AEWC Ltd

Animal Ecology & Wildlife Consultants

Bat Survey Report

Chichester Wildlife Corridors

DRAFT

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Contents

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The information and data which has been prepared and provided is true and has been prepared and provided in accordance with the Professional Guidance and 'Code of Professional Conduct' issued by the Chartered Institute of Ecology and Environmental Management (CIEEM). We confirm that the opinions expressed are our true and professional bona fide opinions.

1 Introduction

1.1 AEWC Ltd were commissioned by Chichester District Council to undertake bat activity monitoring at eight locations between Chichester and Emsworth to help inform the proposed West of Chichester City Strategic Wildlife Corridors.

1.2 This report details the results of the bat activity monitoring over a three month period.

Aims and objectives

1.3 The objective of the survey was to:

- Carry out passive bat activity monitoring using static bat detectors to inform on bat species present and likely activity levels in the areas proposed for the new strategic wildlife corridors.

Study Area

1.4 The study area lies between the western edge of Chichester and eastern edge of Emsworth. The South Downs National Park lies to the north, and the Chichester Harbour to the south, forming part of the Chichester Harbour SSSI/Chichester and Langstone Harbours Ramsar & SPA/Solent Maritime SAC/Eames Farm LNR and Nutbourne Marshes LNR. The landscape comprises a mix of residential villages, open farmland and pockets of woodland connected by a network of hedgerow and tree lines.

FIGURE 1: SHOWING THE STUDY AREA AND EIGHT STATIC DETECTOR LOCATIONS

Legislation

1.5 All species of bats are listed on *Schedule 5* of the *Wildlife and Countryside Act 1981 (as amended)* which affords them protection under *Section 9*, as amended. They are also protected under the *Conservation of Habitats and Species Regulations 2017*. In combination, this makes it an offence to:

- intentionally kill, injure or take (capture etc.);
- possess;

- intentionally or recklessly damage, destroy, obstruct access to any structure or place used by a scheduled animal for shelter or protection, or disturb any animal occupying such a structure or place; and
- sell, offer for sale, possess or transport for the purpose of sale (live or dead animal, part or derivative) or advertise for buying or selling such things.

1.6 Furthermore, seven bat species (barbastelle, bechstein's, noctule, soprano pipistrelle, brown long-eared, lesser horseshoe and greater Horseshoe) are also Species of Principal Importance in England under *Section 41* of the *Natural Environment and Rural Communities Act 2006*.

2 Methods

Acoustic surveys - static detectors

2.1 Eight Wildlife Acoustics SM2+ acoustic recorders were used to monitor bat activity in different locations across the study area, with the aim of assessing how bats are using these areas. The detectors were positioned in locations specified by Chichester District Council, with two detectors along each proposed new strategic wildlife corridor (see Figure 1). The detectors were installed on trees around 3-4m above ground, with the microphone facing along a linear feature (see Figure 4).

Table 1: Showing grid references for detectors at each location.

Location	Grid reference	Location	Grid reference
1	SU 75150 05954	2	SU 75955 08233
3	SU 79891 06317	4	SU 79386 05569
5	SU 81152 05359	6	SU 81197 06582
7	SU 84038 04782	8	SU 84114 06450

2.2 Static detector monitoring took place during three periods within the summer survey season, with a minimum of five full nights of activity recorded.

- 25th - 30th June;
- 12th - 16th July and
- 2nd - 6th August 2019.

2.3 Additional monitoring was undertaken using four Batlogger A+ acoustic recorders during two periods in September. The detectors were installed at locations L5 to L8.

- 11th- 17th September and
- 20th - 26th September 2019.

2.4 The detectors were programmed to record from 15 minutes before sunset until 15 minutes after sunrise. The recordings were analysed using Wildlife Acoustics' Kaleidoscope analysis software, which facilitates species identification.

2.5 In general, bat calls were identified down to the species level. However, some species are difficult to separate based on echolocation alone (e.g. the myotis bats and long-eared bats), and standard practice is to group those species with similar echolocation calls into a complex. For the purposes of this study, all *Myotis, Plecotus* and *Nyctalus* calls have been identified to their respective genus, but not to species level.

2.6 Following species identification, the data was run through Ecobat, an online tool for assessing bat activity, originally designed with support from the NERC and the University of Exeter and now run by the Mammal Society.

3 Constraints/Limitations

3.1 Bats are some of the most difficult species to locate, identify and study. They cannot be easily identified in flight and nocturnal activity means that they cannot be easily visually observed to identify behaviours and movements.

3.2 Many species have very similar echolocation calls making accurate species identification from acoustic surveys difficult, especially for cryptic groups like Myotis bats. Different amplitude of calls of different bat species can dramatically under or over identify the presence of some species, resulting in a biased survey technique towards louder bats and commonly under sampling or missing identifying presence of some quieter species such a long-eared bats and some myotis species.

3.3 Two of the eight detectors failed during the June-August survey and no bat call data was able to be retrieved from these detectors. These detectors were at Locations L6 and L8, and these have therefore been excluded from the analysis. Without the data from these two detectors, the value of the individual sites L5 and L7 are assessed. September data was therefore collected for Locations L5 and L7, as well as additionally surveying L6 and L8 to better evaluate these two corridors.

4 Results

Acoustic surveys - static detectors

4.1 The detectors were deployed for a total of six nights in June, five nights in July and five nights in August. The six detectors at Locations L1 to L5 and L7 all recorded bat activity on every night of deployment.

4.2 In September, detectors L5 to L8 were deployed for two periods of seven nights, and all four detectors recorded bat activity for a minimum of six nights before the data cards became full, with the exception of L8 during the second September period, when the data cards were full after three nights of recording, indicating very high levels of bat activity at this location during that recording period.

4.3 At least eight species were recorded across the surveys: common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus,* Nathusius' pipistrelle *Pipistrellus nathusii,* barbastelle *Barbastella barbastellus,* serotine *Eptesicus serotinus, Nyctalus sp.,* long-eared bats *Plecotus sp.* and myotis bats *Myotis sp.* More than one species from each complex may have been present however it is not possible to confirm this from acoustic data alone.

Hermitage to Westbourne Corridor - June to August

4.4 The detectors at L1 and L2 recorded significantly more recordings of bats than any of the other detectors, with each having over 3 times as many bat recordings as the next highest (L7). The species/group breakdown of L1 and L2 were similar, and this remained consistent across all three months (Figure 2). Soprano pipistrelle made up the majority of the calls consistently on both detectors across all three months and activity levels of this species in both locations were calculated to be extremely high using the Ecobat comparison with bat data for the wider area at a similar time of year (Figure 3).

4.5 L1 also recorded a consistently high level of common pipistrelle activity across all three months, and both detectors recorded moderate to good level of myotis activity across all three months. L1 also recorded a number of Nathusius' pipistrelle recordings (Table 2) in all three months; and while the percentage appears very low against the high number of soprano pipistrelle recordings (Figure 2), this represents a moderate level of activity for this rarer species.

4.6 The distribution of calls across each survey night shows that common and soprano pipistrelle activity to be relatively evenly spread between sunset and sunrise (Figures 8 & 9). Serotine and Nyctalus sp. activity tended to be higher during the first half of the night for both locations (Figures 4 & 5), as did Myotis sp. (Figure 6), while Plecotus sp. activity tended to be more evenly spread through the night (Figure 7), although the lower number of calls recorded makes it more difficult to establish trends. Nathusius' pipistrelle activity at L1 concentrated in the second half of the night during June and July, but in the first half of the night during August (Figure 10).

4.7 A view of the spread of recordings of each species from each location against the accepted emergence window for each species shows that L2 consistently recorded very early activity of both soprano pipistrelle and myotis bats relative to their described emergence windows (Figures 11 – 13). In both species, bats were recorded prior to and during the earliest part of the emergence period in all three months.

Chidham / East of Nutbourne Corridor - June to August

4.8 L3 and L4 both recorded the lowest number of bat recordings during the survey period. The majority of L3's recordings for June were of soprano pipistrelle, with a good proportion of Nyctalus sp. also recorded, however L4 recorded predominantly common pipistrelle with a good proportion of serotine bats. Numbers changed in July with L4 recording significantly more soprano pipistrelle and Plecotus sp. than in June, while L3 recorded predominantly common pipistrelle. In August L3 recorded a large percentage of common pipistrelle again, but with a good proportion of Nyctalus sp., and L4 recorded predominantly soprano pipistrelle.

4.9 The spread of bat activity across the night also varied; soprano pipistrelle activity at L3 was higher in the second half of the night in June, but higher early in the night in July and August, while at L4 soprano activity shifted from the first half of the night in June and July to a more even spread across the night in August. Common pipistrelle activity tended to be concentrated in the first half of the night at L3, but with a more even spread through the night at L4, across all three months.

4.10 Nyctalus and serotine activity tended to be concentrated in the first half of the evening for both locations, with the exception of L3 in June where Nyctalus activity was focused in the last quarter of the night and L4 in August where serotine activity was more evenly spread across the night. Myotis and Plecotus sp. activity was also concentrated predominantly within the first half of the night, with a more even spread of myotis activity across the middle of the night for L3 in July. Only a single Nathusius' pipistrelle pass was recorded on this corridor, at L4 early in the evening in July.

4.11 L3 recorded a few very early soprano pipistrelle passes in June, prior to the emergence window for this species, however all other bat recordings for L3 and L4 tended to be later during the emergence windows or after the emergence period, for all species in all three months.

Broadbridge to East Ashling Corridor

4.12 L5 recorded a relatively consistent species breakdown across June to August with over 50% common pipistrelle and a good proportion of Nyctalus sp. (Figure 2), representing a good to high level of activity of these species for the wider area (Figure 3). The balance of the recordings comprised some soprano pipistrelle and serotine and a smaller percentage of Myotis sp, with only a single Plecotus pass in both July and August. In August however, the proportion of Myotis sp. recorded rises significantly, giving a high level of activity for these species relative to the wider area (Figure 3).

4.13 In September, common pipistrelle still forms the highest proportion of calls recorded by L5, with the proportion of Myotis sp. also remaining high, again giving a high level of activity for these species relative to the wider area. Activity of both Nyctalus sp. and serotine has decreased, and a higher proportion of Plecotus calls have been recorded. L6 recorded a relatively similar species breakdown to L5, with slightly higher soprano pipistrelle and Nyctalus and slightly lower Myotis activity. L6 also recorded five Nathusius' pipistrelle passes on three separate nights. Barbastelle was recorded for the first time in the study, with L5 recording two passes on two separate nights, and L6 recording 38 passes on seven different nights across the two September recording periods.

4.14 Figures 4-11 show that serotine activity, more concentrated into the first half of the night in June, becomes more evenly spread in July and August, while Nyctalus sp. activity is typically spread through the middle of the night across all three months. Common and soprano pipistrelle making up the highest proportion of the recordings, are both evenly spread through the night across all three months as well. The very

low numbers of Plecotus sp. make it harder to ascertain a pattern but the few calls recorded have been in the middle to late part of the night. The same can be said for Myotis sp. with very low numbers recorded in June and July however activity starts early in the night in June numbers and becomes more spread in July to August with a concentration in the middle of night.

4.15 In September, serotine activity is predominantly in the first third of the night at both L5 and L6. Nyctalus activity is generally concentrated in the first half of the night at both L5 and L6, although at L5 activity spreads slightly across the middle of the night as well. Activity of both common and soprano pipistrelle is still generally even through the night at both L5 and L6, although L6 has a slightly level of soprano pipistrelle activity in the first half of the night. Myotis activity is generally higher in the first half of the night at both L5 and L6, although L5 has a small concentration of activity before dawn as well. Plecotus activity at L5 is evenly spread through the night, and in the first half of the night at L6. Barbastelle and Nathusius' pipistrelle activity is in the first half of the night at both detectors.

4.16 Figures 12-15 show a low number of early common pipistrelle recordings prior to/within the emergence window at L5 in June, August and September, and the same for Myotis at L5 in August and soprano pipistrelle at L5 in September. The majority of calls recorded by this detector were after the emergence window for each species. L6 also recorded a low number of early Nyctalus and Myotis recordings prior to/early in the emergence window, and a higher number of early common and soprano pipistrelle prior to the emergence window in September.

West of Chichester to Fishbourne Corridor

4.17 L7 recorded a similar species breakdown to L5 (Figure 2), with the majority of recorded calls from common pipistrelle, reflecting a high level of activity relative to the wider area (Figure 3). June recorded a good proportion of big bat species (serotine and Nyctalus sp.), again representing a good to high level of activity relative to the wider area, and this decreased over July into August, with a corresponding increase in both common and soprano pipistrelle activity, as well as Myotis sp. through July and into August. This remained consistent from August into September, with high levels of common pipistrelle activity, moderate to high soprano pipistrelle and moderate Myotis sp., with low activity for other species. L7 also recorded a single Nathusius' pipistrelle pass in September.

4.18 L8 recorded a very different species breakdown to L7 in September, and more closely resembled that recorded by L1 in earlier months. Soprano pipistrelle made up the vast majority of recordings to give a high level of activity for this species, with moderate to high common pipistrelle activity, and only low activity for big bat species, Myotis and Plecotus. Both L7 and L8 recorded a single pass each of barbastelle, on separate nights.

4.19 Figures 4-11 show that activity of both common and soprano pipistrelle at L7, while spread through the night, tended to be slightly more concentrated in the earlier part of the night, with smaller concentrations towards dawn, in all four months. Serotine

activity tended to concentrate in the first third of the night while Nyctalus activity was relatively even across the night, although in September activity was slightly higher in the first half of the night. While L7 had some Myotis sp. activity through the night, during June to August it was largely concentrated towards dawn with a smaller concentration in the first quarter of the night. In September this was reversed with Myotis activity largely in the first half of the night and a smaller concentration towards dawn.

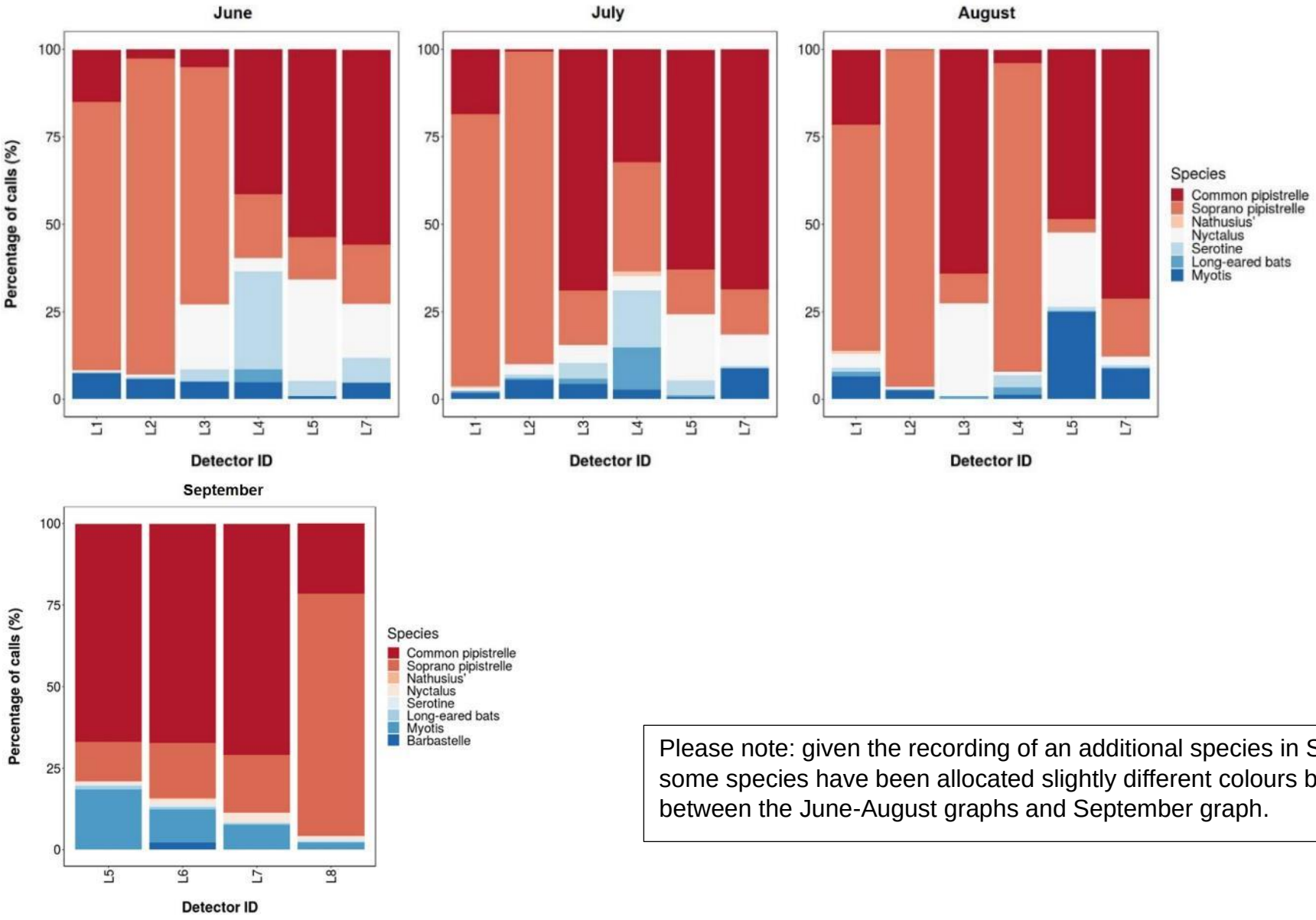
4.20 Common and soprano pipistrelle activity at L8 was generally spread through the night although slightly less concentrated towards dawn, particularly later in September. Serotine and Nyctalus sp. activity at L8 was predominantly in the first part of the night while Myotis sp. activity concentrated over the middle of the night. Plecotus recordings were generally spread across the night although the very low number of recordings makes it difficult to ascertain a pattern.

4.21 Figures 12-15 show a very low number of early recorded bats at L7 with a few Nyctalus sp. passes prior to the emergence window in June and a single early common pipistrelle pass in June and August, which could indicate a roost for these species in proximity to L7, however the vast majority of bat activity during these three months was recorded late in the emergence window or after the emergence window for all species, likely to be bats commuting past from further afield. There was a slight increase in early recorded bats at L7 in September, with low numbers of common and soprano pipistrelle, Myotis sp. and Nyctalus sp., including two Nyctalus passes recorded before sunset.

4.22 L8 recorded a higher proportion of common and soprano pipistrelle passes prior to the emergence window, including one soprano pipistrelle recorded before sunset. A few Nyctalus sp. and Myotis sp. were also recorded prior to/early in the emergence window, and the single barbastelle recording was also recorded prior to the emergence window for this species.

Table 2: Showing the total number of calls recorded for each species by each detector in each month.

	L1			L2			L3			L4			L5				L6	L7				L8
ID	**June**	**July**	**Aug**	**June**	**July**	**Aug**	**June**	**July**	**Aug**	**June**	**July**	**Aug**	**June**	**July**	**Aug**	**Sep**	**Sep**	**June**	**July**	**Aug**	**Sep**	**Sep**
EPTESICUS	10	3	12	14	8	2	2	3	0	23	12	14	10	22	8	20	13	54	4	1	9	10
MYOTIS	281	27	64	180	44	52	3	0	0	4	2	5	2	3	27	908	163	37	53	40	248	26
NYCTALUS	8	12	38	24	24	12	11	4	31	3	3	4	68	97	143	45	24	118	52	11	90	11
PIPPIP	564	291	207	81	6	6	3	16	73	34	24	16	126	321	327	3281	1090	427	408	329	2271	269
PIPPYG	2897	1213	627	2835	701	2042	40	2	10	15	23	360	28	65	25	590	274	130	77	77	568	919
PIPNAT	13	7	9	1	0	0	0	0	0	0	1	0	0	0	0	0	5	0	0	0	1	0
PLECOTUS	7	9	13	5	3	6	0	1	1	3	9	9	0	2	2	61	15	0	0	2	15	5
BARBASTELLUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	38	0	0	0	1	1
TOTAL	**3780**	**1562**	**970**	**3140**	**786**	**2120**	**59**	**26**	**115**	**82**	**74**	**408**	**234**	**510**	**532**	**4907**	**1622**	**766**	**594**	**460**	**3203**	**1241**



Please note: given the recording of an additional species in September, some species have been allocated slightly different colours by Ecobat between the June-August graphs and September graph.

FIGURE 2: SHOWING PERCENTAGE OF CALLS OF EACH SPECIES PER DETECTOR PER MONTH.

5 Discussion

Hermitage to Westbourne Corridor

5.1 The detectors at L1 and L2 were located immediately adjacent to water; L1 was alongside a garden pond with the inflow to Mill Pond on the opposite side of the track, and L2 was located alongside the River Ems. The much higher volume of recordings on these two detectors is most likely due to the abundant water and good surrounding habitat of mature treelines and pasture; in particular the very high level of soprano pipistrelle activity as this species is strongly associated with water. The species breakdown of the myotis recordings can't be accurately determined by acoustics alone, however the presence of abundant water increases the likelihood that Daubenton's bats are present, with the homeowner at L2 communicating that Daubenton's bats have previously been seen on the River Ems within his boundary. Nathusius' pipistrelle, a rarer migratory species, is also strongly associated with water.

5.2 The very early soprano pipistrelle and myotis recordings each month at L2 suggest the possibility of a roost in close proximity, and the homeowner has communicated that there are bats roosting beneath the hanging tiles on the house. It is possible that the earliest recorded bats may have emerged from the house or surrounding properties, and that the high volume of recordings can be attributed to the abundant water providing excellent foraging habitat for bats.

5.3 While L1 and L2 recorded similar species and activity levels each month, they were the furthest apart of all the proposed corridor paired detectors, making it impossible to confirm whether bats are moving along the proposed corridor and recorded at both locations, or separate populations using the excellent foraging habitat at both locations. However, given similar proportions and species present, coupled with the good connectivity, with the river running under the road and good linking habitat, as well as ease with which species can follow this commuting feature it strongly indicates that bats are commuting through this landscape. The recording of moderate to good levels of Nathusius' pipistrelle activity at L1 each month, but only a single pass at L2 across the whole survey period, indicates that this species at least is keeping closer to the more open water in the southern area.

Chidham / East of Nutbourne Corridor

5.4 The low total number of recordings on L3 and L4 makes it difficult to extrapolate trends, as a small change in the number of passes causes a big change in the percentage prevalence of a species.

5.5 The increase in Plecotus sp. activity in July may have been a response to a rise in preferred prey in that location (for instance in response to a particular plant coming into bloom, such as buddleia which flowers in July).

5.6 The good proportion of large bat species (serotine and Nyctalus sp.), particularly in June may also be in response to prey availability. Preferred prey species such as chafer and dung beetle emerge at this time of year, with areas of lawn and pasture

providing good habitat for these prey species and therefore good foraging habitat for the three larger bat species.

5.7 Early soprano pipistrelle recordings at L3 June may indicate closer proximity of a roost for this species, however this was not consistent through July to August when recordings of this species were later, and with lower numbers of recordings.

Broadbridge to East Ashling Corridor

5.8 While L5 is the most enclosed by residential housing, the village is small and the location well connected to nearby open green space with abundant water close by to the north-west. The garden is also predominantly large flowerbeds and planted to attract a range of insects across the summer period, providing good foraging opportunities for bats.

5.9 L6 is more rural and is situated in very close proximity to large areas of woodland. This would account for the significantly higher number of barbastelle recordings at this location; barbastelle is a woodland specialist and the habitat surrounding L6 is the most suitable for this species.

5.10 The spike in Myotis activity in August and September may have been a response to increased prey availability with seasonal blooming of particular plants within this and surrounding gardens, or roost switching with bats moving to a roost close to this location. August is also when juveniles will be flying and can explore new areas, and September a time of year when bats exhibit swarming behaviour, and Myotis bats are known to be a swarming species.

5.11 The low number of early common pipistrelle (June and August) and Myotis (August only) calls recorded by L5 in June to August may indicate a roost for these species in close proximity to the detector location, however most recorded passes were later in or after the emergence window and are likely bats commuting in from elsewhere. In September, L5 recorded more early passes of common and soprano pipistrelle which could indicate roost switching by these species closer to this detector. Early recordings of common and soprano pipistrelle, Myotis and Nyctalus sp. at L6 could also indicate these species roosting in close proximity to the detector in September.

West of Chichester to Fishbourne Corridor

5.12 The good proportion of large bat species (serotine and Nyctalus sp.) at L7, particularly in June and July is also likely a response to prey availability. Preferred prey species such as chafer and dung beetle emerge at this time of year, and this particular location is surrounded by large areas of open lawn and rough grassland, providing excellent habitat for these prey species and therefore good foraging habitat for the three larger bat species.

5.13 The spike in Myotis activity at L7 across July into August and September is similar to that seen at L5, although here this could be due to a change in prey availability at the location or an increase in the numbers of commuting bats. L7 is located along a mature tree line linking pockets of woodland and mature garden areas, providing an

excellent linear feature for commuting bats, numbers of which may also increase in response to prey availability in the linked habitats.

5.14 The location of L8 adjacent to a garden pond may account for the high proportion of soprano pipistrelle recorded, a species strongly associated with water. The detector also recorded low to moderate Myotis activity, which could also have comprised Daubenton's bats as they are also associated with water, however the pond is small and there is less open water in the immediate landscape.

5.15 The early Nyctalus sp. recordings in June could potentially indicate a roost for this species in proximity to L7, particularly as it coincides with the peak in preferred prey species and excellent surrounding habitat for these prey species. However Nyctalus are high and fast-flying species and can cover significant distances in a short space of time, and therefore could still have commuted in from further afield.

5.16 L8 recorded significantly more early common and soprano pipistrelle recordings prior to the emergence window, including one common pipistrelle pass before sunset, and it is highly likely these species are roosting in close proximity to the detector. Two Myotis passes and the single barbastelle pass were also recorded prior to their accepted emergence windows, and it is possible these are roosting in proximity to L8, although barbastelle bats are known to commute considerable distances between the roost and foraging areas and can do this very quickly, and with only a single pass recorded it is considered less likely that this species is roosting nearby.

5.17 L7 and L8 are situated in very different habitat types, suitable for different species, which has resulted in a very different breakdown of species recorded. This makes it very difficult to ascertain whether bats are moving along the proposed corridor and recorded at both locations, or separate populations using the varied habitats available along the length of the corridor. The recording of moderate levels of barbastelle activity at L6, but only two passes at L5, indicates that this Annex II species is concentrating nearer the more suitable woodland habitats.

<u>Overall Observations</u>

5.18 All detectors analysed recorded a good range of species. The range in habitat types at the specific detector locations helps to demonstrate the importance of varied habitats for bats and that residential areas still provide important resources.

5.19 Acoustic data can be biased towards bats calling louder and at lower frequencies. Lower frequency calls travel much further, and therefore Nyctalus sp. and serotines would be detected at a notably greater distance than quieter species such as Plecotus and some Myotis species, and these quieter species are therefore often under-recorded in acoustic studies.

5.20 The very low numbers of some species recorded on some detectors does make it difficult to extrapolate trends, as a small change in the number of passes causes a big change in the percentage prevalence of a species, and this also makes

comparisons between the corridors more difficult. This will always be particularly true for very quiet species such as long-eared bats where the number of bats present will be hugely under recorded.

5.21 September surveys recorded very high numbers of calls (particularly notable when comparing L5 and L7 to previous months), and this could be due to a number of reasons. At this time of year juveniles are flying and independent, bats are changing roost, searching for mates and beginning to investigate hibernation roosts, with several bat species are actively swarming. The September surveys have also been carried out using different detectors to the other months making it more difficult to directly compare total numbers of calls recorded, although the proportion of each species recorded and the distribution of calls through each night and through the survey period would not be affected by this.

5.22 While the data recorded may not be able show direct linear movement of bats along a corridor on a short time scale (i.e. nightly), it does show a good range of species have been recorded across the study area, and that the proportions of each species recorded do change between locations, months and even between days (see Figures 4-11). As well as providing connectivity for bats to move through their range over short time periods (i.e. nightly). The corridors are not only providing a range of habitats with different vegetation cover and aspects for day-to-day varying weather conditions, but it is also evident that different areas of the corridors may be important for bats at different times of the year, such as hatches of particular prey species or flowering of particular plants at different points in the season causing an increase in preferred prey at a particular location. Bats are therefore able to utilise and move through these corridors not only on a nightly short term scale, but also on a more seasonal scale, such as moving to seasonal foraging areas, movement of roost areas where a roost can move by a few kilometres, as well as dispersal throughout the landscape for fragmenting colonies and dispersing males.

5.23 Monitoring of the proposed corridors across a full summer season, and potentially with more detectors along the longer corridors (most notably the Hermitage to Westbourne corridor) could provide more detailed information as to how bats are using the length of the corridor and provide additional data to inform if or where areas are that could benefit bats through enhancement, such as strengthening connectivity and increasing foraging potential through targeted native planting and potentially even provision of increased roost availability in the area for species present. To provide a more detailed indication of bats commuting loggers could also be deployed at connectivity features, such as underpasses to the main A27.

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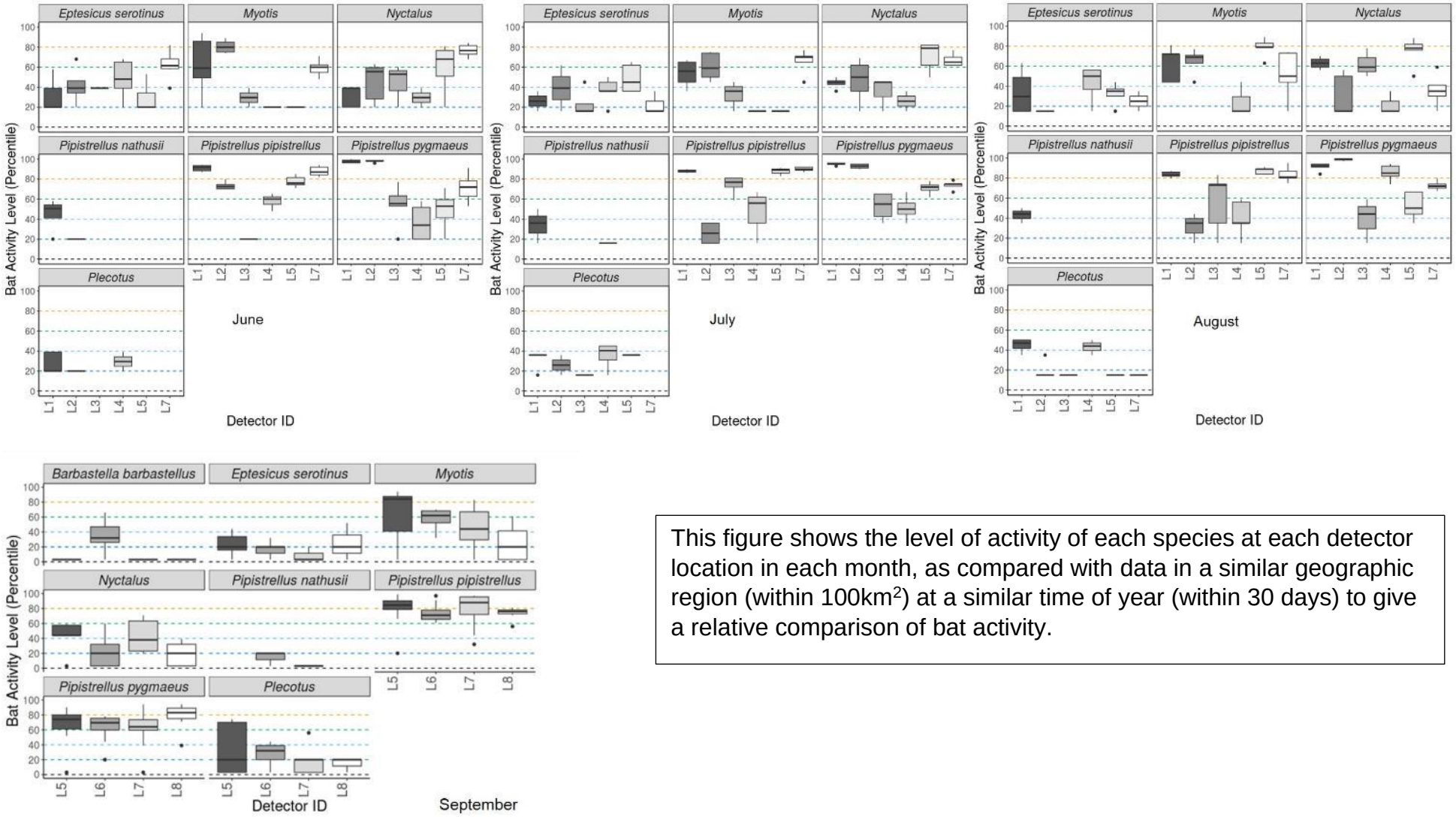
7 Appendix



This figure shows the level of activity of each species at each detector location in each month, as compared with data in a similar geographic region (within 100km^2) at a similar time of year (within 30 days) to give a relative comparison of bat activity.

FIGURE 3: DIFFERENCES IN ACTIVITY BETWEEN STATIC DETECTOR LOCATIONS, SPLIT BY SPECIES AND LOCATION. THE CENTRE LINE INDICATES THE MEDIAN ACTIVITY LEVEL WHEREAS THE BOX REPRESENTS THE INTERQUARTILE RANGE (THE SPREAD OF THE MIDDLE 50% OF NIGHTS OF ACTIVITY).

7.1 The following Figures 4 - 10 show the timing of bat calls plotted as minutes before/after sunset, whereby 0 on the y axis represents sunset. Sunrise throughout the survey period is depicted as the red dashed line. Colours indicate kernel densities, with darkest colours showing peaks of activity. These colours are comparative only within each plot, and do not account for overall activity.

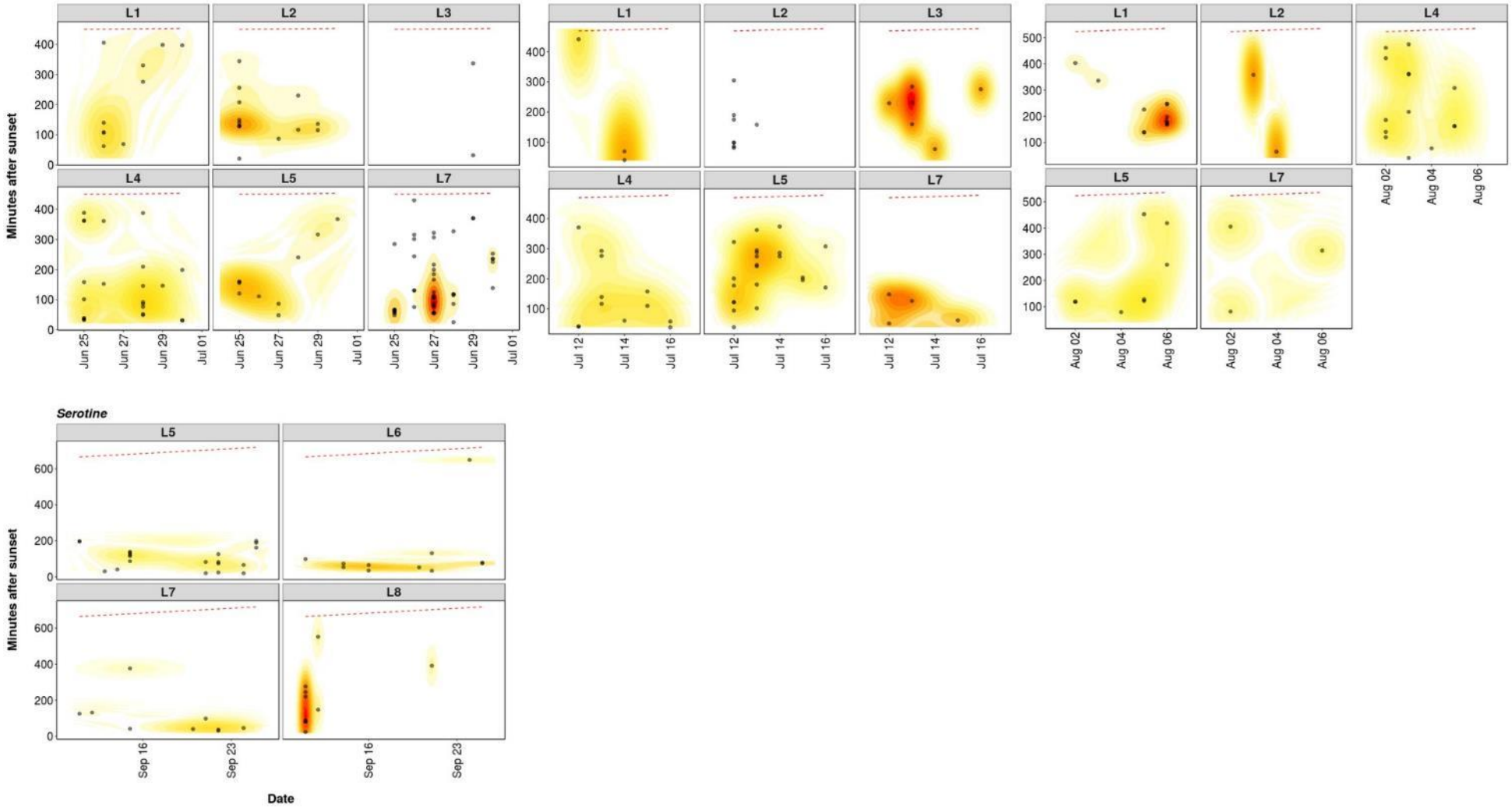


FIGURE 4: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - SEROTINE

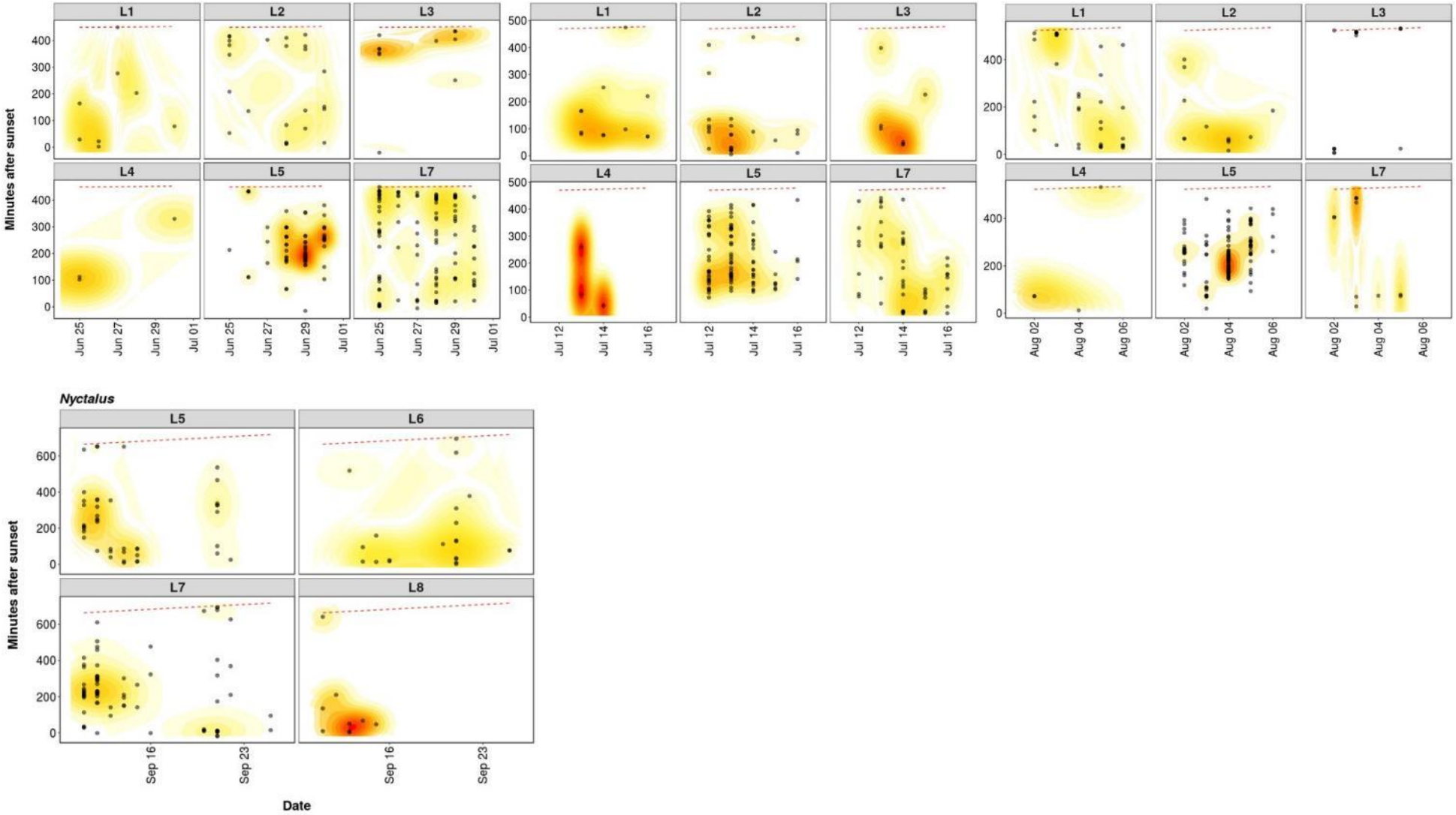


FIGURE 5: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - NYCTALUS

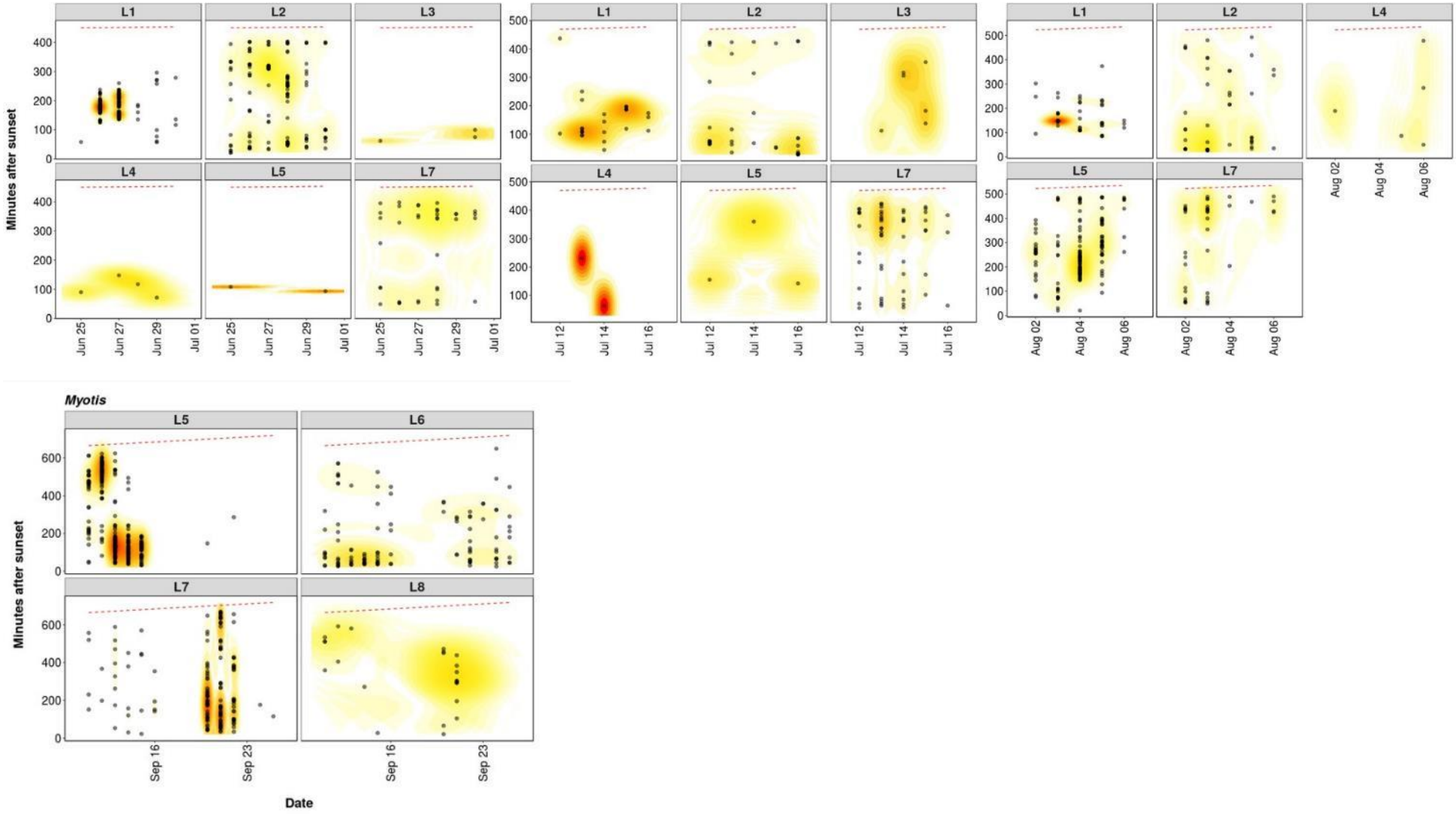


FIGURE 6: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - MYOTIS

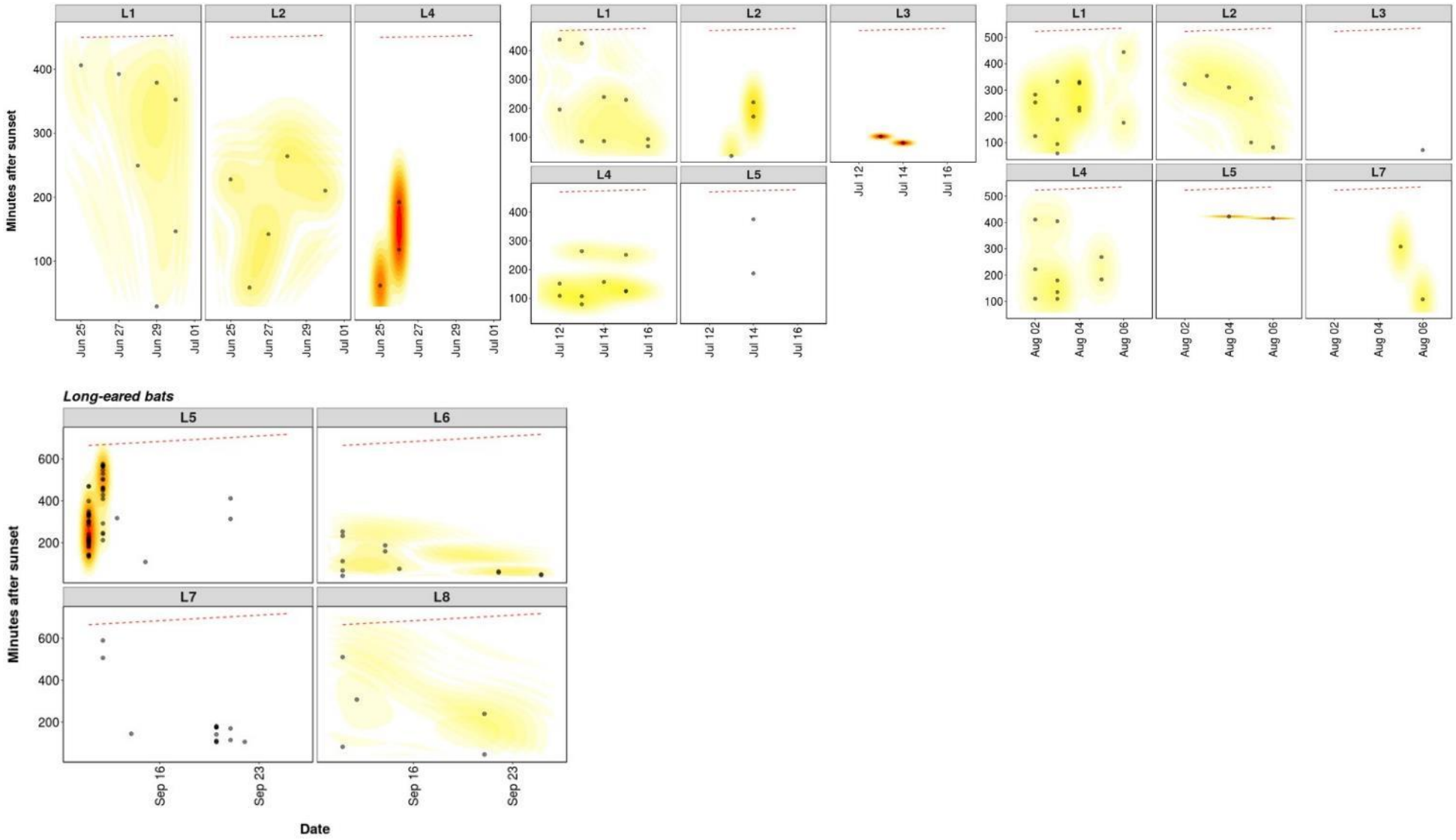


FIGURE 7: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - PLECOTUS

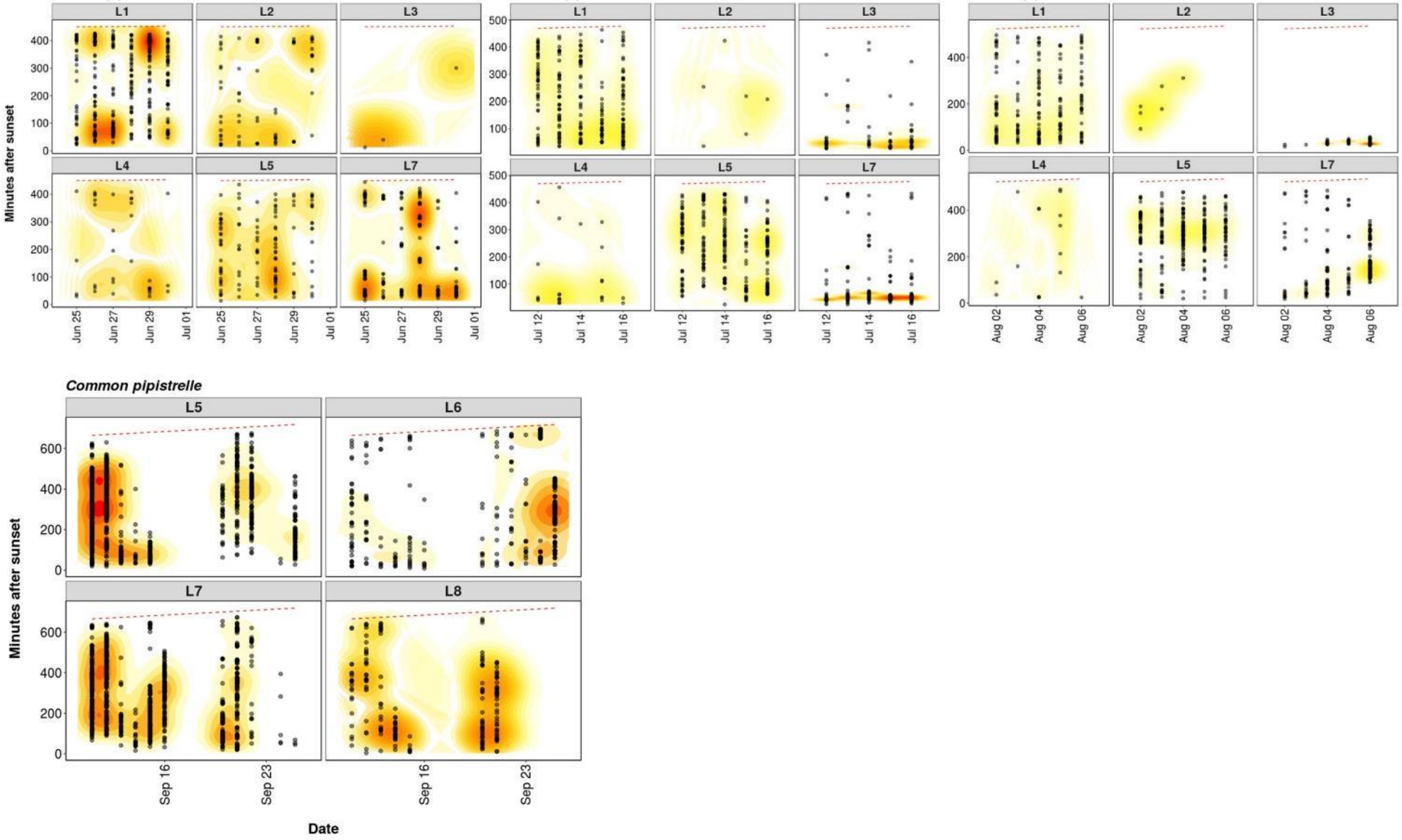


FIGURE 8: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - COMMON PIPISTRELLE

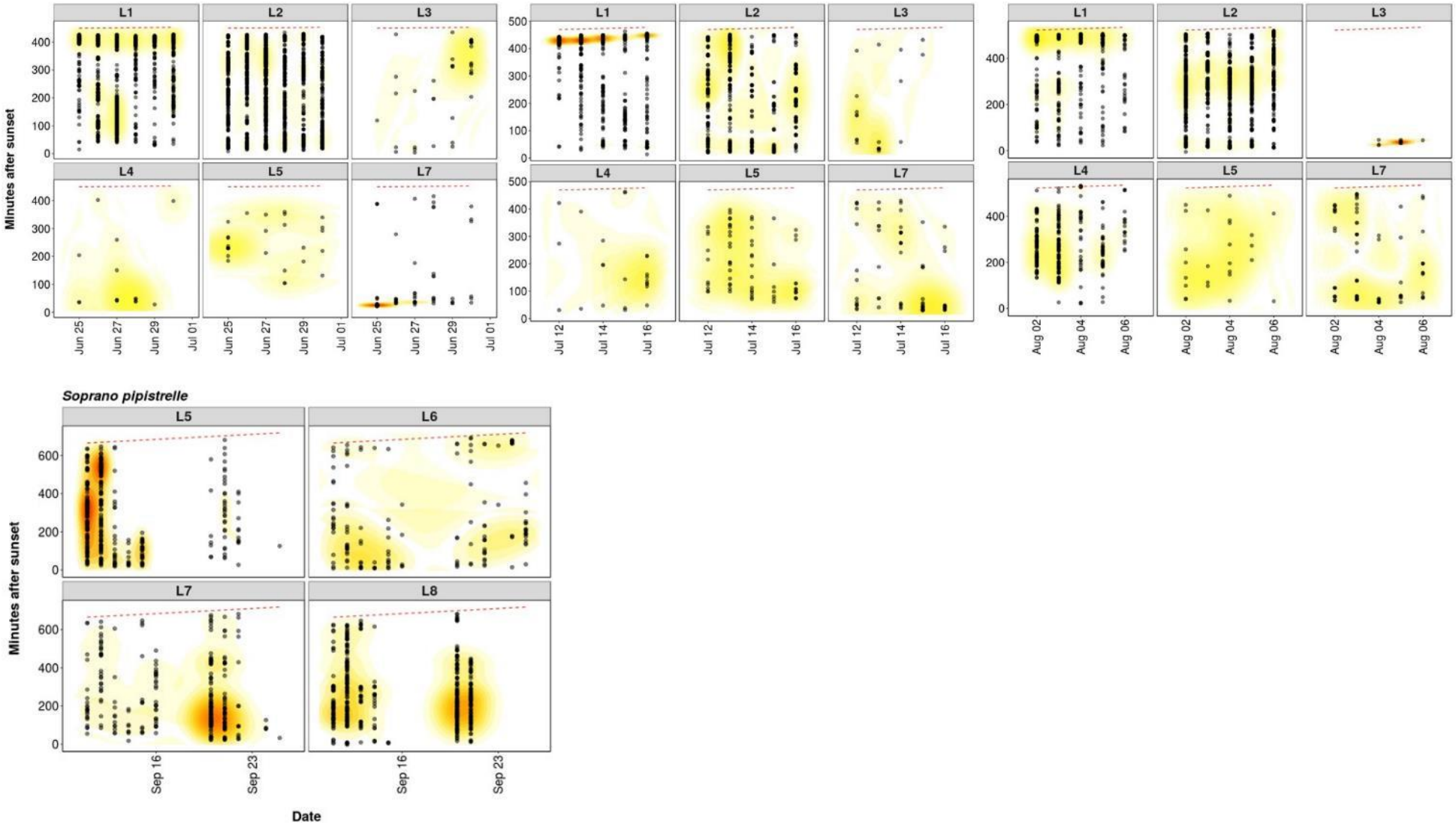


FIGURE 9: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - SOPRANO PIPISTRELLE

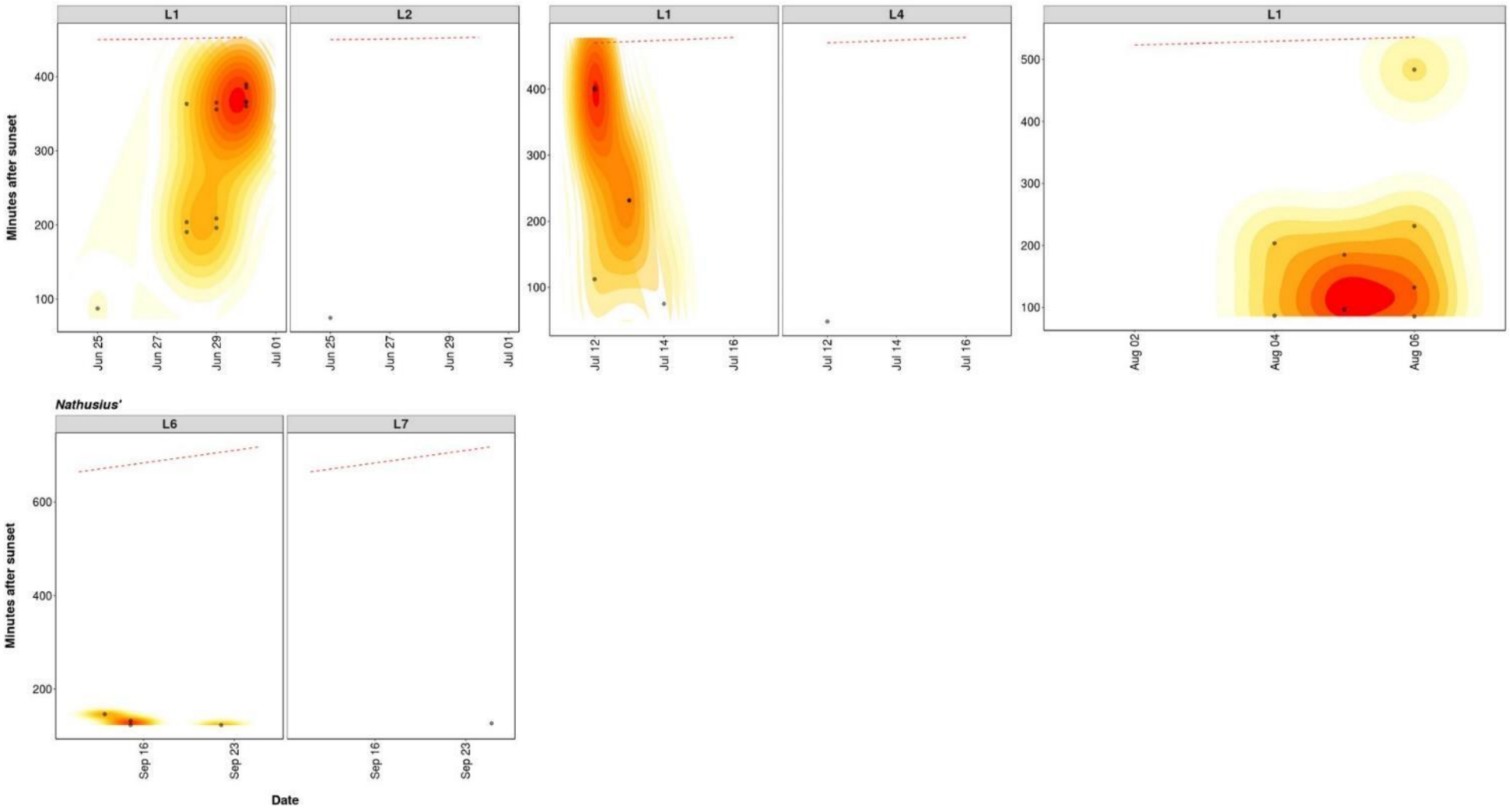


FIGURE 10: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - NATHUSIUS' PIPISTRELLE

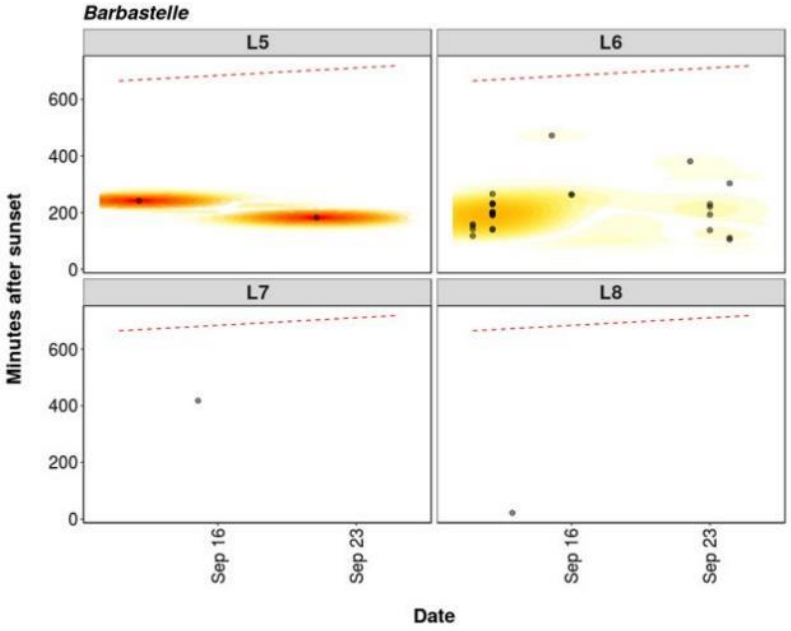


FIGURE 11: DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME - NATHUSIUS' PIPISTRELLE

7.2 The following Figures 12-15 are an analysis of bat passes over time after emergence to potentially indicate proximity to a roost (Russ 2012). The figures show time from 15 minutes before to 90 minutes after sunset. Species-specific emergence time ranges are shown as grey bars. Bat passes overlapping species-specific grey bars may potentially indicate the presence of a nearby roost.

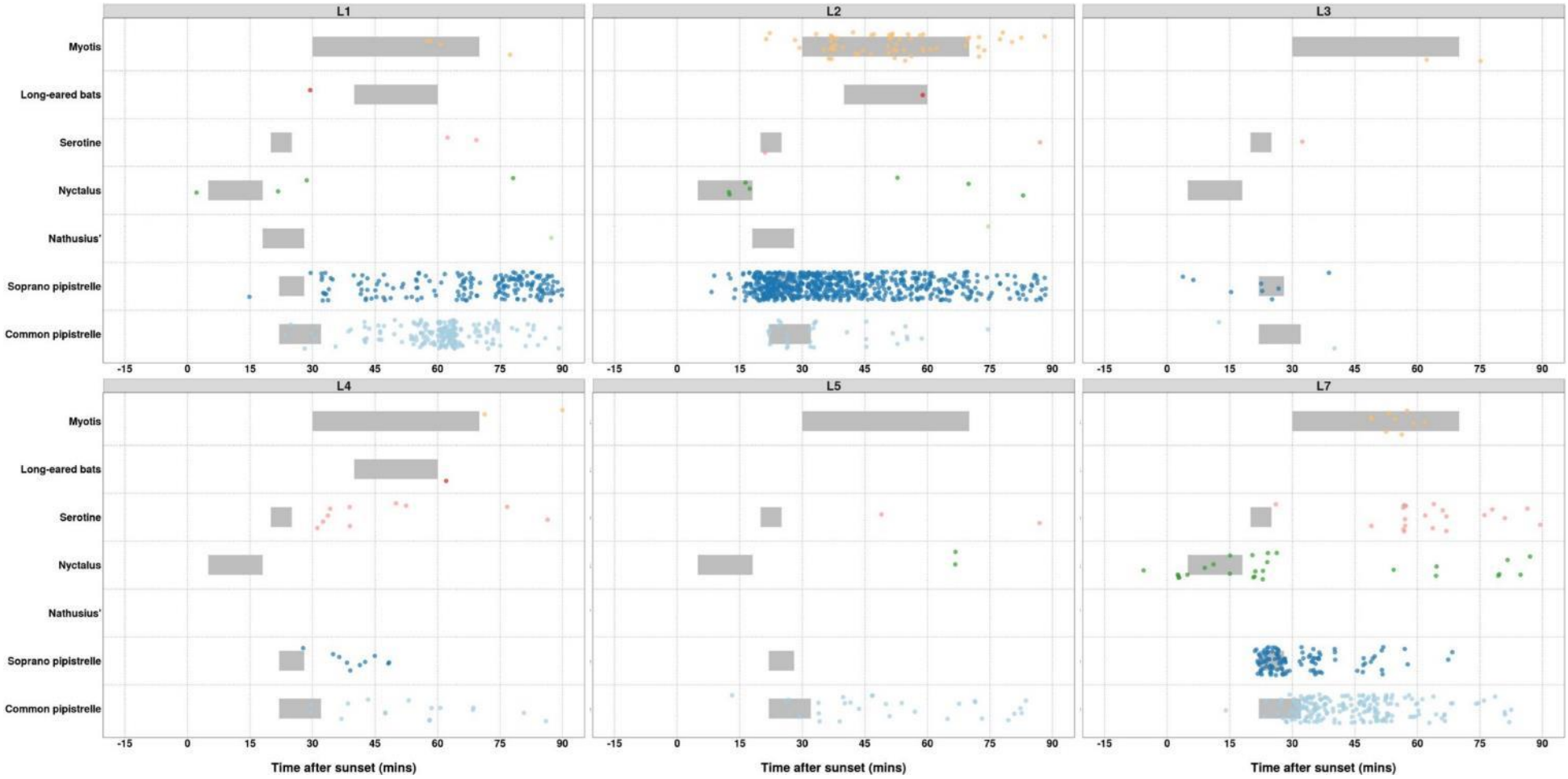


FIGURE 12: SHOWING BAT PASSES OVER TIME AFTER EMERGENCE IN JUNE FOR EACH DETECTOR LOCATION.

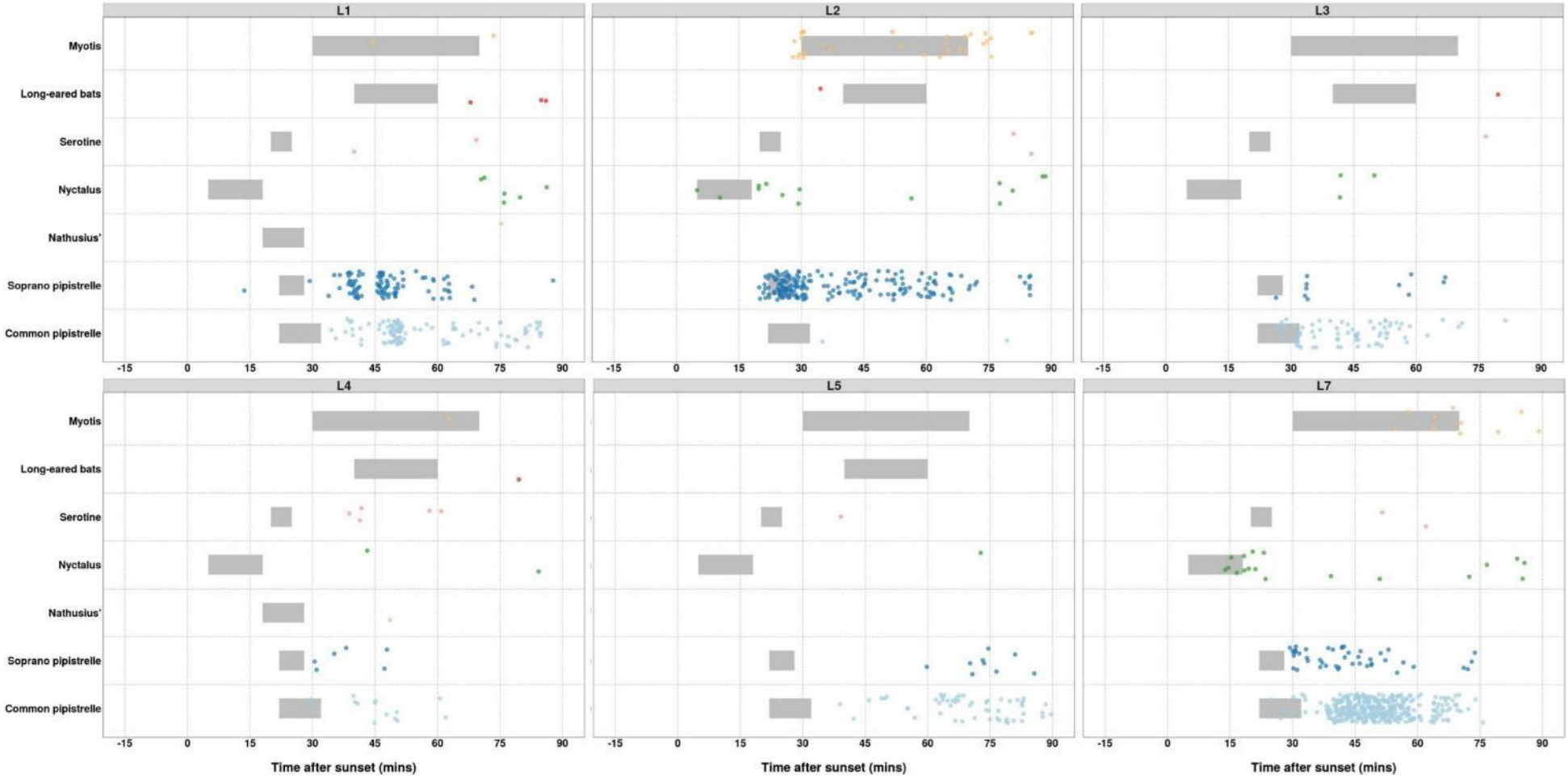


FIGURE 13: SHOWING BAT PASSES OVER TIME AFTER EMERGENCE IN JUNE FOR EACH DETECTOR LOCATION.

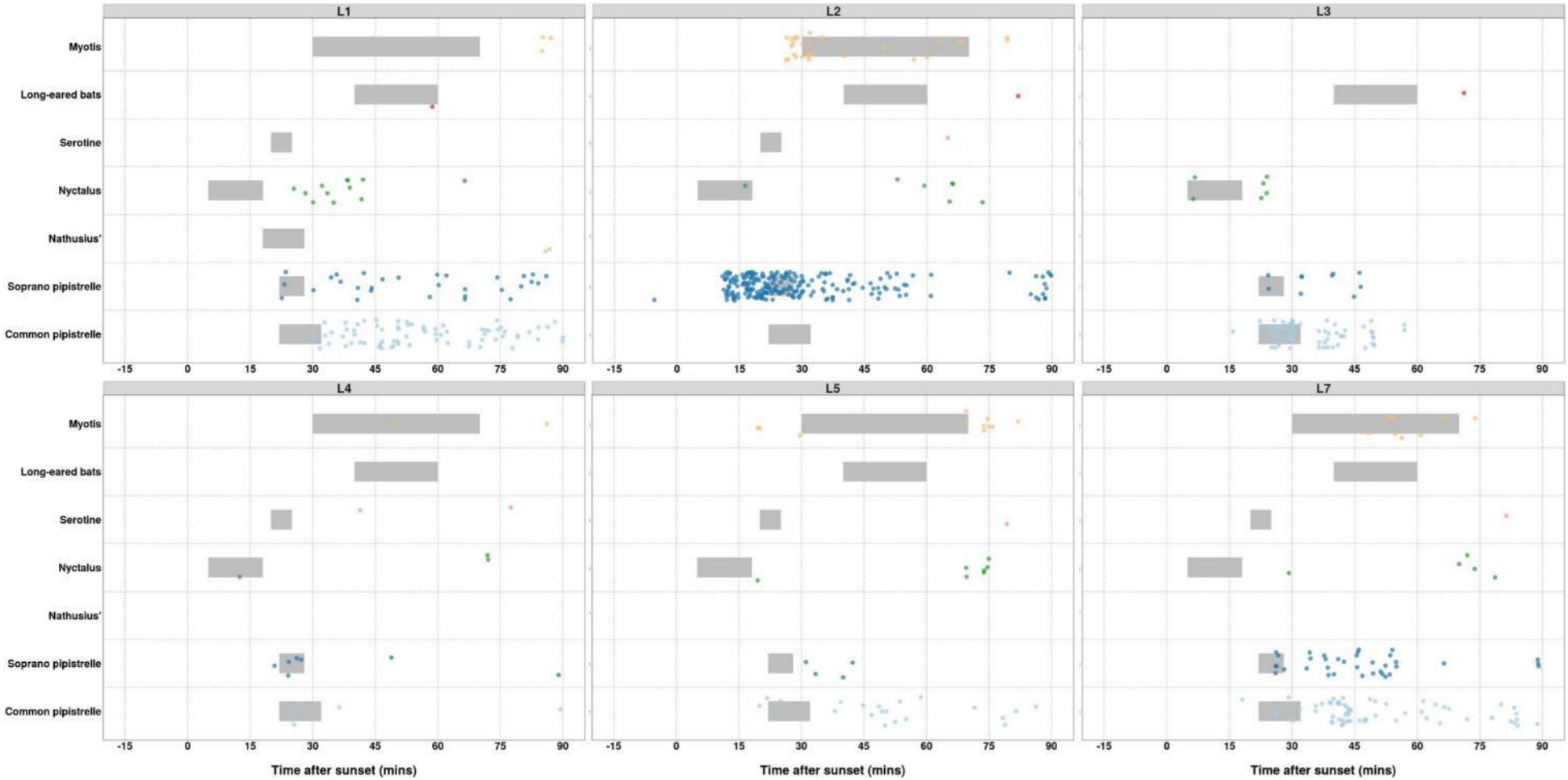


FIGURE 14: SHOWING BAT PASSES OVER TIME AFTER EMERGENCE IN JUNE FOR EACH DETECTOR LOCATION.

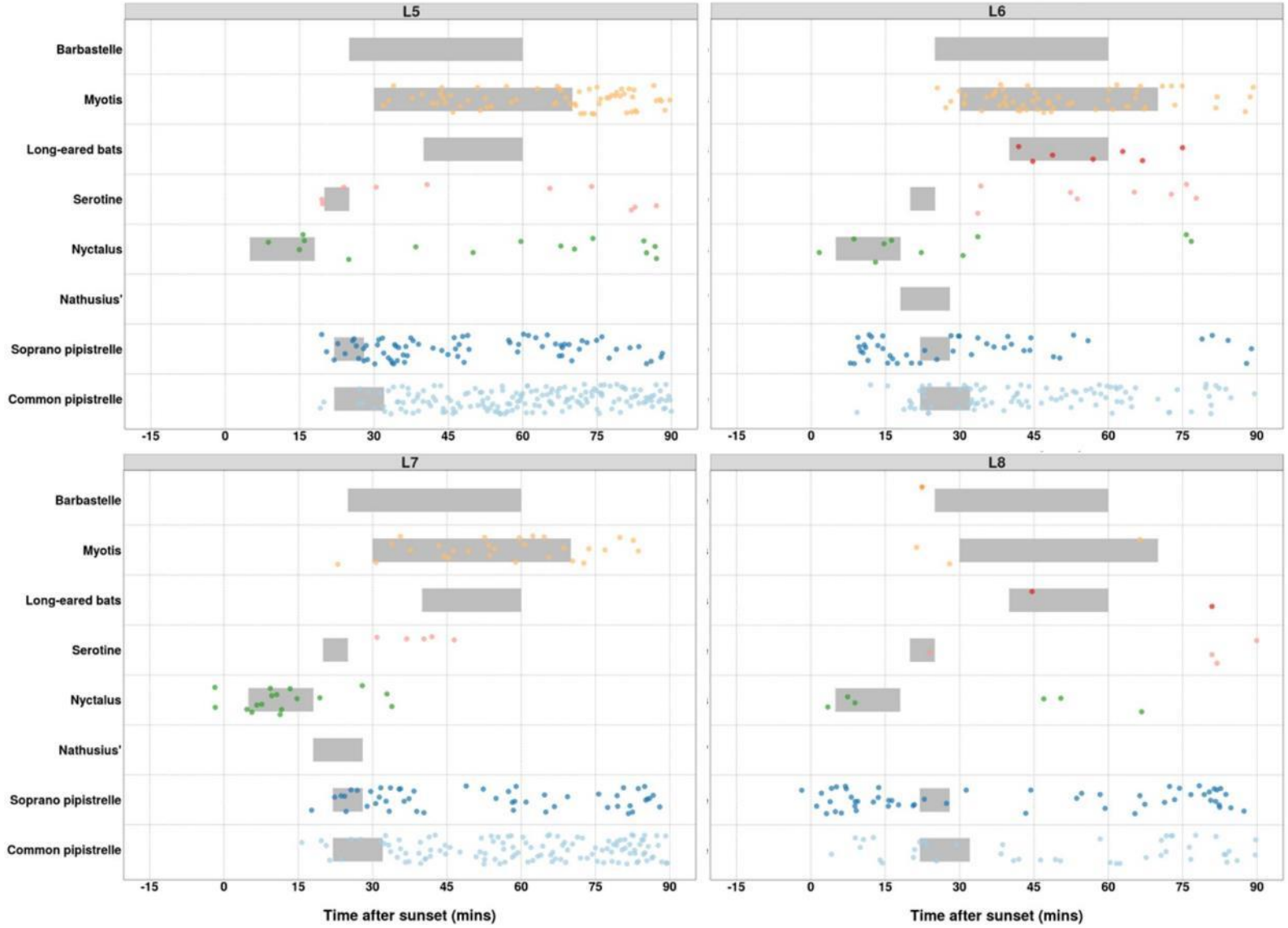


FIGURE 15: SHOWING BAT PASSES OVER TIME AFTER EMERGENCE IN JUNE FOR EACH DETECTOR LOCATION.