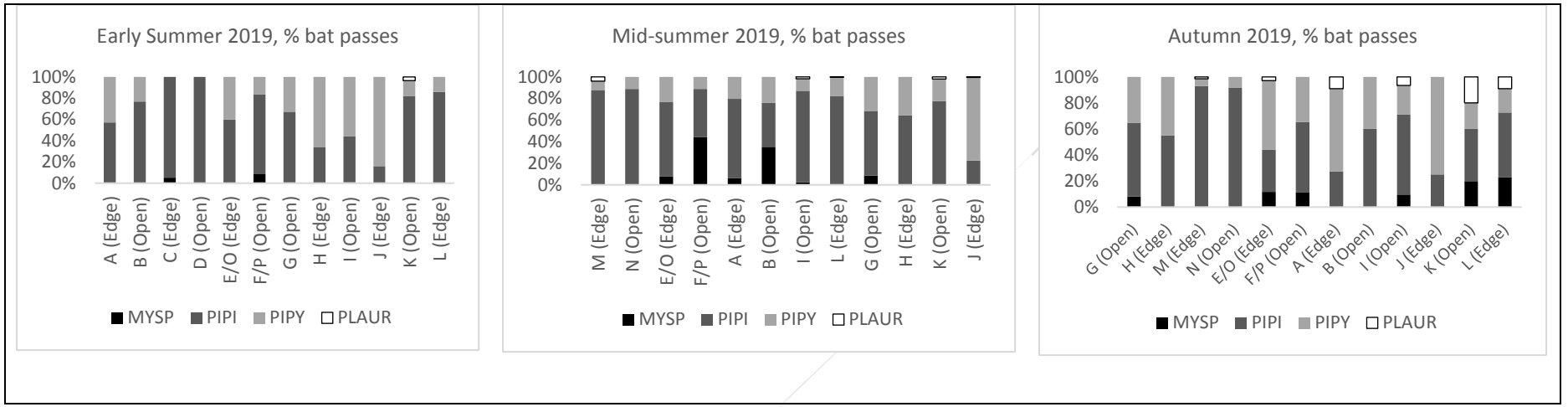
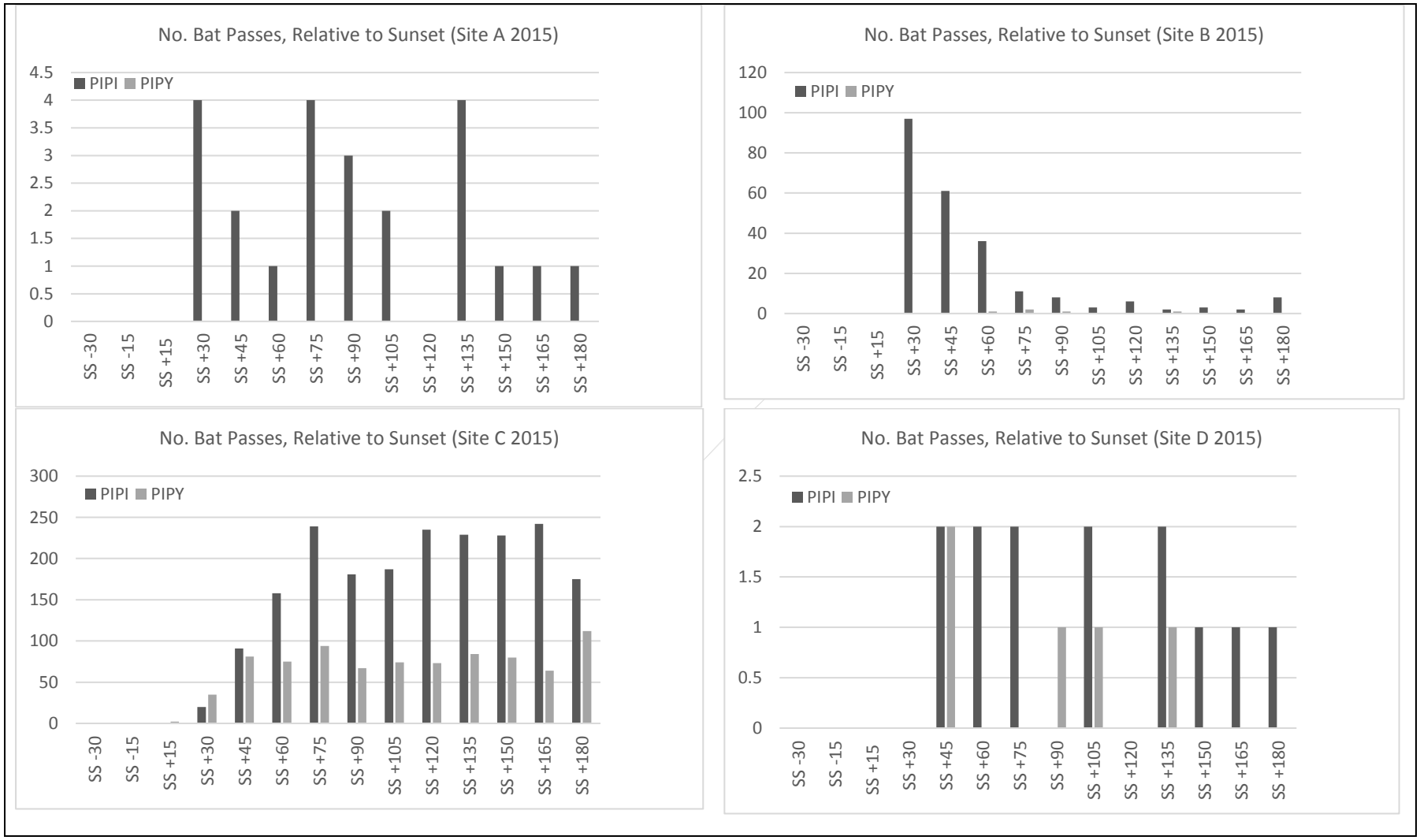


Figure A.2.2a Bat Activity Relative to Sunset 2015



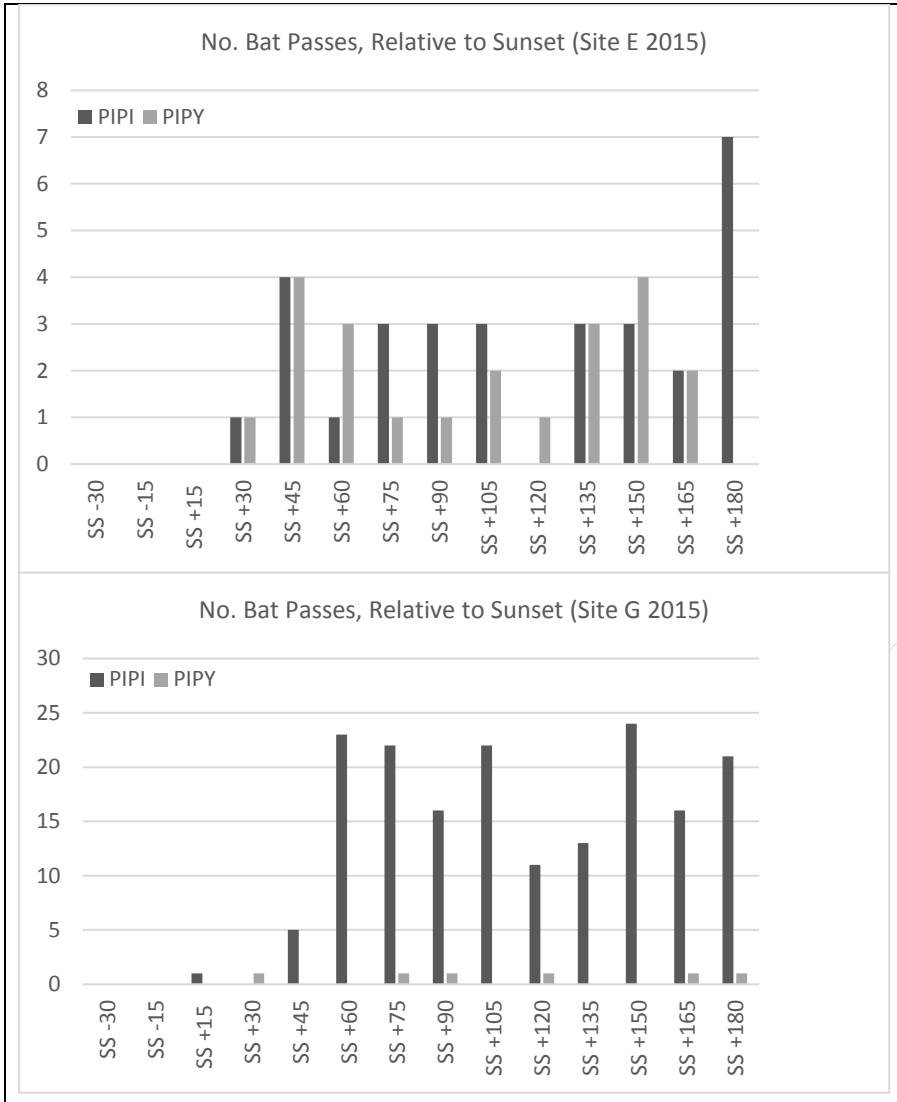
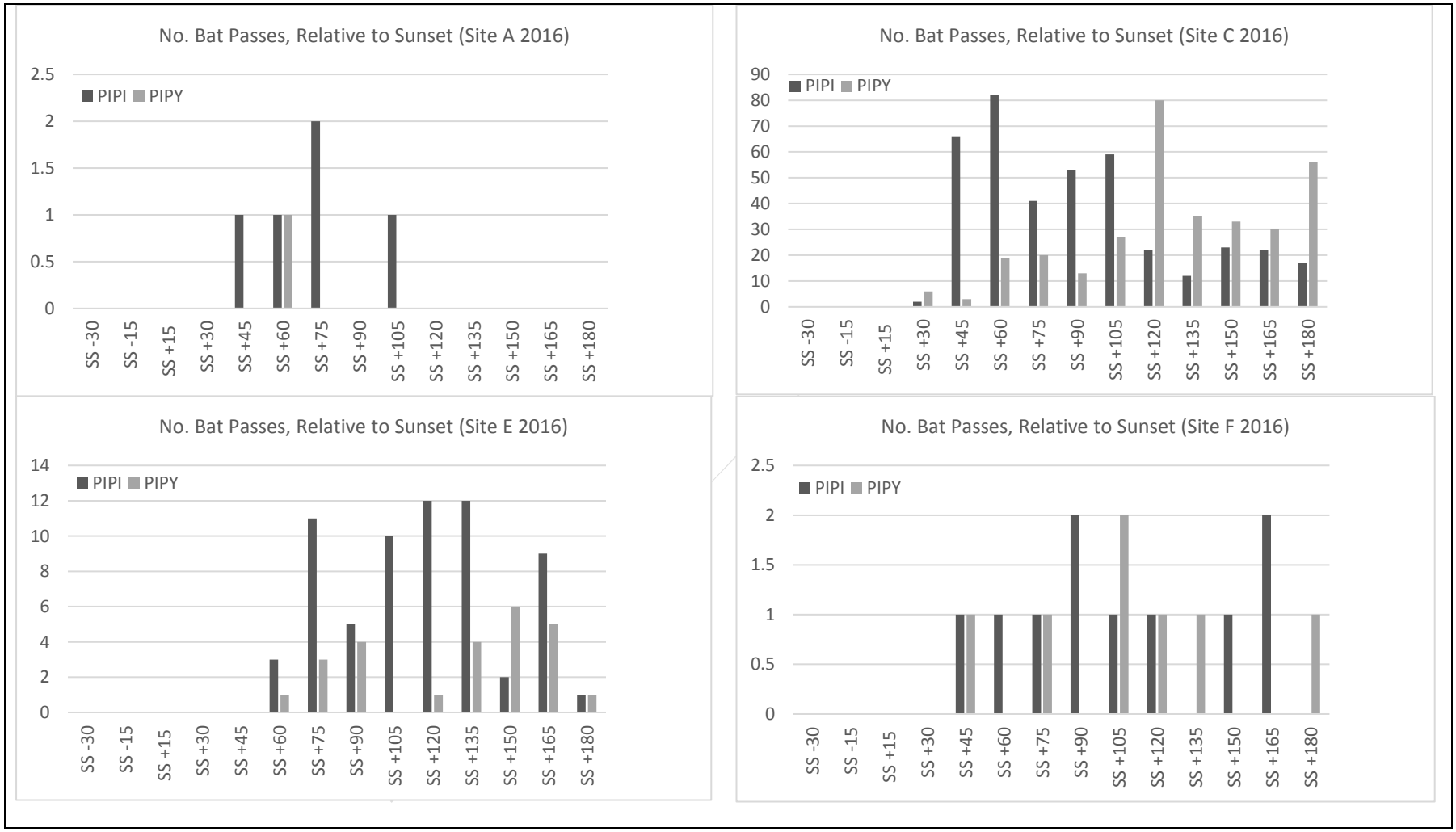
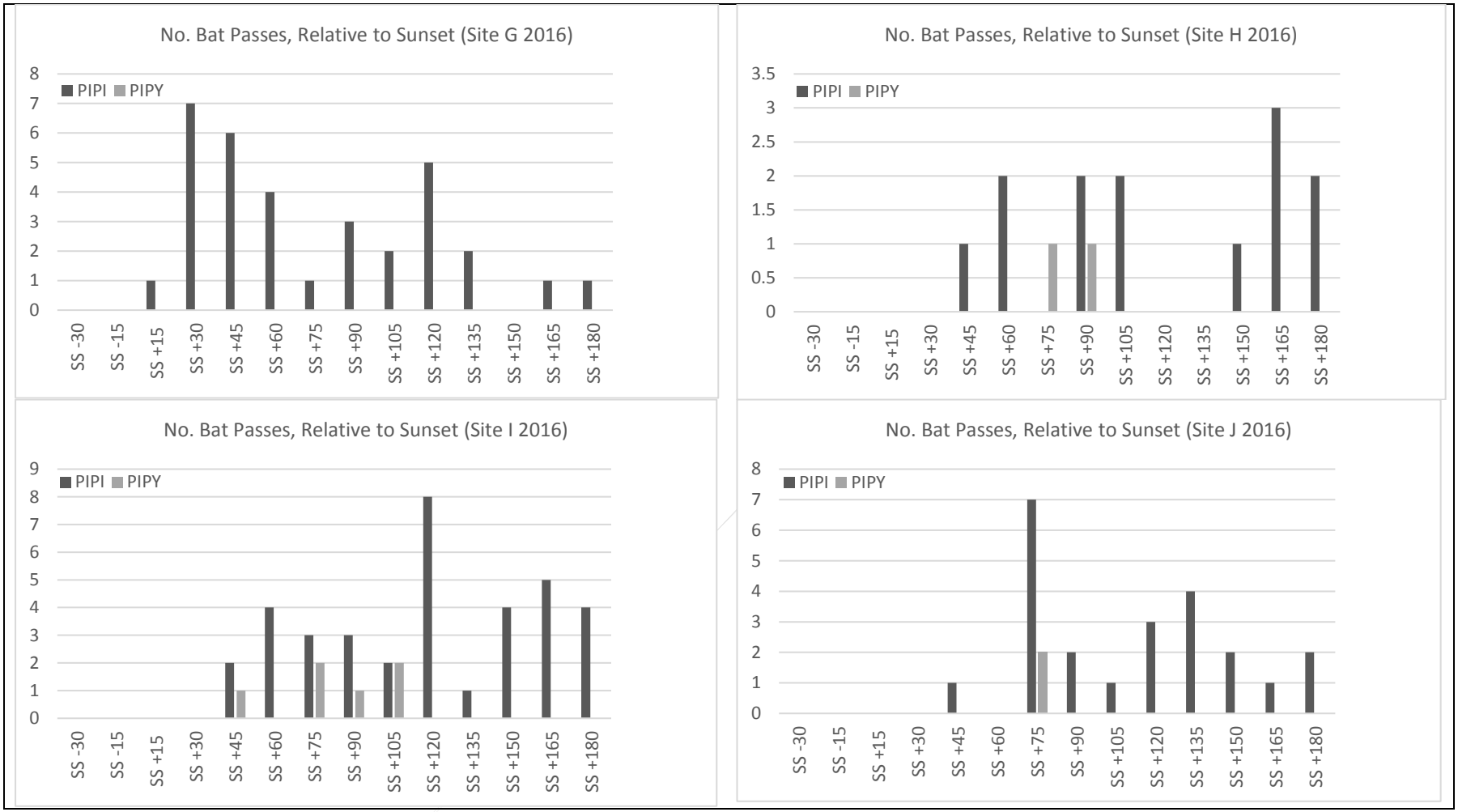
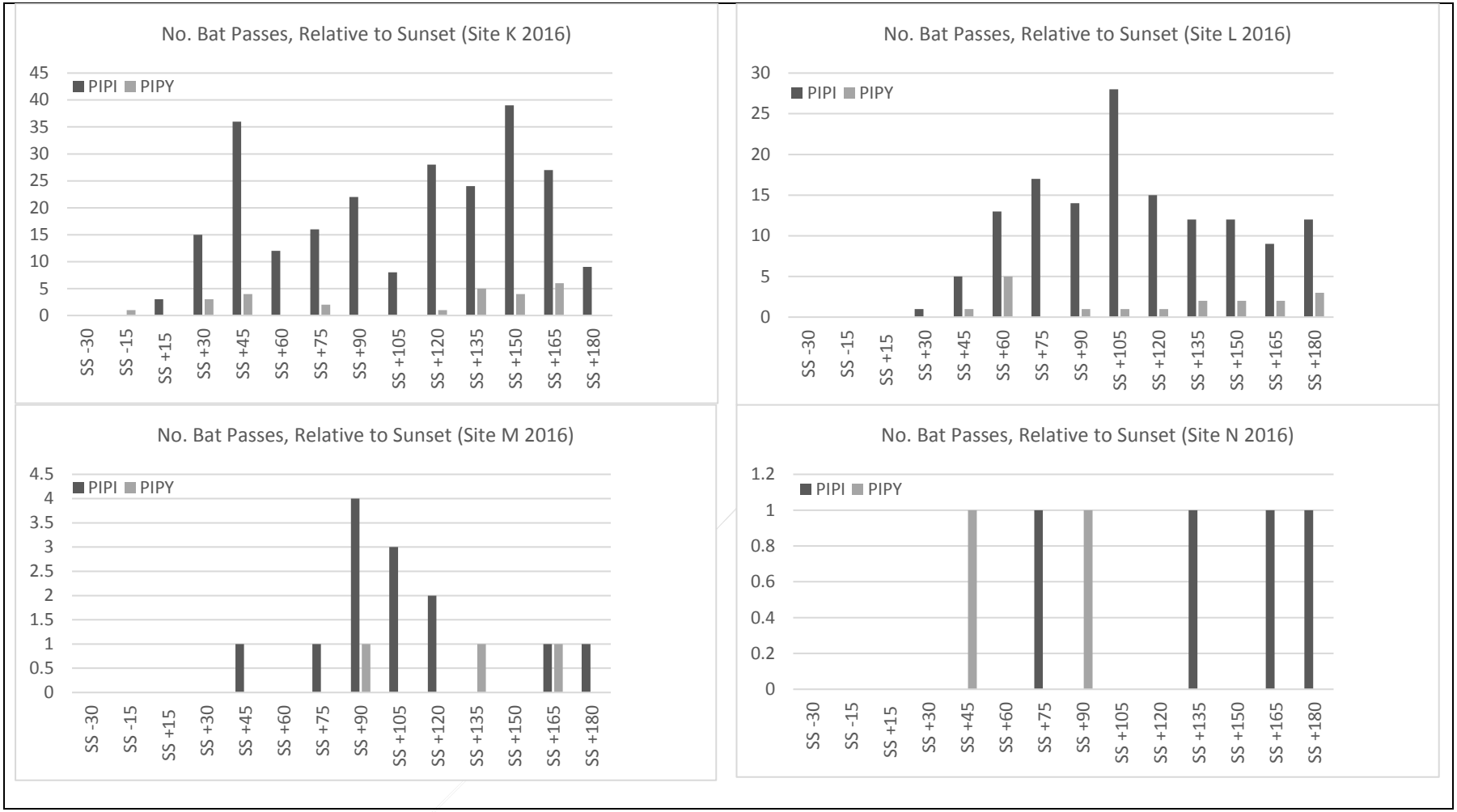

No. Bat Passes, Relative to Sunset (Site E 2015)
PIPI
PIPY
0
1
2
3
4
5
6
7
8
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site G 2015)
PIPI
PIPY
0
5
10
15
20
25
30
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site F 2015)
PIPI
PIPY
0
0.5
1
1.5
2
2.5
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180

Figure A.2.2b Bat Activity Relative to Sunset 2016




No. Bat Passes, Relative to Sunset (Site G 2016)
PIPI
PIPY
0
1
2
3
4
5
6
7
8
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site H 2016)
PIPI
PIPY
0
0.5
1
1.5
2
2.5
3
3.5
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site I 2016)
PIPI
PIPY
0
1
2
3
4
5
6
7
8
9
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site J 2016)
PIPI
PIPY
0
1
2
3
4
5
6
7
8
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180


No. Bat Passes, Relative to Sunset (Site K 2016)
PIPI
PIPY
45
40
35
30
25
20
15
10
5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site L 2016)
PIPI
PIPY
30
25
20
15
10
5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site M 2016)
PIPI
PIPY
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site N 2016)
PIPI
PIPY
1.2
1
0.8
0.6
0.4
0.2
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180

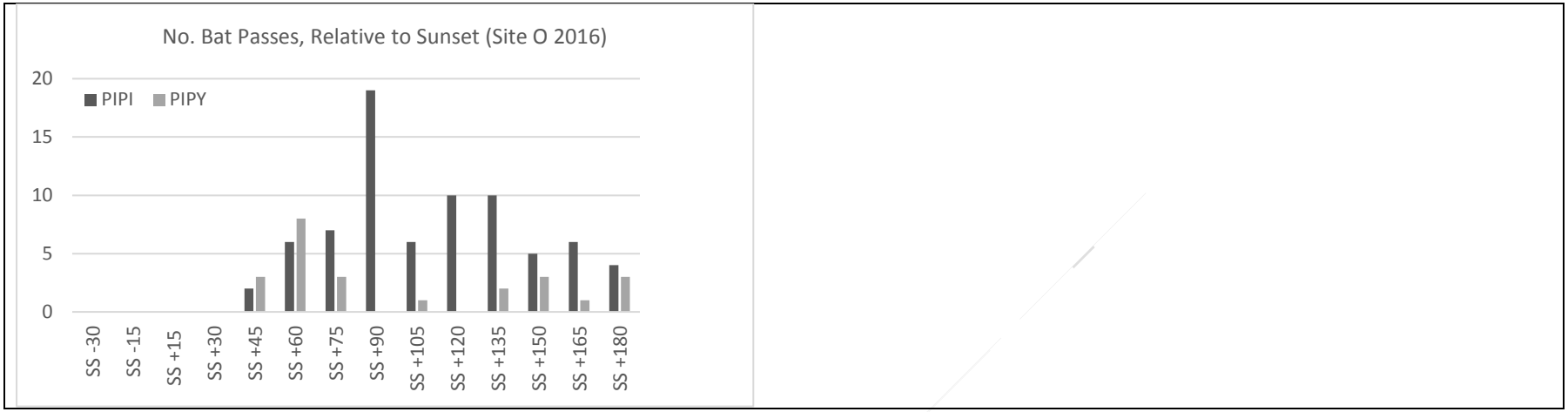
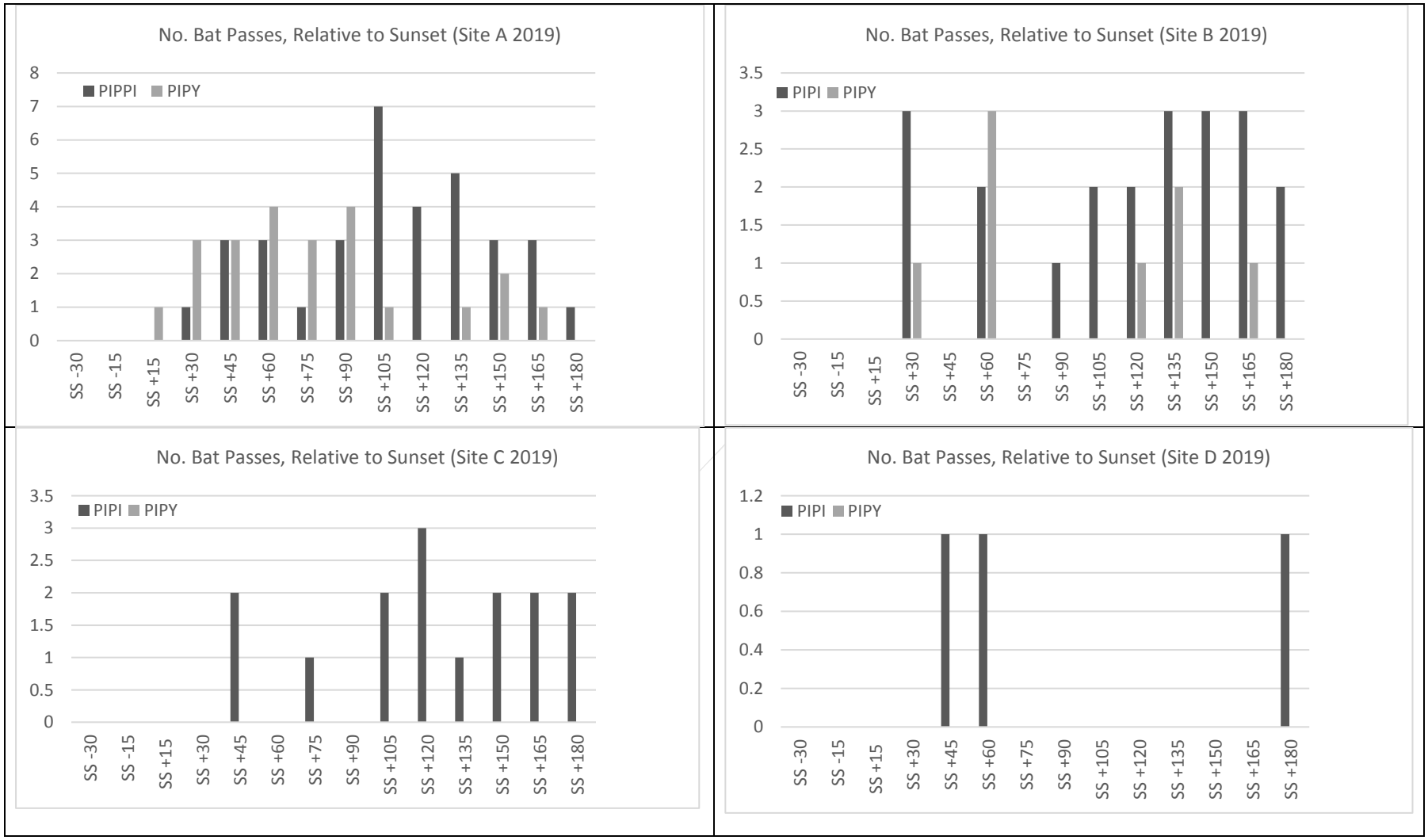
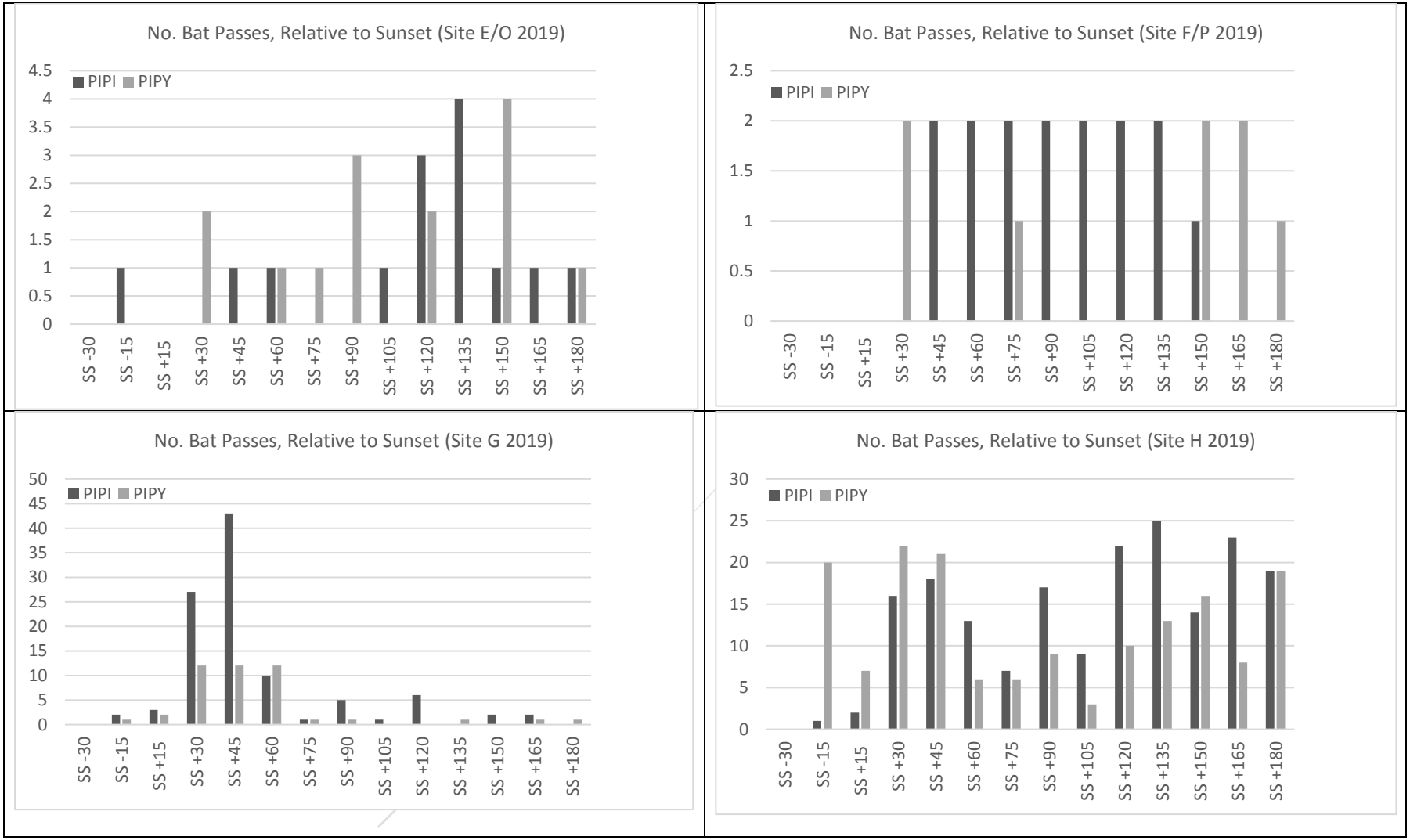
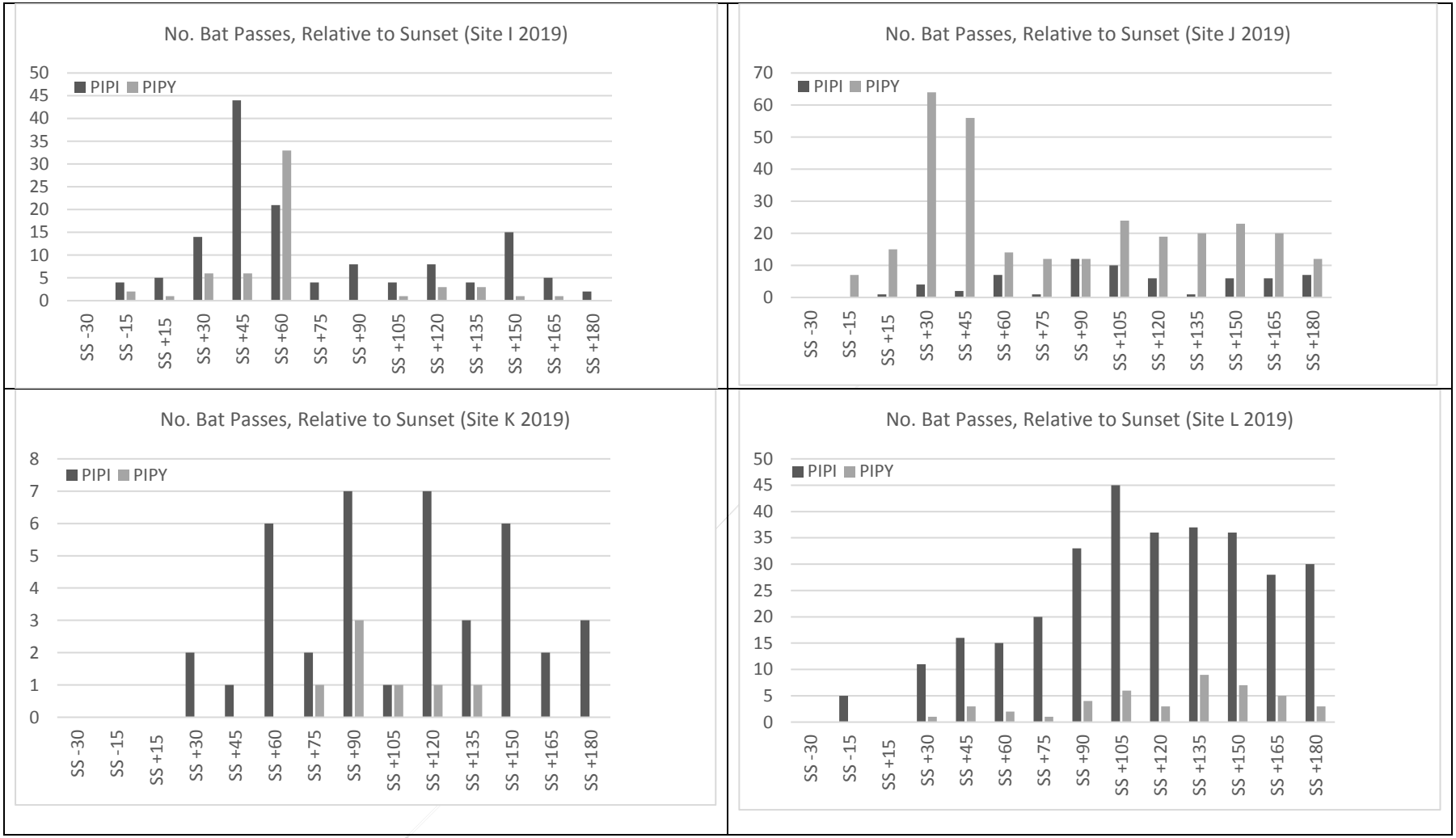
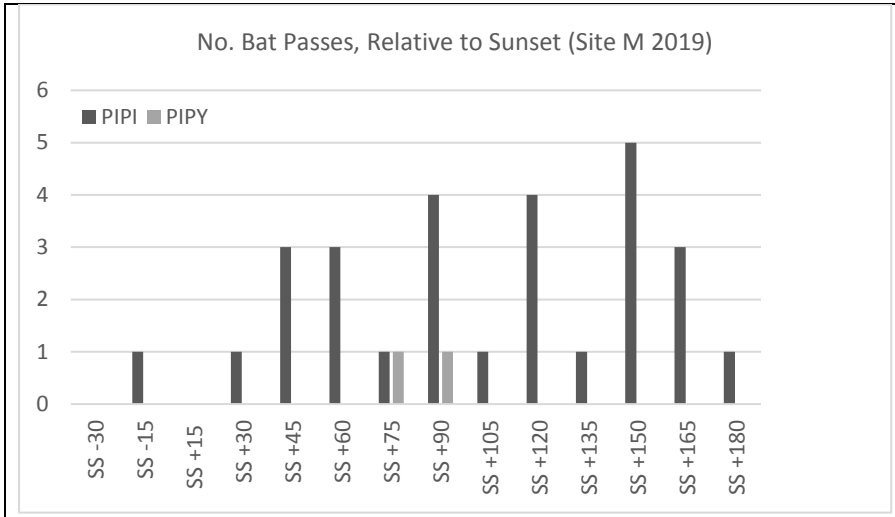

No. Bat Passes, Relative to Sunset (Site O 2016)
20
15
10
5
0
PIPI
PIPY
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180

Figure A.2.2c Bat Activity Relative to Sunset 2019




No. Bat Passes, Relative to Sunset (Site E/O 2019)
PIPI
PIPY
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site F/P 2019)
PIPI
PIPY
2.5
2
1.5
1
0.5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site G 2019)
PIPI
PIPY
50
45
40
35
30
25
20
15
10
5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site H 2019)
PIPI
PIPY
30
25
20
15
10
5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180


No. Bat Passes, Relative to Sunset (Site I 2019)
PIPI
PIPY
50
45
40
35
30
25
20
15
10
5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site J 2019)
PIPI
PIPY
70
60
50
40
30
20
10
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site K 2019)
PIPI
PIPY
8
7
6
5
4
3
2
1
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180
No. Bat Passes, Relative to Sunset (Site L 2019)
PIPI
PIPY
50
45
40
35
30
25
20
15
10
5
0
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180


No. Bat Passes, Relative to Sunset (Site M 2019)
PIPI
PIPY
0
1
2
3
4
5
6
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180

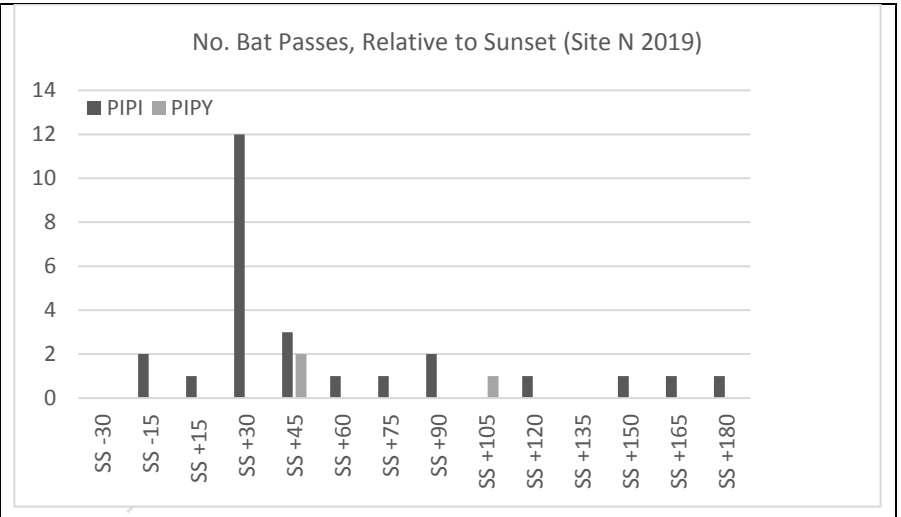
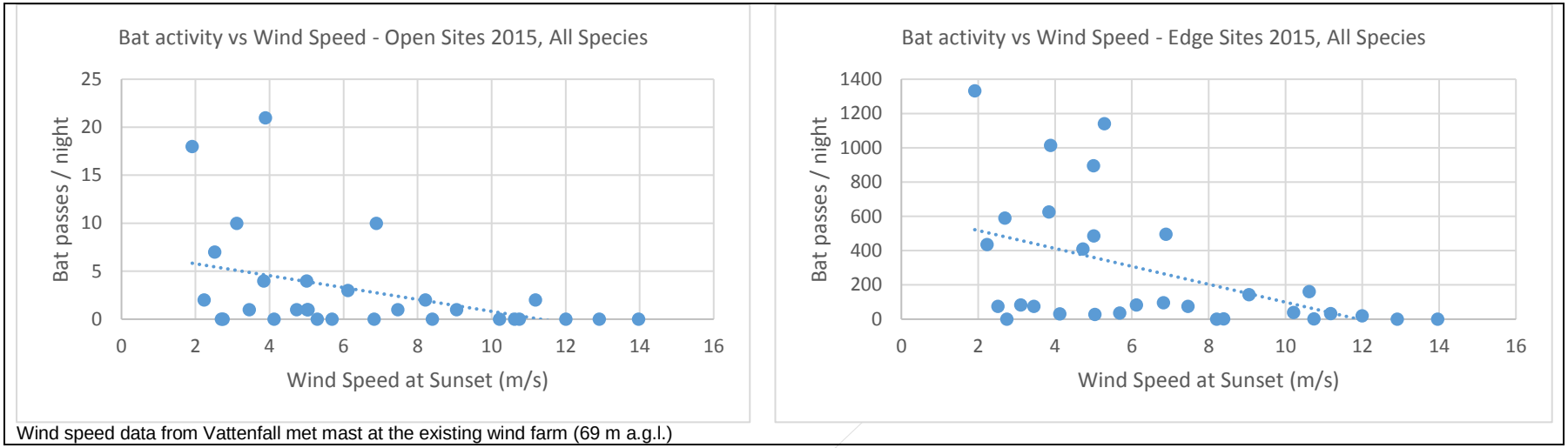
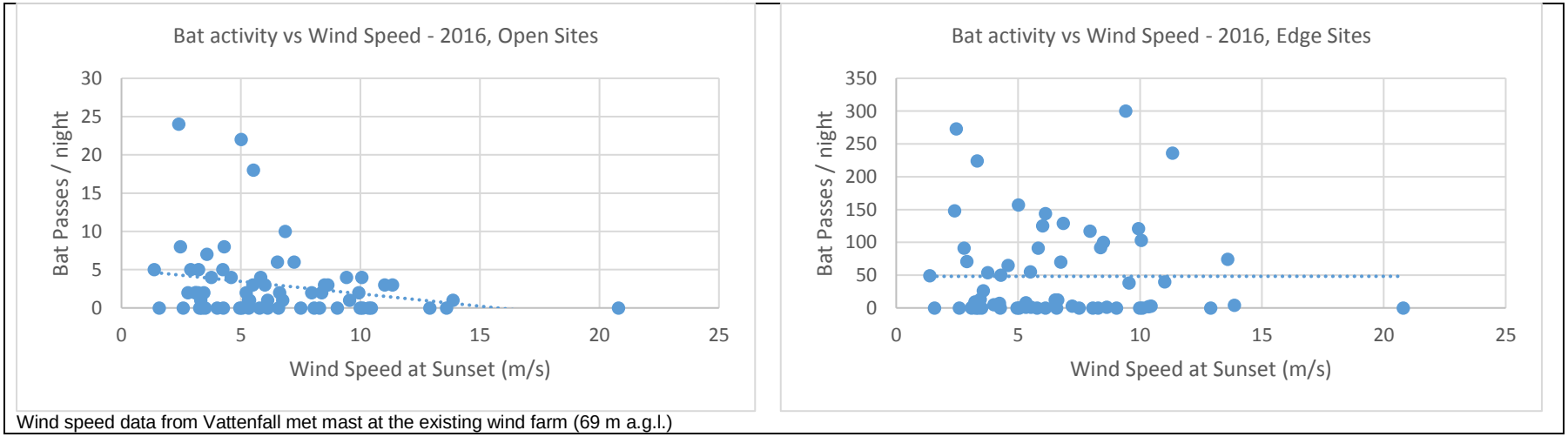

No. Bat Passes, Relative to Sunset (Site N 2019)
PIPI
PIPY
0
2
4
6
8
10
12
14
SS -30
SS -15
SS +15
SS +30
SS +45
SS +60
SS +75
SS +90
SS +105
SS +120
SS +135
SS +150
SS +165
SS +180

Figure A.2.3a Bat Activity Relative to Wind Speed 2015



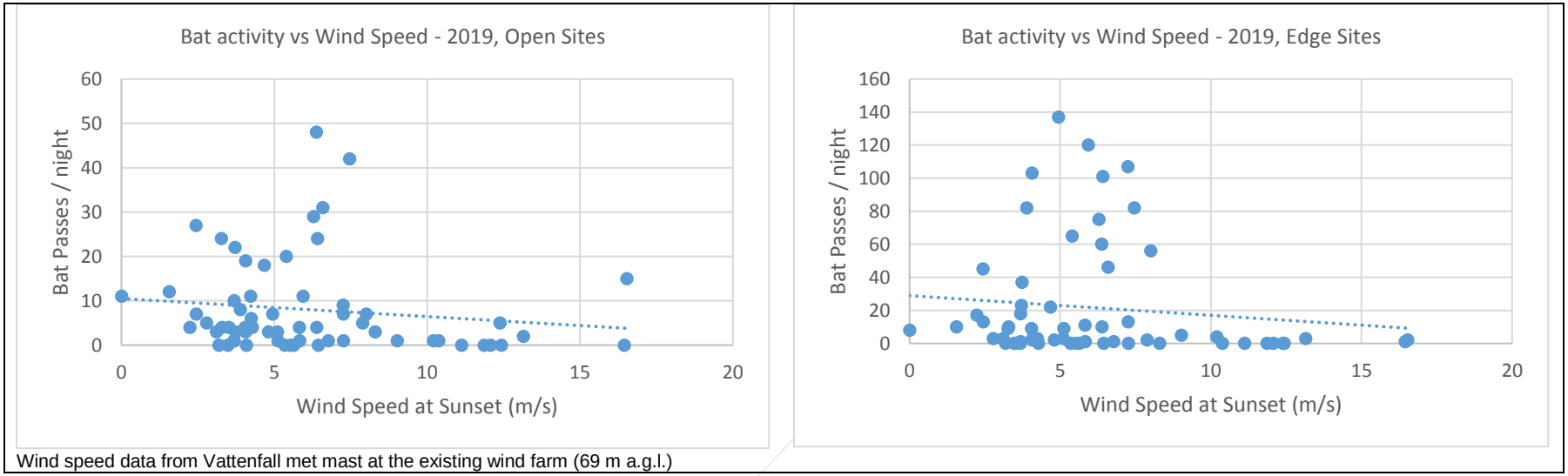
Wind speed data from Vattenfall met mast at the existing wind farm (69 m a.g.l.)

Figure A.2.3b Bat Activity Relative to Wind Speed 2016



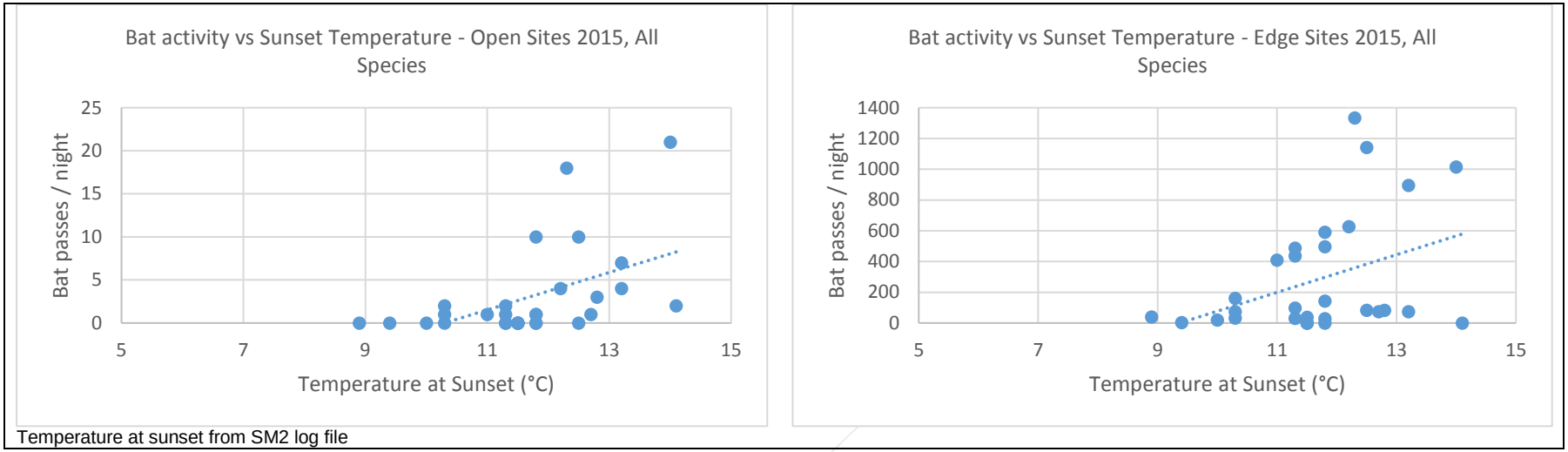
Wind speed data from Vattenfall met mast at the existing wind farm (69 m a.g.l.)

Figure A.2.3c Bat Activity Relative to Wind Speed 2019



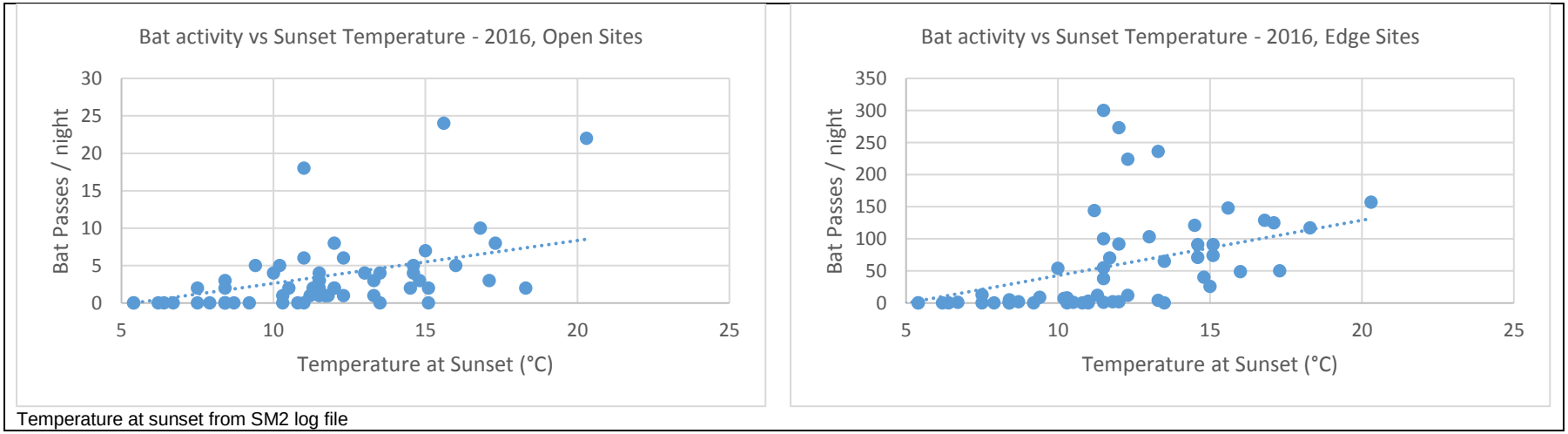
Wind speed data from Vattenfall met mast at the existing wind farm (69 m a.g.l.)

Figure A.2.4a Bat Activity Relative to Temperature at Sunset 2015



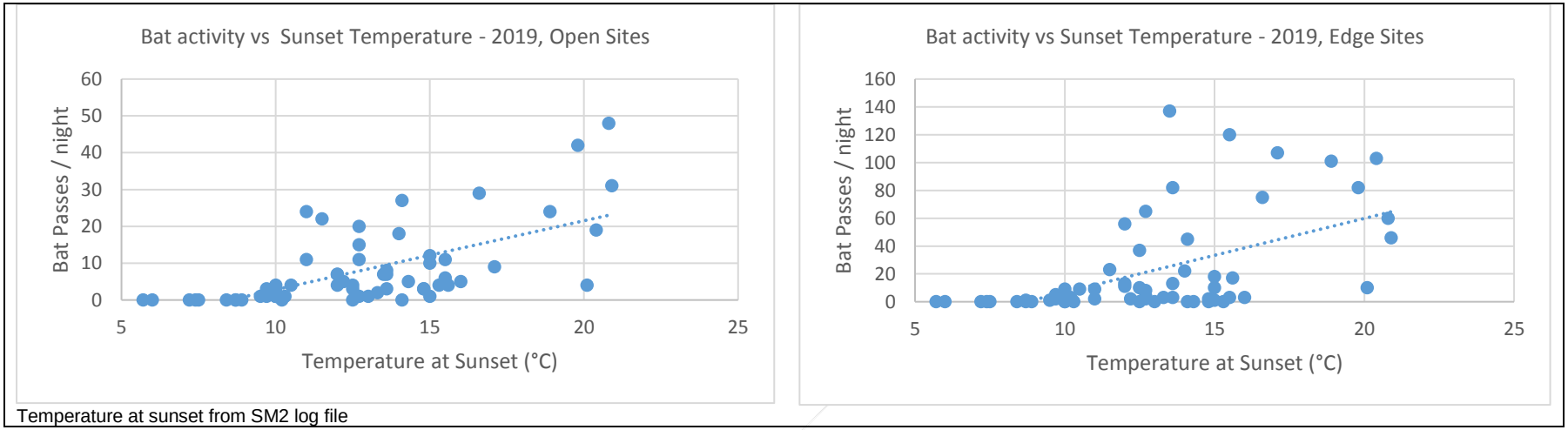
Temperature at sunset from SM2 log file

Figure A.2.4b Bat Activity Relative to Temperature at Sunset 2016



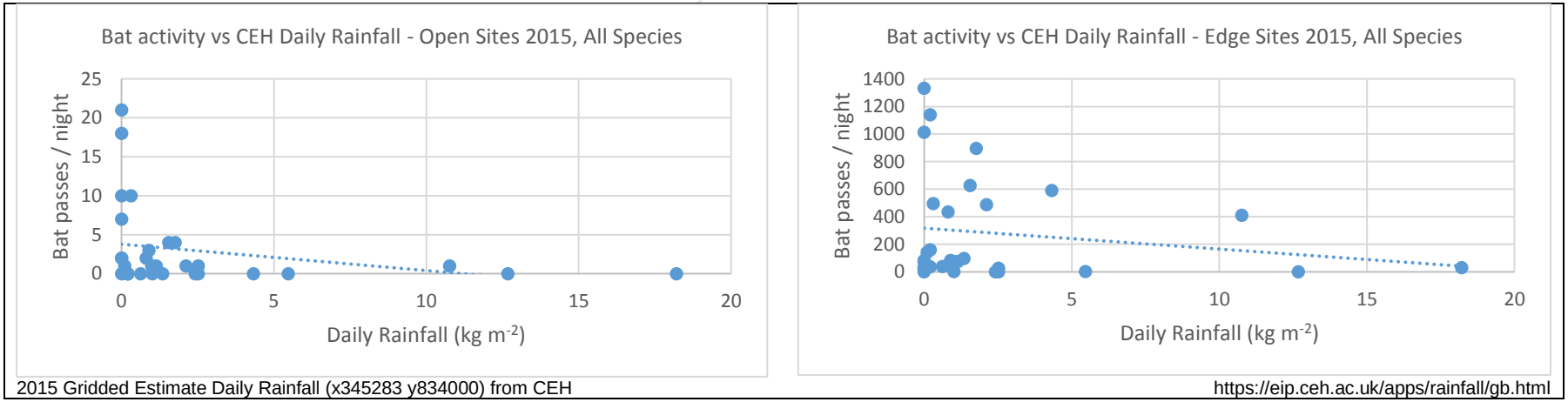
Temperature at sunset from SM2 log file

Figure A.2.4c Bat Activity Relative to Temperature at Sunset 2019



Temperature at sunset from SM2 log file

Figure A.2.5 Bat Activity Relative to Estimated Daily Rainfall 2015



2015 Gridded Estimate Daily Rainfall (x345283 y834000) from CEH https://eip.ceh.ac.uk/apps/rainfall/gb.html

APPENDIX 3: Ecobat Analysis Output for Reference Dataset Comparisons

This appendix provides the tabulated results of the Ecobat analysis output for reference dataset comparisons. Tables A3.1 – A3.6 provide a summary of the bat activity survey data in the form of nights of comparatively 'high', 'moderte/high', 'moderate', 'low/moderate' and 'low' levels of activity, and the associated key metrics, based on the output from the Mammal Society Ecobat website [www.ecobat.org.uk]. This online data processing tool allows the comparison of bat activity data with data collected from other similar sites in the same geographical region. This helps to provide some level of context for the results, i.e. whether activity levels are comparatively high, moderate or low in comparison to the reference dataset.

Table A3.1: Summary table showing the number of nights recorded bat activity fell into each activity band for each species 2015.

Site	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
A	*Myotis*	0	0	0	1	1
A	*Pipistrellus pipistrellus*	0	1	4	2	5
B	*Myotis*	0	0	0	1	2
B	*Pipistrellus pipistrellus*	4	1	0	1	0
B	*Pipistrellus pygmaeus*	0	0	0	2	1
C	*Myotis*	0	0	0	1	3
C	*Pipistrellus pipistrellus*	11	3	4	1	2
C	*Pipistrellus pygmaeus*	11	5	2	1	1
D	*Pipistrellus pipistrellus*	0	0	2	2	1
D	*Pipistrellus pygmaeus*	0	0	1	2	5
E	*Myotis*	0	0	0	0	3
E	*Pipistrellus pipistrellus*	0	4	4	2	1
E	*Pipistrellus pygmaeus*	0	2	2	3	6
E	*Plecotus auritus*	0	0	0	0	1
F	*Myotis*	0	0	0	0	2

Site	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
F	*Pipistrellus pipistrellus*	0	0	0	2	1
F	*Pipistrellus pygmaeus*	0	0	0	2	2
G	*Myotis*	0	0	0	1	2
G	*Pipistrellus pipistrellus*	6	3	1	1	0
G	*Pipistrellus pygmaeus*	0	0	3	0	1

Table A3.2: Summary table showing key metrics for each species recorded (2015).

Site	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
A	*Myotis*	12	11.5 - 11.5	23	2	128
A	*Pipistrellus pipistrellus*	35	38 - 52	62	12	377
B	*Myotis*	0	0 - 0	35	3	128
B	*Pipistrellus pipistrellus*	86	54.5 - 87.5	89	6	377
B	*Pipistrellus pygmaeus*	23	23 - 23	23	3	284
C	*Myotis*	0	0 - 0	35	4	128
C	*Pipistrellus pipistrellus*	92	67 - 95	100	21	377
C	*Pipistrellus pygmaeus*	82	70 - 90.5	99	20	284
D	*Pipistrellus pipistrellus*	35	23 - 57	57	5	377
D	*Pipistrellus pygmaeus*	0	23 - 41	41	8	284
E	*Myotis*	0	0 - 0	0	3	128
E	*Pipistrellus pipistrellus*	48	35.5 - 68	75	11	377
E	*Pipistrellus pygmaeus*	23	29 - 62	73	13	284
E	*Plecotus auritus*	0	0	0	1	27

Site	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
F	*Myotis*	0	0 - 0	0	2	128
F	*Pipistrellus pipistrellus*	23	23 - 23	23	3	377
F	*Pipistrellus pygmaeus*	12	29 - 29	35	4	284
G	*Myotis*	0	0 - 0	23	3	128
G	*Pipistrellus pipistrellus*	82	60 - 85	89	11	377
G	*Pipistrellus pygmaeus*	47	41 - 57	57	4	284

Table A3.3: Summary table showing the number of nights recorded bat activity fell into each activity band for each species 2016.

Site	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
A	*Pipistrellus pipistrellus*	0	0	0	4	4
A	*Pipistrellus pygmaeus*	0	0	0	0	1
C	*Myotis*	0	0	0	0	2
C	*Pipistrellus pipistrellus*	10	2	4	3	0
C	*Pipistrellus pygmaeus*	10	4	0	1	0
E	*Myotis*	0	0	0	2	0
E	*Pipistrellus pipistrellus*	0	8	3	3	1
E	*Pipistrellus pygmaeus*	0	2	2	6	3
E	*Plecotus auritus*	0	0	0	0	1
F	*Pipistrellus pipistrellus*	0	0	1	3	7
F	*Pipistrellus pygmaeus*	0	0	0	2	6
G	*Pipistrellus pipistrellus*	1	1	1	3	2
H	*Pipistrellus pipistrellus*	0	0	2	0	4
H	*Pipistrellus pygmaeus*	0	0	0	1	0
I	*Pipistrellus pipistrellus*	0	1	5	8	7
I	*Pipistrellus pygmaeus*	0	0	0	3	9
J	*Myotis*	0	0	0	0	1
J	*Pipistrellus pipistrellus*	0	1	2	2	8
J	*Pipistrellus pygmaeus*	0	0	0	2	2
K	*Myotis*	0	0	0	0	1
K	*Pipistrellus pipistrellus*	6	7	2	2	0
K	*Pipistrellus pygmaeus*	0	1	6	2	1

Site	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
K	*Plecotus auritus*	0	0	0	0	1
L	*Myotis*	0	0	0	1	2
L	*Pipistrellus pipistrellus*	3	7	4	2	0
L	*Pipistrellus pygmaeus*	0	2	3	3	4
L	*Plecotus auritus*	0	0	0	0	1
M	*Pipistrellus pipistrellus*	0	0	2	1	4
M	*Plecotus auritus*	0	0	0	0	1
M	*Pipistrellus pygmaeus*	0	0	0	2	1
N	*Pipistrellus pipistrellus*	0	0	0	1	5
N	*Pipistrellus pygmaeus*	0	0	0	0	3
O	*Myotis*	0	0	0	1	3
O	*Pipistrellus pipistrellus*	2	5	3	1	4
O	*Pipistrellus pygmaeus*	0	1	2	4	5

Table A3.4: Summary table showing key metrics for each species recorded.

Site	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
A	*Pipistrellus pipistrellus*	12	12 - 12	24	8	342
A	*Pipistrellus pygmaeus*	0	0	0	1	253
C	*Myotis*	0	0 - 0	0	2	112
C	*Pipistrellus pipistrellus*	80	56.5 - 83	97	19	342
C	*Pipistrellus pygmaeus*	86	73.5 - 90	97	15	253
E	*Myotis*	24	24 - 24	24	2	112

Site	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
E	*Pipistrellus pipistrellus*	61	48.5 - 70	79	15	342
E	*Pipistrellus pygmaeus*	24	24 - 49	69	13	253
E	*Plecotus auritus*	0	0	0	1	26
F	*Pipistrellus pipistrellus*	0	30 - 39.5	43	11	342
F	*Pipistrellus pygmaeus*	0	0 - 0	24	8	253
G	*Pipistrellus pipistrellus*	36	36 - 63	84	8	342
H	*Pipistrellus pipistrellus*	0	50.5 - 50.5	58	6	342
H	*Pipistrellus pygmaeus*	24	0	24	1	253
I	*Pipistrellus pipistrellus*	24	30 - 46	67	21	342
I	*Pipistrellus pygmaeus*	0	24 - 24	36	12	253
J	*Myotis*	0	0	0	1	112
J	*Pipistrellus pipistrellus*	0	24 - 56	63	13	342
J	*Pipistrellus pygmaeus*	12	12 - 12	24	4	253
K	*Myotis*	0	0	0	1	112
K	*Pipistrellus pipistrellus*	69	59.5 - 80.5	94	17	342
K	*Pipistrellus pygmaeus*	43	33.5 - 52	61	10	253
K	*Plecotus auritus*	0	0	0	1	26
L	*Myotis*	0	0 - 0	24	3	112
L	*Pipistrellus pipistrellus*	69	57 - 74.5	88	16	342
L	*Pipistrellus pygmaeus*	30	30 - 63	77	12	253
L	*Plecotus auritus*	0	0	0	1	26
M	*Pipistrellus pipistrellus*	0	24 - 56	56	7	342
M	*Pipistrellus pygmaeus*	24	24 - 24	24	3	253
M	*Plecotus auritus*	0	0	0	1	26

Site	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
N	*Pipistrellus pipistrellus*	0	0 - 0	24	6	342
N	*Pipistrellus pygmaeus*	0	0 - 0	0	3	253
O	*Myotis*	0	0 - 0	36	4	112
O	*Pipistrellus pipistrellus*	58	53 - 77	89	15	342
O	*Pipistrellus pygmaeus*	24	30 - 49	61	12	253

Table A3.5: Summary table showing the number of nights recorded bat activity fell into each activity band for each species 2019.

Site	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
A	*Myotis*	0	0	0	0	3
A	*Pipistrellus pipistrellus*	0	3	6	2	8
A	*Pipistrellus pygmaeus*	0	0	3	5	10
A	*Plecotus auritus*	0	0	0	0	1
B	*Myotis*	0	1	0	2	3
B	*Pipistrellus pipistrellus*	0	0	6	2	8
B	*Pipistrellus pygmaeus*	0	0	2	1	10
C	*Myotis*	0	0	0	0	1
C	*Pipistrellus pipistrellus*	0	0	2	2	4
D	*Pipistrellus pipistrellus*	0	0	0	1	1
E/O	*Myotis*	0	0	0	0	5
E/O	*Pipistrellus pipistrellus*	0	0	4	3	6
E/O	*Pipistrellus pygmaeus*	0	0	5	3	2
E/O	*Plecotus auritus*	0	0	0	0	1
F/P	*Myotis*	0	0	1	2	8
F/P	*Pipistrellus pipistrellus*	0	0	4	6	9
F/P	*Pipistrellus pygmaeus*	0	0	0	2	10
G	*Myotis*	0	0	0	1	5
G	*Pipistrellus pipistrellus*	1	5	9	8	11
G	*Pipistrellus pygmaeus*	0	1	10	4	9
H	*Myotis*	0	0	0	0	1
H	*Pipistrellus pipistrellus*	12	13	8	2	2

Site	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
H	*Pipistrellus pygmaeus*	9	20	4	3	4
I	*Myotis*	0	0	0	1	5
I	*Pipistrellus pipistrellus*	2	6	8	6	9
I	*Pipistrellus pygmaeus*	0	5	3	4	9
I	*Plecotus auritus*	0	0	0	1	2
J	*Myotis*	0	0	0	0	4
J	*Pipistrellus pipistrellus*	0	9	7	6	5
J	*Pipistrellus pygmaeus*	9	14	3	4	4
J	*Plecotus auritus*	0	0	0	0	2
K	*Myotis*	0	0	0	0	1
K	*Pipistrellus pipistrellus*	0	2	8	7	8
K	*Pipistrellus pygmaeus*	0	0	2	0	8
K	*Plecotus auritus*	0	0	0	0	3
L	*Myotis*	0	0	0	2	3
L	*Pipistrellus pipistrellus*	13	9	6	2	3
L	*Pipistrellus pygmaeus*	1	8	5	4	7
L	*Plecotus auritus*	0	0	0	0	3
M	*Pipistrellus pipistrellus*	1	1	6	4	5
M	*Pipistrellus pygmaeus*	0	0	1	0	3
M	*Plecotus auritus*	0	0	0	0	2
N	*Pipistrellus pipistrellus*	0	1	3	3	6
N	*Pipistrellus pygmaeus*	0	0	0	1	2

Table A3.6: Summary table showing key metrics for each species recorded 2019.

Site	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
A	*Myotis*	0	0 - 0	0	3	177
A	*Pipistrellus pipistrellus*	28	38.5 - 59	69	19	672
A	*Pipistrellus pygmaeus*	0	28 - 38.5	49	18	498
A	*Plecotus auritus*	0	0	0	1	42
B	*Myotis*	14	28 - 28	72	6	177
B	*Pipistrellus pipistrellus*	14	34.5 - 52	55	16	672
B	*Pipistrellus pygmaeus*	0	41 - 41	41	13	498
C	*Myotis*	0	0	0	1	177
C	*Pipistrellus pipistrellus*	14	28 - 55	55	8	672
D	*Pipistrellus pipistrellus*	14	14 - 14	28	2	672
E/O	*Myotis*	0	0 - 0	0	5	177
E/O	*Pipistrellus pipistrellus*	28	28 - 52	55	13	672
E/O	*Pipistrellus pygmaeus*	35	28 - 49	55	10	498
E/O	*Plecotus auritus*	0	0	0	1	42
F/P	*Myotis*	0	28 - 28	49	11	177
F/P	*Pipistrellus pipistrellus*	28	28 - 41	55	19	672
F/P	*Pipistrellus pygmaeus*	0	0 - 0	28	12	498
G	*Myotis*	0	0 - 0	28	6	177
G	*Pipistrellus pipistrellus*	28	34.5 - 52	84	34	672
G	*Pipistrellus pygmaeus*	28	38.5 - 52	69	24	498
H	*Myotis*	0	0	0	1	177
H	*Pipistrellus pipistrellus*	72	61.5 - 77	97	37	672

Site	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
H	*Pipistrellus pygmaeus*	68	63 - 76	93	40	498
I	*Myotis*	0	0 - 0	28	6	177
I	*Pipistrellus pipistrellus*	41	41.5 - 60.5	84	31	672
I	*Pipistrellus pygmaeus*	28	34.5 - 63.5	78	21	498
I	*Plecotus auritus*	0	0 - 0	28	3	42
J	*Myotis*	0	0 - 0	0	4	177
J	*Pipistrellus pipistrellus*	41	41.5 - 59	77	27	672
J	*Pipistrellus pygmaeus*	71	60 - 77.5	92	34	498
J	*Plecotus auritus*	0	0 - 0	0	2	42
K	*Myotis*	0	0	0	1	177
K	*Pipistrellus pipistrellus*	28	34.5 - 49	65	25	672
K	*Pipistrellus pygmaeus*	0	48 - 48	55	10	498
K	*Plecotus auritus*	0	0 - 0	0	3	42
L	*Myotis*	0	0 - 0	28	5	177
L	*Pipistrellus pipistrellus*	72	62.5 - 80.5	94	33	672
L	*Pipistrellus pygmaeus*	41	46.5 - 66	83	25	498
L	*Plecotus auritus*	0	0 - 0	0	3	42
M	*Pipistrellus pipistrellus*	28	34.5 - 58.5	89	17	672
M	*Pipistrellus pygmaeus*	0	0 - 0	41	4	498
M	*Plecotus auritus*	0	0 - 0	0	2	42
N	*Pipistrellus pipistrellus*	28	28 - 59	77	13	672
N	*Pipistrellus pygmaeus*	0	0 - 0	28	3	498