Ballinlee Green Energy Ltd

Ballinlee Wind Farm

Appendix 6E - Bat technical results report

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1. INTRODUCTION

For the basis of this assessment "the Site" only refers to the area within the redline boundary (incorporating the potential development area) as displayed in Figure 1. Where the turbine delivery and grid connection routes are stated these will be referred to as TDR and GCR respectively.

1.1. Background

Ballinlee Green Energy Ltd. are applying for planning consent for a renewable energy development referred to as the Ballinlee Wind Farm (further referred to as the 'Proposed Development'), located in County Limerick, 3km southwest of the village of Bruff.

This bat report provides a summary of the methods used to survey the bat species present within the proposed development site, along with presenting the results and providing discussion of the results for further assessment.

Baseline surveys for bats aimed to identify the species occurring within the Site, and to provide an understanding of how local bat populations utilise the area in terms of density of use for foraging, roosting (maternity and hibernation), social interactions, and commuting.

1.2. Site description

The Site is located within the townlands of Carrigeen, Camas South, Ballinrea, Ballincurra, Ballinlee South, Ballingayrour, Knockuregare, Ballinlee North.

The Site features habitats that are considered highly suitable for foraging and commuting bats. It has excellent connectivity throughout, with a continuous mosaic of hedgerows, especially along the southern extent of the Site. The northern extent of the Site is well-connected by a network of artificial drains and the Morningstar River, which flows through this area.

The Site has several stands of commercial forestry which also offer good foraging and commuting for bats across the site.

1.3. Project description summary

The proposed development will consist of 17 no. wind turbines with a tip height of up to 160 m, access tracks, hardstanding areas at each turbine location, temporary compounds, borrow pits, deposition areas, drainage works, underground electrical and communications cables between the turbines and an underground cable to connect the proposed development to Killonan 220/110 kV Substation located approx. 27.6 km north of the Proposed Development. Felling of approximately 14.4ha of conifer forestry is also included.

1.4. Protected status of bats in Ireland

Bats are protected by law in the Republic of Ireland under the Wildlife Act 1976 and subsequent amendments (2000 and 2010). The latest is the wildlife amendment Act 2023.

Under the Wildlife Acts, it is an offence to intentionally disturb, injure or kill a bat or disturb its resting place. The Wildlife Acts also make it an offence to unintentionally kill or injure bats or to unintentionally destroy or interfere with bat roosts as part of any construction or engineering works.

National Parks and Wildlife Service (NPWS) (2021a and 2021b) guidelines outline further legal protection afforded to species listed on Annex IV off the Habitats Directive (92/43/EEC), as required by Articles 12, 13 and 16. The Habitats Directive is transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations, 2011-2021 (Habitats Regulations) and this legislates for requirements in relation to strict protection of species listed on Annex IV of the Habitats Directive, which are set out in Regulation 51, with Regulation 54 pertaining to derogation licences, including Regulation 54 A, when the Minister is applying for a derogation.

All bat species fall under Annex IV of the EU Habitats Directive (1992). The system of Strict Protection is applied across the entire natural range of Annex IV species, even outside of protected sites. As set out in Regulation 51, carrying out of any work with the potential to capture or kill any specimen of a Strictly Protected species, or to disturb these species, and for which a derogation licence has not been granted, may constitute an offence under Regulation 51 of the Habitats Regulations. Furthermore, any action resulting in damage to, or destruction of, a breeding or resting place of an animal may constitute an offence unless a derogation licence has been granted. This action does not need to be deliberate to constitute an offence, i.e. places onus on demonstrating due diligence. Breeding and resting places are protected even when the animals are not using them, once there is a high probability that they will return. Planning authorities may refuse planning permission solely on grounds of the predicted impact on protected species like bats.

Lesser horseshoe bat (Rhinolophus hipposideros) is listed in Annex II of the EU Habitats Directive 1992 and are known to occur in Counties Cork, Kerry, Limerick, Clare, Mayo, and Galway (NPWS, 2019). The greater level of protection offered to the lesser horseshoe bat means that areas important for this species are designated as Special Areas of Conservation (SACs). The foraging range (core sustenance zone) for lesser horseshoe bats from maternity roosts is approximately 2.5 km and seasonal movements between summer and winter roosts reported as 5 km to 10 km (Collins *et al*. 2016). The Site is not ecologically linked to Natura 2000 sites designated for this species.

For all other bat species occurring in Ireland, EU legislation requires that they are strictly protected. Among Ireland's obligations under the Habitats Directive is the obligation to maintain favourable conservation statuses of Annex-listed species.

Under the EU Nature Restoration Law (Regulation (EU) 2024/1991), Member States are required to implement restoration measures for habitats of species listed under the Habitats Directive, which includes all bat species occurring in Ireland. The regulation mandates ecosystem-specific restoration targets, including terrestrial and freshwater habitats, to ensure the long-term survival of species such as bats. Restoration efforts must improve habitat quality and connectivity, prevent deterioration, and contribute to favourable conservation status. These obligations complement existing protections and reinforce Ireland's duty to restore and maintain bat habitats as part of its national restoration plan.

Ireland has also ratified the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983). This convention was instigated to protect migrant species across all European boundaries, which covers certain species of bat.

1.5. Outline of the scope of works

To comply with the requirements of the EU Habitats Directive 1992 and the EC Habitats Regulations 2011, and the EU Nature Restoration Law (Regulation (EU) 2024/1991), wind farm applications in Ireland need to be assessed as to their potential impact on bat populations.

To inform the impact assessment of the proposed development a range of bat surveys were undertaken including a desk-based study and field surveys. As there are no national guidelines for the collection of baseline data for bats, the guidelines produced by Scottish Natural Heritage Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (Scottish Natural Heritage (SNH)) *et al*., 2019, as updated NatureScot *et al*., (2021) have been adopted for this project. Hereafter these guidelines will be referenced as NatureScot *et al*. (2021). While these UK-based guidelines provide a robust framework for survey design and assessment, it is also important to note that Irish guidelines from the NPWS and Bat Conservation Ireland are referenced where specific requirements exist or for mitigation measures. In particular, the Bat Mitigation Guidelines for Ireland (Marnell *et al.,* 2022) and other best practice protocols for species conservation are used to ensure alignment with national standards and ecological context. These resources complement the survey approach and provide Ireland-specific guidance for impact avoidance and mitigation.

This report is to serve as a technical results report to be included as an appendix of an Environmental Impact Assessment Report (EIAR) for the proposed development. It provides details of methodologies and survey effort for the suite of bat surveys conducted for the Site, including tabulated results, maps, and charts, as well as reports from roost suitability surveys, bat activity surveys and seasonal static bat detector surveys. These surveys highlight baseline bat populations and habitat suitability of the Site.

In summary, bat surveys were undertaken in accordance with NatureScot, (2021) guidelines. Static bat recording equipment was deployed at selected locations representative of the proposed turbine layout provided for the Site. Static deployments were carried out on three occasions during the 2023 active bat season, in conjunction with continuous monitoring of climatic conditions on the Site to ensure recording windows were inline within compliant weather parameters.

Additionally, informed by an assessment of potential bat roost features within the Site, active roost emergence/re-entry surveys and bat activity transects were undertaken. The observations recorded during roost emergence/re-entry survey and bat activity surveys contextualise how bats utilise the Site.

1.6. Evidence for competence and experience

Jason Guille – Associate director – Author and QA of report

Jason Guile is an Associate Director with Woodrow and has co-authored and reviewed this report. Jason has over 15 years' experience in ecological assessment and holds a BSc in Marine Biology/Oceanography from the University of Wales, Bangor and a HND in Coastal Conservation with Marine Biology from Blackpool and Fylde College. Jason has a wide range of experience in the preparation of Environmental Impact Assessment Reports, Appropriate Assessment Screening reports and Natura Impact Statements. Jason was the lead ecologist on a range of projects in the UK, including large scale infrastructural schemes. Since moving to Ireland, he has been lead ecologist / author (EIAR, EcIA, AA Screening reports and NIS's) for a number of projects including historic landfill remediation works, urban planning applications and commercial regeneration sites.

Oisín O Sullivan – Senior Ecologist & Technical Lead on bat surveys – Co-author of report.

Oisín O'Sullivan was a Senior Ecologist with Woodrow. Oisín has completed a B.Sc. in Ecology and Environmental Biology at University College Cork. His final year thesis involved bat surveys of urban habitats in Cork City. His work as a graduate ecologist with Woodrow was focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Oisín has developed a high level of proficiency with Kaleidoscope, Ecobat and BatExplorer, all of which are analysis software used to assess bat calls and activity. Since joining Woodrow, Oisín's work involved coordinating, surveying, analysing data, and writing bat technical reports for onshore wind developments. This also involved the use of R (statistical analysis) to provide data on bat activity relative to weather conditions with the goal of informing curtailment strategies as a mitigation measure. During 2022 Woodrow began undertaking offshore bat surveys, Oisín was a technical lead on these projects. Oisín is a Qualifying member of CIEEM and holds a bat derogation license for disturbance.

Qualifications:

BSc (Hons) Ecology and Environmental Biology. University College Cork 2020

Patrick Power – Ecologist (Bat Specialist) – Co-author of report.

Patrick Power is an ecologist with Woodrow. Patrick has completed a BSc in Forestry, BSc (Hons) in land management in Forestry with Waterford Institute of Technology and a PGCert in Wildlife Biology and Conservation with Edinburgh Napier University.

His work with Woodrow is focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Patrick has developed a high level of proficiency with Kaleidoscope and BatExplorer, the analysis software used to assess bat calls and activity. Patrick also possess Reptile, mammal, and woodland tree surveying skills. Patrick currently has a bat derogation licence for disturbance.

Qualifications:

BSc in Forestry. Waterford Institute of Technology. 2014

BSc (Hons) in Land Management in Forestry. Waterford Institute of Technology 2016

PG Certificate in Wildlife Biology and Conservation. Edinburgh Napier University. 2023

Kevin O'Reilly – Ecologist (Bat specialist) – Bat surveyor for this assessment

Kevin O'Reilly is an ecologist with Woodrow. He obtained First Class Honours degree in Business and Law at University College Dublin before training and qualifying as a Solicitor with the Law Society of Ireland. He completed a master's research project in environmental management and GIS with Ulster University with a focus on bats and street lighting. Kevin has also undertaken several volunteer projects to gain valuable experience in habitat surveying techniques and knowledge of environmental management and the flora and fauna of protected species in Ireland and abroad. Since joining Woodrow, Kevin has undertaken numerous bat surveys including static detector deployment and roost surveys and worked on several large-scale developments. He has also authored multiple bat technical reports and coordinated bat surveys. Kevin is a qualifying member of CIEEM and holds a full bat derogation licence issued by NPWS.

Qualifications:

BBL Bachelor of Business and Law – University College Dublin, 2016

Professional Practice Courses I & II – The Law Society of Ireland, 2019

PgDip Environmental Management with GIS – Ulster University, 2023

Róisín O Connell – Ecologist (Bat specialist) – Data analysis for this assessment

Róisín O'Connell is an ecologist with Woodrow. Róisín has completed a B.Sc. in Environmental Science at Atlantic Technological University in Sligo. Her final year thesis involved carrying out aquatic macrophyte surveys of lough Doon in County Leitrim. Her work as a graduate ecologist with Woodrow is focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Róisín has developed a high level of proficiency with Kaleidoscope and BatExplorer, the analysis software used to assess bat calls and activity. Róisín also possesses marine and freshwater habitat survey skills from her time studying at ATU. Since joining Woodrow, Róisín has authored multiple bat activity reports and coordinated bat surveys. She has also undertaken numerous bat surveys including static detector deployment and roost surveys and worked on several large-scale developments. Róisín is a Qualifying member of CIEEM and holds a bat derogation licence for disturbance .

Qualifications:

BSc (Hons) Environmental Science. Atlantic Technical University Sligo 2020.

Louise Gannon BSc (Hons) – Ecologist (Bat specialist) – Data analysis for this assessment

Louise Gannon is an Ecologist with Woodrow. Louise has completed a B.Sc. in Environmental Science. Her main experience lies in conducting protected species surveys for bats (preliminary roost assessments, emergence/re-entry surveys and activity transect surveys), as well as the deployment of static bat detectors and reporting on the same. She also conducts bat call analysis using Kaleidoscope and BatExplorer, the analysis software used to assess bat calls and activity. Louise also has experience in conducting otter, badger, and red squirrel surveys. Louise is a licenced bat surveyor and a Qualifying member of CIEEM.

Qualifications:

BSc (Hons) Environmental Science. Atlantic Technical University Sligo 2020.

Frederico Hintze – Ecologist (Bat specialist) – Bat surveyor and data analysis for this assessment

Frederico Hintze was an Ecologist working with Woodrow. He holds a B.Sc. in Biology-Geology and an M.Sc. in Ecology from the University of Minho (Portugal), as well as a PhD in Animal Biology from the Federal University of Pernambuco (Brazil). His passion for bat research and monitoring began during his undergraduate thesis in 2009. For his master's thesis, he focused on assessing the impact of agricultural dams on bat populations in Northeastern Portugal. During his PhD, he utilized bioacoustics and species distribution modelling to enhance the understanding of the distribution of Neotropical bat species. Subsequently, his post-doctoral work led him to the world's largest iron ore mine in Carajás, Pará, Brazil, where he aimed to characterize the vocalizations of Amazonian bats and assess the impacts of mining on bat populations. Throughout his career, he has actively participated in numerous Environmental Impact Assessment (EIA) projects in Portugal, covering various developments including dams, wind farms, roads, and transmission lines. He also served as the coordinator of the Bioacoustics Committee at the Brazilian Bat Research Society. In addition to his academic contributions, he has authored over fifteen scientific publications and sampling event datasets, showcasing his expertise in the field. As an ecologist with Woodrow, his work focused on bat data analysis, including bat call identification, bat roost/habitat suitability surveys, and report writing and review. He possesses a high level of proficiency and experience with various analysis software used to assess bat calls and activity.

Qualifications:

BSc in Biology-Geology. University of Minho - Portugal 2011.

MSc in Ecology. University of Minho - Portugal 2014.

PhD in Animal Biology. Federal University of Pernambuco – Brazil 2020.

Adrian Walsh – Ecologist – bat surveyor for this assessment

Adrian is an Ecologist with Woodrow Sustainable Solutions Ltd. He has completed an honours BSc with a focus on Zoology and an MSc in Wildlife Conservation and Management at University College Dublin. Adrian had developed proficiencies in ornithological and terrestrial mammal surveying in addition to advanced habitat, bat and invertebrates monitoring. Adrian regularly contributes to Appropriate Assessment and Ecological Impact Assessment reports. He volunteers as a surveyor for Birdwatch Ireland for the Irish Wetland Bird Survey (I-WeBS) and the Countryside Bird Survey (CBS) and is a Qualifying Member of CIEEM.

Qualifications:

BSc (Hons) Zoology. University of Galway. 2018

MSc Wildlife Conservation and Management. University College Dublin. 2020

Bruno Mels – Ecologist and Data Coordinator – Bat surveyor and Data analysis for this assessment.

Bruno Mels (BM) is an Ecologist and Data Coordinator at Woodrow. He is experienced in undertaking habitat suitability modelling, and statistical analysis and modelling using R and Maxent. Bruno is also competent in modelling species population trends using Stella. He is also a digital illustrator, having designed and created various information boards for UNESCO world heritage sites in the Seychelles. He has a vast amount of experience mapping with both ArcGIS and QGIS, as well as data management using Excel and Access.

Conn Barry – Data Coordinator – Bat surveyor for assessment

Conn holds an MSc in Environmental Resource Management. His academic background has made him familiar with environmental law & policy, ecosystem services, GIS and data analysis. Conn has also undertaken field work concerning hen harriers and red grouse, both of which are priority conservation species in the Republic of Ireland. Since joining Woodrow, Conn has been involved in a wide range of projects such as Phase 1 surveys, bat roost and transect surveys, terrestrial mammal surveys and community outreach programmes. He is a Qualifying member of CIEEM and is undertaking a course in wildflower identification with Atlantic Technological University Sligo.

Conn Barry – Qualifications

MSc – Environmental Resource Management, University College Dublin, 2021

BA History & English, Trinity College Dublin, 2017

Figure 1: The proposed wind farm layout

2. METHODOLOGY

2.1. Desk study

A desk-based review of habitat availability in the environs of the Site, and the available 3rd party bat data was used to inform the scope of the bat surveys required. As recommended by both BCI (2012) and NatureScot, (2021) the area covered by the desk-based review was extended to 10 km surrounding the proposed development. The desk-based study included the following:

- Reviewing distances from closest Natura 2000 sites designated for bats.
- Examining aerial imagery and 6-inch maps to identify potential bat foraging and roosting habitats.
- Following Lundy *et al*. (2011) in order to provide a high-level assessment of potential habitat suitability for different species of bat occurring in Ireland.
- A data request was submitted to Bat Conservation Ireland (BCI) for known roost records within 10 km of the centre of the Site. The request search was made on 2 August 2023.

2.2. Field surveys

Bat field surveys were conducted by Adrian Walsh, Bruno Mels, Conn Barry, Kevin O'Reilly, Oisín O Sullivan, Frederico Hintze and Patrick Power during the 2023 and 2024 active bat seasons in accordance with NatureScot, (2021). This guidance document supersedes some aspects of the previous guidelines (Collins, 2016; Hundt, 2012 & BCI, 2012) and recommends a site-by-site approach to survey design, with the only prescriptive element being the positioning, number, and duration of static bat detector deployments, as well as the strongly recommended continual monitoring of site-specific weather data on rainfall, temperature, and wind speeds.

As of October 2023, the 4th edition of Bat surveys for professional ecologists has been updated. Collins (2016) is now referred to as Collins (2023) to reflect this update. All bat surveys were carried out following the Collins (2016) guidance, which is still compliant with the newly updated 2023 guidance.

As a minimum, the latest NatureScot, 2021 guidelines require three deployments of static detectors aimed at covering Spring (April to May), Summer (June to mid-August) and Autumn (mid-August to October), each with a minimum deployment period of 10 nights (within compliant weather parameters). Seasonal deployments of static detectors are set out at all potential turbine locations for proposals comprising 10 or less turbines, with a third of any additional locations also covered up to a maximum of 40 detectors. Compliant weather conditions are defined as: temperatures at ≥ 8°C at dusk, maximum ground level wind speed of 5 m/s and no, or only very light, periodic rainfall.

Additional requirements of the NatureScot, 2021 guidelines include swarming surveys, and winter roost inspections if potential hibernation roosts are identified. Transect and/or vantage point surveys are seen as methods used to complement the static detector surveys, with applicability being discretionary, based on professional judgement, and on a case-by-case site-specific basis.

2.2.1. Habitat and roost assessment surveys.

The most recent guidelines from NatureScot (2021) for bat surveying recommend that "Key features that could support maternity roosts and significant hibernation and/or swarming sites (both of which may attract bats from numerous colonies from a large catchment) within 200 m plus rotor radius of the boundary of the proposed development should be subject to further investigation". The project design envelope allows for turbines of up to 68 m rotor radius; 200 m + 68 m = 268 m. Due to design stages and minor movement of turbine locations, the survey area was extended to 300 m to provide a conservative buffer.

Preliminary roost assessment (PRA) surveys within the Study Area were undertaken in August 2023 aided with the use of endoscopes, thermal inspection cameras and high-powered torches. Ground-level tree assessment (GLTA) surveys were completed in February 2024. The Study Area for roost assessment surveys includes a 300 m radius of the turbine. PRA and GLTA surveys of the TDR and GCR were undertaken in March 2024. The Study Area for the TDR and GCR includes a 50 m radius of the route.

Surveyors utilised the preliminary roost assessment criteria described in Collins (2016), which provides guidelines for assessing potential suitability of structure and habitat features as bat roosts, and to assess habitat suitability for foraging bats. This allows surveyors to classify the roosting and habitat suitability for bats in the Study Area. All potential roost assessment surveys were carried out by trained and experienced bat surveyors under licence from NPWS. For the purposes of this application, the classification and nomenclature of results have been updated to align with the 2023 guidance, superseding the previous 2016 guidance. Refer to Table 1 for classifications as per 2023 guidance.

Table 1: Guidelines for assessing the potential suitability of proposed development sites for bats based on the presence of habitat features within the landscape, to be applied using professional judgement (Collins, 2023).

Suitability	Description Roosting Habitats	Commuting and Foraging Habitats
None	No habitat features on site likely to be used by any roosting bats at any time of the year (i.e., a complete absence of crevices/suitable shelter at all grounds /underground levels).	No habitat features on site likely to be used by any commuting or foraging bats at any time of the year (i.e., no habitats that provide continuous lines of shade/protection for flight-lines or generate/shelter insect populations available to foraging bats).
Negligible [a]	No obvious habitat features on site likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.	No obvious habitat features on site likely to be used as flightpaths or by foraging bats; however, a small element of uncertainty remains to account for non-standard bat behaviour.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not	Habitat that could be used by small numbers of commuting bats such as a hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding

Suitability	Description Roosting Habitats	Commuting and Foraging Habitats
	provide enough space, shelter, protection, appropriate conditions [b] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e., unlikely to be suitable for maternity and not a classic cool/stable hibernation site but could be used by individual hibernating bats [c]).	landscape by another habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions [b], and/or surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only, such as maternity and hibernation – the categorisation described in this table is made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland, or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions, and surrounding habitat. These structures have the potential to support high conservation status roosts e.g. maternity or classic cool/stable hibernation site.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, treelined watercourses and grazed parkland. Site is close to and connected to known roosts.

[a] Negligible is defined as so small or unimportant as to be not worth considering, insignificant. This category may be used where there are places that a bat could roost or forage (due to one attribute), but it is unlikely that they would (due to another attribute).

[b] for example, in terms of temperature, humidity, height above ground level, lights levels or levels of disturbance.

[c] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al*., 2016 and Jansen *et al*., 2022.) Common pipistrelle swarming has been observed in the UK (Bell, 2022 and Tomlinson, 2020) and winter hibernation of numbers of this species has been detected at Seaton Hall in Northumberland (National trust, 2018). This phenomenon requires some research in the UK, but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in prominent buildings in the landscape, urban or otherwise.

The above categorisation does not work well for trees. A better categorisation is that shown in Table 2.

It was recognised that the categorisation in Table 1 does not work well for trees and potential roost features (PRFs) and an updated set of categories was established by Collins (2023) guidance. These categories are displayed in Table 2.

Table 2: Guidelines for categorising the potential suitability of PRF's

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

Based on the features present and the location of the trees or other structures, the potential use of the feature can also be considered, and classified as per Hundt, 2012:

- Maternity (breeding roost).
- Summer/transitional (to include transitional, occasional, satellite, night and day roosts); and Hibernation roost.

Surveyors initially inspect using non-invasive external and internal techniques for any building encountered. All trees encountered were assessed from the ground level.

Surveys were carried out on the TDR and GCR in March 2024, with a specific focus on PRFs. The routes were driven at a slow pace (~10 km/hour) with any tree/building with roosting potential investigated further by stopping the vehicle and identifying any PRF of the respective tree/building. Binoculars were employed to examine PRFs high off the ground that may be overhanging the routes.

PRF's adjacent to the TDR and GCR were classified using the methodology outlined in Table 1 for buildings and structures and Table 3 for guidelines on the preliminary assessment of trees on the routes. The Study Area for the TDR and GCR includes the Planning Application Boundary only. Trees and buildings with moderate to high potential, outside the footprint were recorded, if identified.

Table 3: Guidelines for assessing the suitability of trees on proposed development sites for bats, to be applied using professional judgement

Suitability	Description
NONE	Either no PRF's in the tree or highly unlikely to be any.
FAR	Further assessment required to establish if PRF's are present in the tree.
PRF	A tree with at least one PRF present.

2.2.2. Roost emergence/re-entry surveys.

The locations for dusk emergence and dawn re-entry surveys were informed by the roost assessment survey results within a 300m buffer from the proposed turbine locations at time of surveying. Locations beyond the 300m buffer may also be considered, provided they have strong connectivity to the proposed turbine area.

Dusk surveys commenced 15 mins before sunset and concluded 1.5 hours after sunset and dawn re-entry surveys commenced 1.5 hours before sunrise to 30 mins after sunrise.

Surveyors (Oisín O Sullivan, Frederico Hintze, Kevin O'Reilly, Bruno Mels, Conn Barry and Patrick Power) watched for dusk emergences and dawn re-entries at potential roosting sites identified during the roost assessment surveys and noted any peripheral activity. The surveys were aided by the use of IR (Canon xa60) and thermal cameras.

Survey notes were recorded using the ESRI Survey123 mobile app and detections by hand-held Elekon Batlogger M bat detectors, which enabled the collection of geo-referenced recordings of bat activity.

Subsequently, the captured acoustic recordings were subjected to analysis using the BatExplorer software. All dusk and dawn surveys (emergence and re-entry) were undertaken within prescribed favourable weather conditions, i.e. a temperature of at least 8°C at sunset, a maximum ground level wind speed of 5 m/s, and no or very light periodic precipitation. Roost survey times and details are shown in Table 4.

Table 4: Roost survey times and details 2023

Date	Sunrise/ sunset	Start time	End time	Location (PRF reference)	Survey type	Weather conditions temperature (°C), wind speed (m/s), cloud coverage *(Oktas) and precipitation (mm).
18 July	22:05	21:50	23:18	B1	Emergence	19°C, 1 m/s, 6 oktas and 0 mm.
19 July	05:32	4:02	5:47	B2	Re-entry	11 °C, 0 m/s, 2 oktas and 0 mm.
9 August	06:04	4:30	6:15	B3	Re-entry	17°C, 2 m/s, 7 oktas and 0 mm.
17 August	20:59	20:44	22:29	B4 and B5	Emergence	18 °C, 5 m/s, 7 oktas and 0 mm.
21 September	19:18	19:03	20:48	B6	Emergence	14 °C, 4 m/s, 5 oktas and 0 mm.
22 September	07:18	5:48	07:48	B7	Re-entry	9 °C, 1 m/s, 2 oktas and 0 mm.
28 September	19:15	19:00	20:45	B8	Emergence	14 °C, 3 m/s, 7 oktas and 0 mm.
29 September	07:31	06:00	08:00	B4 and B5	Re-entry	10 °C, 4 m/s, 4 oktas and 0 mm.
12 October	07:53	06:23	08:08	B1	Re-entry	10°C, 3 m/s, 7 oktas and 0 mm.

* Oktas represent the cloud coverage scale from 0-9. One okta is a cloud amount of one eighth or less. Seven oktas are a cloud amount of seven eighths or more, but not full cloud cover. Eight oktas are full cloud cover with no breaks. Nine oktas are sky obscured by fog or other meteorological phenomena.

2.2.3. Bat activity transects surveys

NatureScot, 2021, guidance considers the application of transect surveys to be discretionary, with survey requirements designed on a site-by-site basis. Transects are complementary to data collected from static bat detectors; and are important for identifying flight lines and for providing context in relation to bat abundance within the survey area. Typically, either prior to a dawn re-entry survey or after a dusk emergence survey a walkover (transect) survey of the Site is conducted. Transect surveys were undertaken using Elekon Batlogger M bat detectors to collect geo-referenced records of bat activity. Field records were made of bat species encountered, number of bat passes, activity (where known e.g., foraging, commuting, advertising), travelling direction and approximate height (where known). Survey details are shown in Table 5.

Table 5: Transect survey details

Date	Start time	End time	Survey type	Weather conditions temperature (°C), wind (m/s), cloud coverage (Oktas) and precipitation (mm).
17-August-2023 (Sunset 20:59).	22:48	23:58	Transect Survey – Covering the eastern section of the Site. The proposed turbine locations of T13, T14, T15, T16 and T17.	18°C, 5 m/s, 7 oktas and 0 mm
21-Sept-2023 (Sunset 19:18).	21:18	22:40	Transect survey – Covering the north-western section of the Site. The proposed turbine locations of T1, T2 and T3.	14°C, 4 m/s, 5 oktas and 0 mm
28-Sept-2023 (Sunset 19:15).	21:05	22:15	Transect survey – Covering the central section of the Site also covering the northwestern section of the Site. Covering T1, T2, T3, T4 and T5.	14°C, 3 m/s, 7 oktas and 0 mm

2.2.1. Winter (hibernation) roost inspection surveys

NatureScot, (2021) recommend that winter roost surveys should also be carried out for any potential hibernation roost within 200 m plus rotor radius of developable area. The surveys were conducted from 12 - 15 February 2024, within the timeframe in which bats would still be utilising the hibernation roosts. Surveys involved searching for and collecting bat faecal samples to be sent for DNA analysis, closer examination of roost potential, the primary use of an endoscope and a thermal imaging camera, as a secondary device, to detect the heat signatures of hibernating bats due to bats being in a state of torpor.

Structures assessed during the roost assessment as comprising PRFs of low to moderate roost potential and which were judged to have potential for occupation as a winter roost were examined.

2.2.1. Static bat detector surveys

Static detector surveys were undertaken using Wildlife Acoustics, Song Meter 4 BAT Full Spectrum (SM4BAT-FS, with a SMM-U2 microphone), and SM MiniBat detectors. A sampling rate of 384 kHz was set for detectors, and recording was scheduled to be continuous subject to triggering from 30 minutes before sunset until 30 minutes after sunrise, for a minimum of 10 weather-compliant nights. Static bat detectors are deployed to record the types of bat species present and to provide an overview of how bat activity is broadly distributed over the Site at given habitat features and turbine locations. This provides context to bat activity within the Site to supplement and provide a comparison for the turbine locations, for example comparing bat activity along habitat features vs bat activity in open areas removed from features, emulating post-construction conditions around turbines.

In 2023, there were 14 static detectors (D.01 – D.14) deployed to monitor bat activity. NatureScot, (2021) sites the use of 14 detectors as adequate coverage. “Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments”.

Table 6 shows the dates of each static deployment. The location of all static detectors for each deployment in 2023 are shown in Figure 2 and Figure 3 and pictured in Appendix A. The weather conditions prevalent during the deployment periods are outlined in Appendix B.

Table 6: Static deployment details

Season	Deployment date	Collection date
Spring	18 May	2 June
Summer	18 July	8 August
Autumn	28 September	11 October

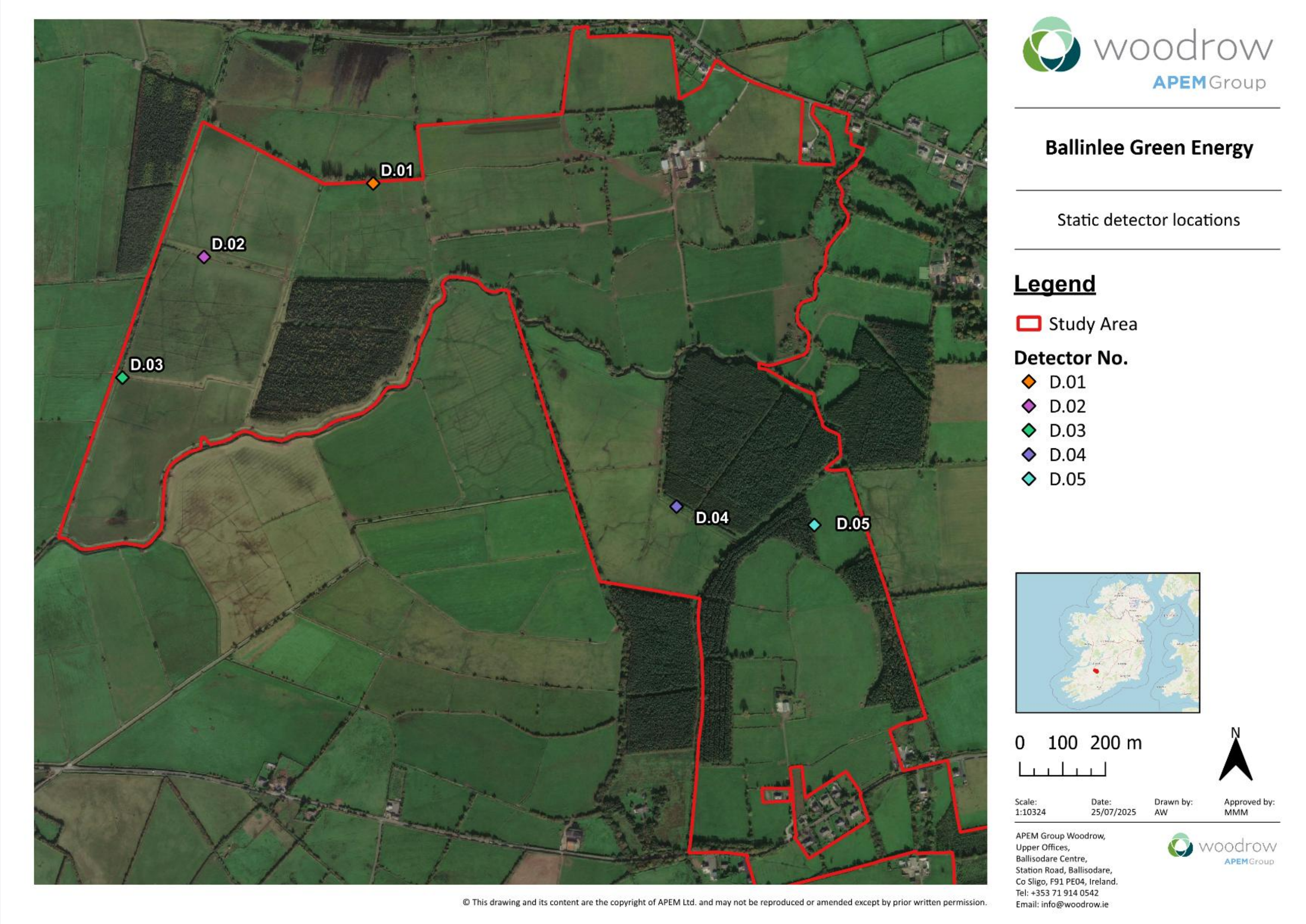

Figure 2: Static detector deployment locations in the northern section of the Study Area in 2023

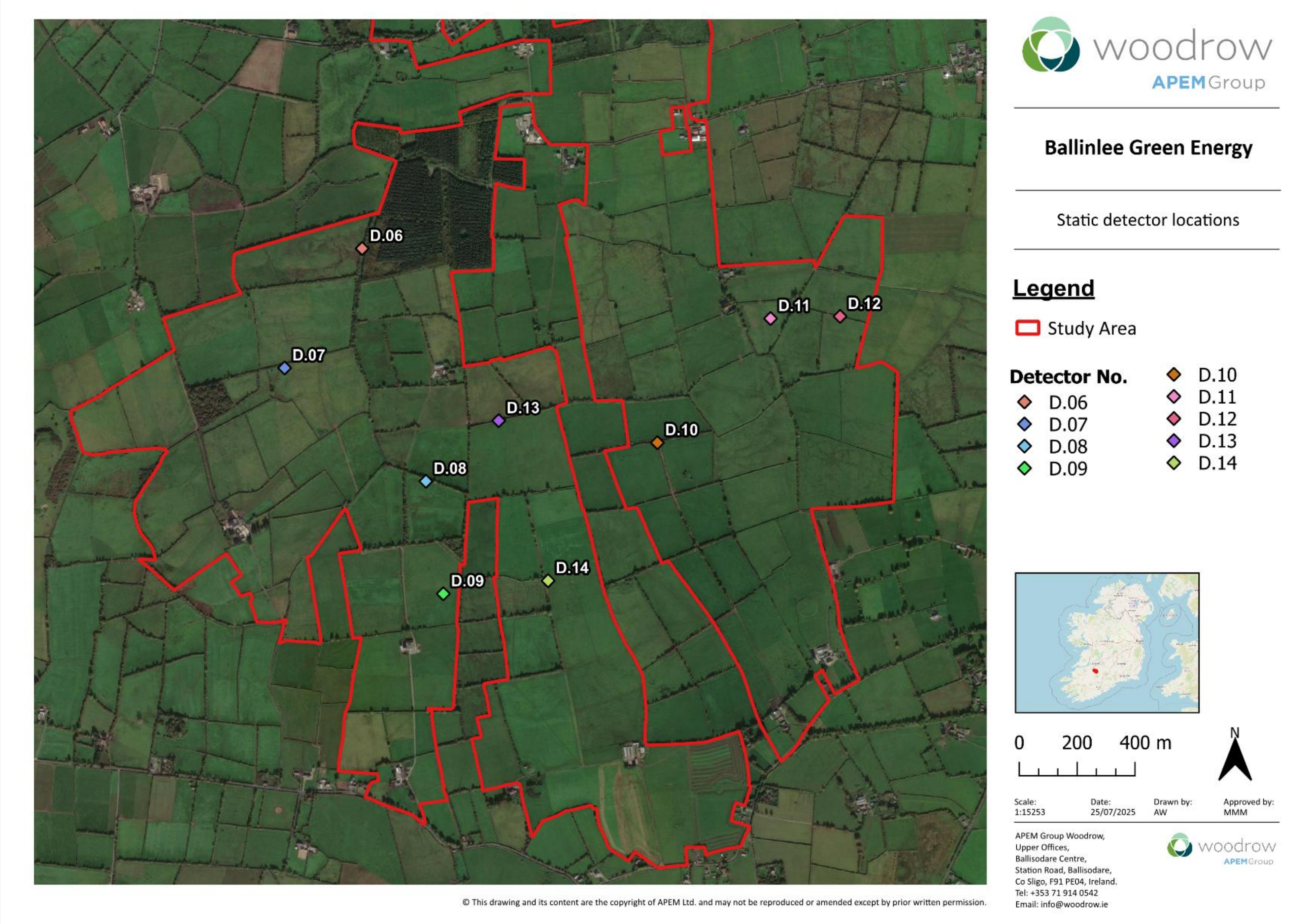

Figure 3: Static detector deployment locations in the southern section of the Study Area in 2023

2.3. Climatic monitoring

Monitoring climatic conditions was undertaken by on-site, fully automated weather station with 3G connectivity (Davis Vantage Vue wireless integrated sensor suite). The weather was monitored from 18 May – 11 October 2023.

The weather station provided data on a real-time basis. This allows weather station functionality to be checked daily during the survey season and for action to be taken if a station fails or there are concerns regarding the data. This obviates the need for a second (backup) weather station. The weather station collected the full range of weather data, including temperature, wind speed and rainfall, allowing surveyors to determine whether deployment nights were compliant with the prescribed weather parameters (≥ 8°C at dusk, max. ground level wind speed of 5m/s and minimal rainfall).

Deployment periods can then be adjusted to ensure 10 nights of compliant data are captured. In addition, site specific weather data can be useful for investigating the recorded patterns of site usage by bats, e.g. exposed open sites can receive an influx of foraging bats during nights that are warm and relatively still, especially towards the end of the summer and into the autumn, as bats disperse from maternity roosts (Woodrow per. obs.).

Weather data for each deployment period has been extracted and shown graphically in Appendix B**Error! Reference source not found.** for each of the spring, summer, and autumn deployments.

2.4. Calibration and testing of recording equipment

Calibration and testing of recording equipment is required by the NatureScot, 2021 guidelines. Additionally, as a standard operating procedure Woodrow has a stringent schedule for internal testing and recalibration of all bat recording equipment prior to, and during deployment in the field. Test results are logged in Excel, providing an audit trail to ensure that all data is robust and traceable. Unique numbering of static detectors, SD cards and microphones allows for traceability should any issues arise, e.g. following a microphone failure. Internal checks undertaken include pre-deployment device configuration and battery checks, and post- and pre-deployment microphone sensitivity checks.

2.5. Data analysis

For data collected using SM2Bat+, SM Mini Bat and SM4BAT-FS, analysis of sound recordings was undertaken using Kaleidoscope software (Version 5.6.3), while BatExplorer software was used for the data collected using the Batlogger M detectors. This analysis aimed to confirm species (or genus for Myotis species) and bat activity (exact number of bat passes) for each deployment and transect survey. All sound files were run through Kaleidoscope Pro's auto-identification (Version 5.6.3), and then manual verification was undertaken by Woodrow operatives. Russ (2012), Middleton *et al*. (2014), and (2022) were used to aid in the species identification of bat calls during data analysis.

Recordings of common and soprano pipistrelles for which Kaleidoscope determined a match ratio of 100% (meaning every recorded call matched the known species call parameters) were deemed accurate to a degree that did not necessitate manual verification. Nevertheless, all other automatically identified bat species were subjected to manual check, which is above the recommended 10% manual verification outlined in SNH *et al*. (2019) and NatureScot *et al*. (2021).

Recordings automatically identified as noise were determined to fall outside of the recording parameters for the survey and were classified as noise. Any calls showing up as "NoID," in which the software cannot identify any species, were also checked and manually identified.

Bat activity was measured by the number of bat passes recorded. Bat passes are commonly used as a metric for bat activity and determine species presence (Kerbiriou *et al*., 2019). Therefore, Woodrow defined a bat pass as the detection of one or more bat calls from a single species within a 15-second sound file. Recordings in which multiple species (or individuals) were recorded were split into separate bat passes. The number of bat passes was considered synonymous with registrations, as defined by commonly accepted practice, which refers to species presence within a 15-second sound file.

Geographical and temporal context for activity levels was then examined through internal comparative analysis. Woodrow have developed an in-house analysis script for data collected. Mean and median bat passes per hour were generated using statistical software R. In order to provide an appropriate test of activity within the Site, Woodrow analysis compares activity levels with other wind farm developments from its own database to provide comparative activity levels.

Activity levels are assessed using the criteria applied by Matthews *et al*. (2016). This study examines the risk of European bat species to wind energy developments in the UK. Woodrow have adapted the Matthews *et al*. (2016) scale of activity per night to a scale of bat passes per hour. This adaptation uses an average of 10 hours per night across the active bat season to determine the cut-off of high activity. Table 7 shows the adapted activity levels. The output is then converted to show the mean and median activity levels that can then be used to determine a risk assessment in relation to bat activity (it should be noted that presenting mean activity levels can be highly misleading where the data are highly skewed, as is frequently the case with bat activity at wind turbines (Lintott & Mathews, 2018)). A judgement can then be made on which is the most relevant.

The results are presented at both local level (per detector) and site scale to allow assessment of activity across the proposed development.

Table 7: Activity level classification as per Mathews *et al.,* (2021) adapted to hourly activity levels

Classification	Bat passes per hour
Low	<1.99
Moderate	2 – 4.99
High	≥5

2.6. Survey limitations

In spring the detector at D.08 failed to record any data and D.09 recorded for only one night (18 May).

In summer D.14 failed to record any data and autumn D.09 and D.10 failed to record any data.

While this infers no data collected for these locations, there are significant other detectors at similar locations around the Site that collected data. These locations are comparable and therefore can be used as a proxy for the analysis and assumed activity levels for the locations.

The level of surveying undertaken and associated results are sufficient with regard to the objective of surveying the bat species present within the proposed development site.

3. RESULTS

3.1. Desk study

BCI records indicate 18 roosts within 10 km of the Site, none of which are lesser horseshoe roosts. Refer to Appendix C for roost details.

There are no Natura 2000 sites designated for bats within 10 km of the Site. The closest such Natura 2000 site is Curraghchase SAC. This SAC is located c. >10 km to the Northwest of the Site. There is likely no direct effect on this site from the Site.

There are no pNHA or NHA designated for bats within 10km of the Site.

3.2. Habitat and roost suitability assessment

The roost assessment identified 21 buildings within the Site, of which eight were classified as having Moderate roost potential and 71 tree PRFs were identified, of which 14 were classified as having PRF-M potential. Locations are further shown in Figure 4 and Figure 5. Full detail of the roost locations is shown in Appendix D and E.

Table 8 provides the habitat classification as per Collins 2023, (refer to Table 1) and roosting potential (trees and buildings) within 300m of the proposed turbine locations.

Table 8: Bat habitat classified in accordance with Collins, (2023)

Turbine location	Collins 2023, bat habitat classification for commuting and foraging. Refer to Table 1	Roost potential within c. 300 m of turbine location
T01	High	There are four potential roost features within 300m of this location.
T02	High	There are no potential roost features within 300 m of this location.
T03	Moderate	There are no potential roost features with 300 m of this location.
T04	High	There are six potential roost features within 300 m of this location.
T05	High	There are five potential roost features within 300 m of this location.
T06	High	There are 12 potential roost features within 300 m of this location.
T07	High	There are no potential roost features within 300 m of this location.
T08	High	There are 11 potential roost features within 300 m of this location.
T09	High	There are 3 potential roost features within 300 m of this location.

Turbine location	Collins 2023, bat habitat classification for commuting and foraging. Refer to Table 1	Roost potential within c. 300 m of turbine location
T10	High	There are 2 confirmed roosts within 300 m of this location.
T11	High	There are 5 potential roost features within 300 m of this location.
T12	High	There is one potential roost feature within 300 m of this location.
T13	High	There are 4 confirmed roosts within 300 m of this location. All within 200-300 m.
T14	High	There are 4 confirmed roosts within 300m of this location. All within 170-270 m.
T15	High	There are two potential roost features within 300 m of this location.
T16	High	There are no potential roost features within 300 m of this location.
T17	High	There is one potential roost feature within 300 m of this location.

As the TDR will be on major roads (M and N roads) with significant existing traffic and disturbance before reaching Croom, no surveys were conducted for bat roosts along the major roads. The roost assessment concentrated on the section of the TDR from Croom to the Site. The roost assessment identified 52 trees along the route with 15 recorded as having PRFs, 36 recorded as FAR and one recorded as None. Refer to Figure 6 showing survey results.

The roost assessment of the GCR identified nine trees along the route with two recorded as having PRFs and the remining recorded as FAR. Refer to Figure 7 showing survey results.

Due to the results of the PRF surveys and the construction methodologies proposed for the TDR and the GCR (refer to EIAR Chapter 2 Description of the Development), no further surveys were undertaken along the routes.

3.3. Roost emergence/re-entry surveys

Roost emergence/ re-entry surveys established or confirmed the presence of five roosts within buildings; details are provided in Table 9 and locations shown in Figure 8. The table outlines the species present and count of species, roost type, survey type that discovered the roost and approximate distance from the closest proposed turbine.

The roost at B3 has been classified a day roost being utilised on a transitional basis.

The roosts at B6 and B8 have been classified as night roosts utilised on a transitional basis.

The final two roosts (B9.1 and B9.2) have been classified as transitional roosts. Both roosts were confirmed on the first daytime roost inspection. On a re-visit to inspect the boxes, the pipistrelle roost at B9.1 was vacant and the roost at B9.2 was still occupied by the two Leisler's bats. Both of these roosts were in wooden bird boxes.

There are numerous potential roost features (PRFs) within trees within the Site, however no tree roosts have been confirmed within the Site during the emergence/re-entry surveys. There remains a likelihood that bats will still use the PRFs within the trees transitionally for roosting. Hinds and Davidson-Watts (2022) highlight that tree-roosting bats exhibit fission and fusion behaviour, frequently switching roosts or congregating in one roost. This roost-switching is influenced by factors like microclimate, seasonal changes, and parasite avoidance, making it difficult to confirm bat presence during specific surveys. As a result, trees with potential roost features should be treated as roosts, and appropriate mitigation measures should be implemented if these trees are to be removed during development. This approach accounts for the dynamic and unpredictable nature of bat roosting habits.

Table 9: Confirmed roosts

PRF Reference	Species (Count)	Roost type	Survey type	Approx. distance from closest turbine
B3	*Myotis* spp. (3), brown long eared bat (1) soprano pipistrelle (1).	Transitional/day roost	Re-entry survey	190m from T14
B6	Soprano pipistrelle (2)	Transitional/night roost	Emergence survey	190m from T14
B8	Soprano pipistrelle (1)	Transitional/night roost	Emergence survey	260m from T14
B9.1-B9.2	Pipistrelle spp. (3) Leisler's bats (2)	Transitional roosts in each wooden bird box	Endoscope inspection survey	245m from T10

Details of emergence/ re-entry survey results are provided below.

Emergence Survey (B1)

Findings: Pipistrelle bats (common and soprano) recorded foraging and commuting along well-connected hedgerows adjacent to the building. Possible emergence and re-entry were observed but **later ruled out** through IR footage.

Re-entry Survey (B2)

Findings: Leisler's bat, common pipistrelle, and soprano pipistrelle recorded foraging around the buildings. One bat observed emerging from a nearby building; however, **no echolocation calls** confirmed the event, and it was **not supported by IR footage**.

Re-entry Survey (B3)

Findings: Multiple bats observed emerging from and re-entering the structure. IR camera footage confirmed use of the building by **Myotis species**, **brown long-eared bat**, and **common pipistrelle**.

Emergence Survey (B4 & B5)

Findings: Leisler's bats noted social calling in the survey area. Common and soprano pipistrelles recorded foraging and commuting. Two possible emergences were **later ruled out** by IR footage.

Emergence Survey (B6)

Findings: **Two confirmed emergences** of soprano pipistrelle bats. Common and soprano pipistrelles observed foraging in the area. Leisler's bats also recorded foraging nearby.

Re-entry Survey (B7)

Findings: Common and soprano pipistrelles observed foraging in the area. No confirmed re-entries.

Emergence Survey (B8)

Findings: **One confirmed emergence** of a soprano pipistrelle bat. Several soprano pipistrelles observed foraging, particularly around a bright light on a nearby shed, indicating opportunistic feeding behaviour.

Re-entry Survey (B4 & B5)

Findings: Common and soprano pipistrelles recorded foraging over buildings. No confirmed re-entry.

Re-entry Survey (B1)

Findings: Soprano pipistrelles observed foraging along adjacent hedgerows. No confirmed re-entry.

3.4. Bat activity transects surveys

There were three transect surveys conducted during the 2023 survey window.

Four species of bats were identified during the transect surveys; common pipistrelle (nine total passes), soprano pipistrelle (15 total passes), Myotis spp. (one total pass) and Leisler's bat (one total pass). A summary of the routes and activity are displayed in Figure 9, Figure 10 and Figure 11.

3.5. Winter (hibernation) roost inspection surveys

Eight potential roost features were surveyed and assessed as having low to moderate suitability for use as hibernation roosts. These included six farm buildings (B2, B3, B4, B5, B6, and B8) and two bird boxes (B9.1 and B9.2). Roost inspections of these features during the hibernation season did not record any evidence of use by hibernating bats. Refer to Table 10 for the survey results.

Table 10: Hibernation results

Reference	Feature description	Hibernation roost potential	Result
B2	Old farmhouse.	Low	Does not support a hibernation roost
B3	Old drystone building with corrugated roof	Moderate	Does not support a hibernation roost
B4	Farm building	Moderate	Does not support a hibernation roost
B5	Farm building	Moderate	Does not support a hibernation roost
B6	Old disused Farm building	Moderate	Does not support a hibernation roost
B8	Old disused farm building	Moderate	Does not support a hibernation roost
B9.1	Bird box	Low	Does not support a hibernation roost
B9.2	Bird box	Low	Does not support a hibernation roost

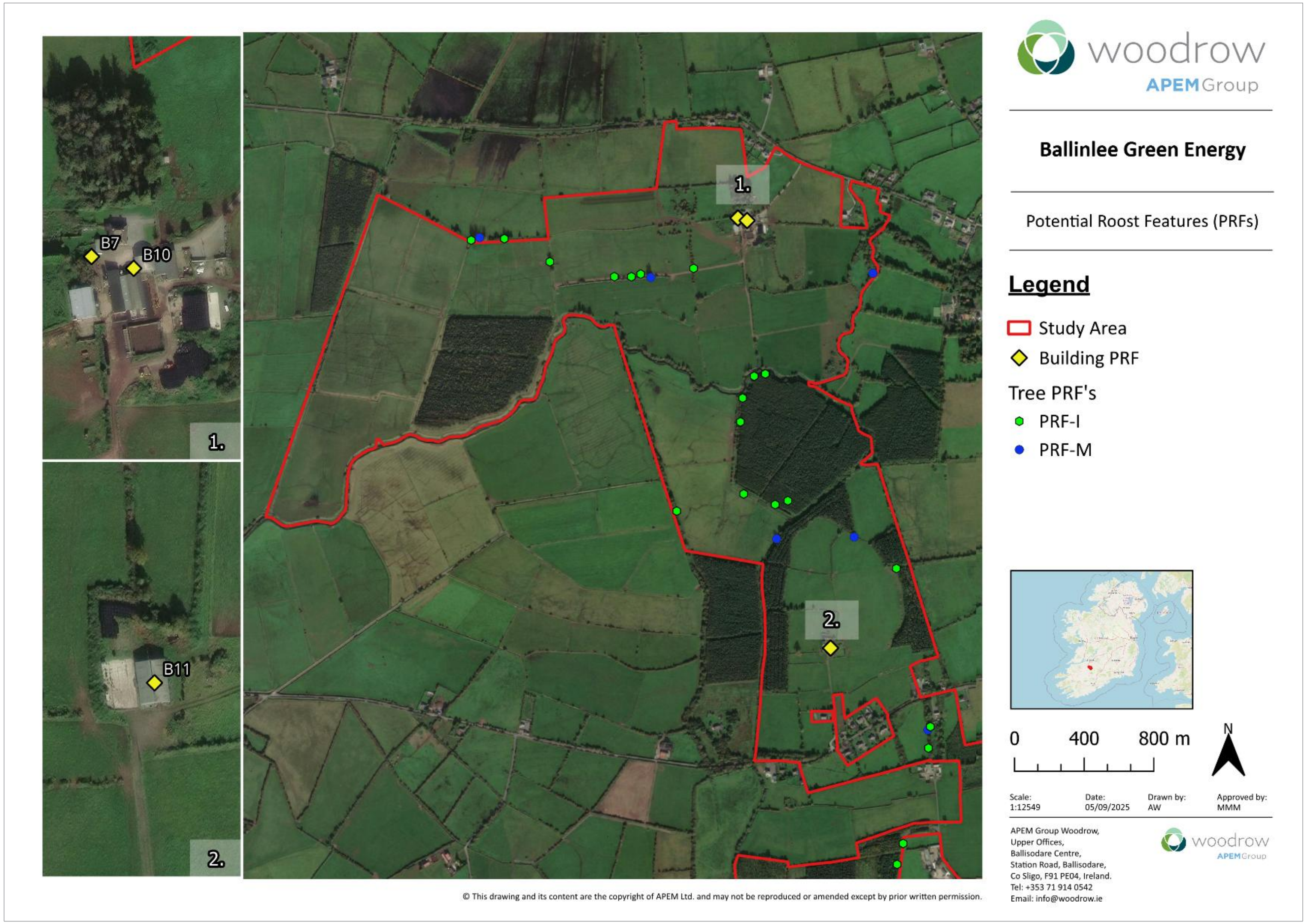

Figure 4: Building and tree potential roosting features (PRFs) identified in northern section of Study Area.

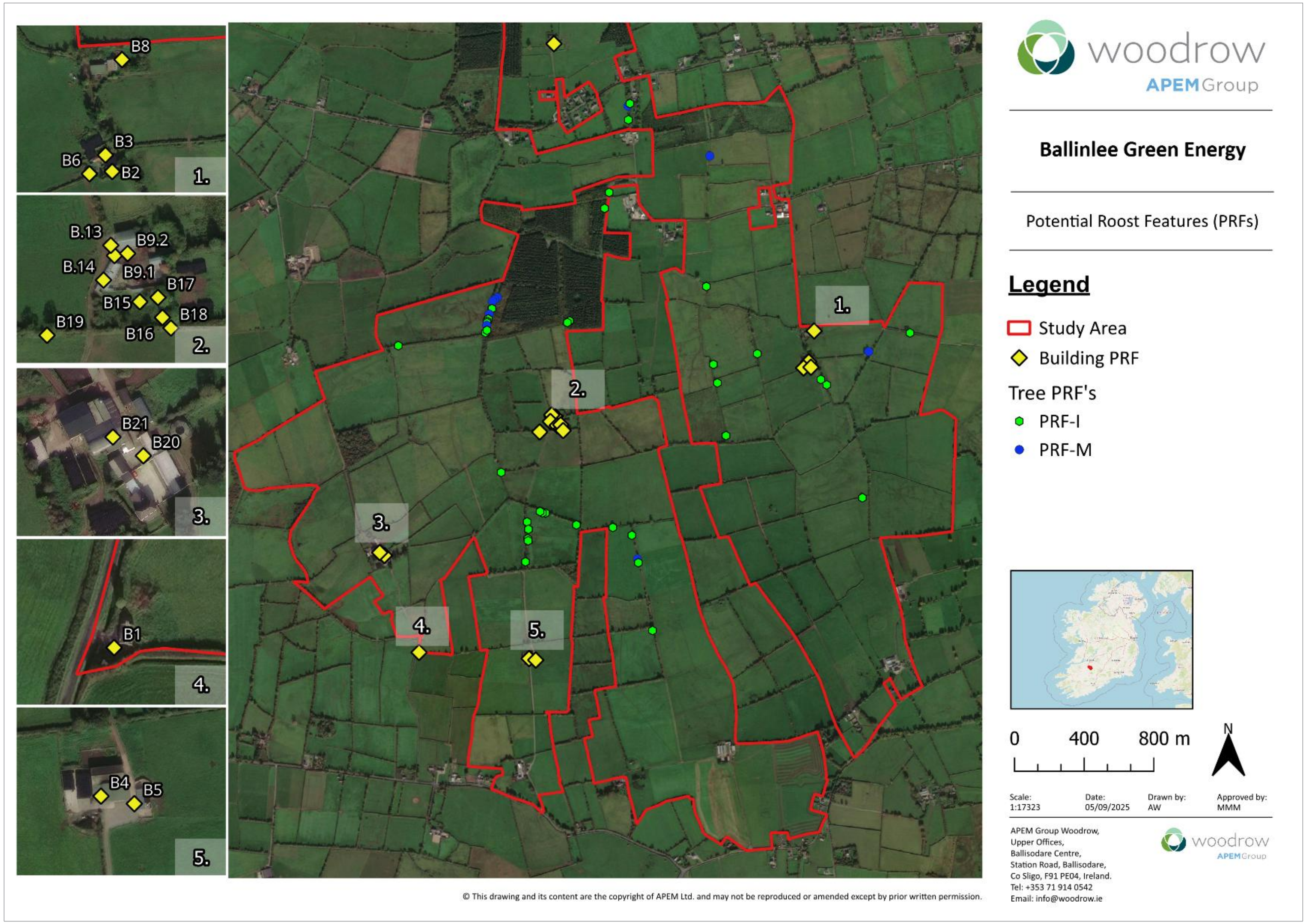

Figure 5: Building and tree potential roosting features (PRFs) identified in southern section of Study Area.

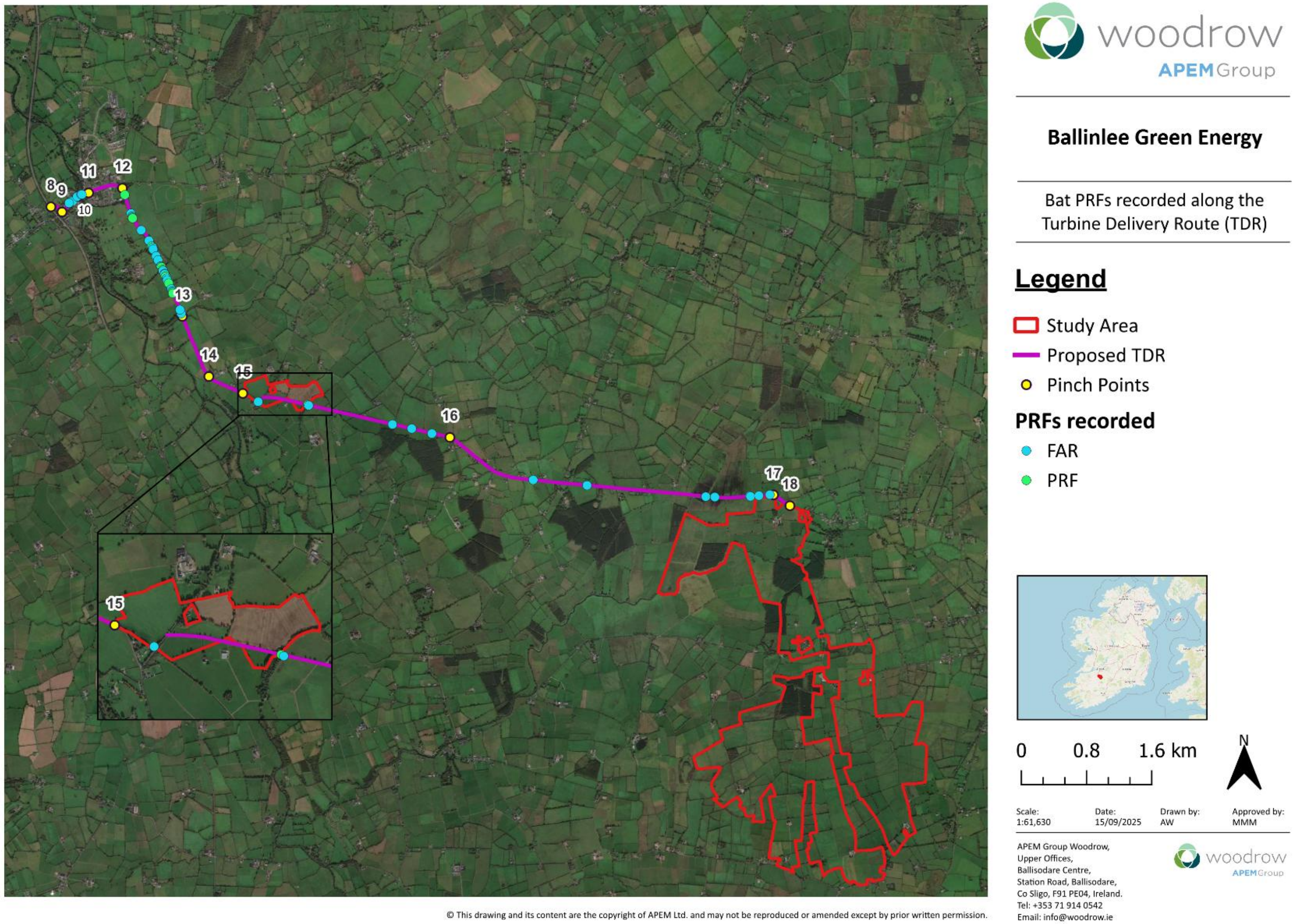

Figure 6: Turbine delivery route (from Croom) and results

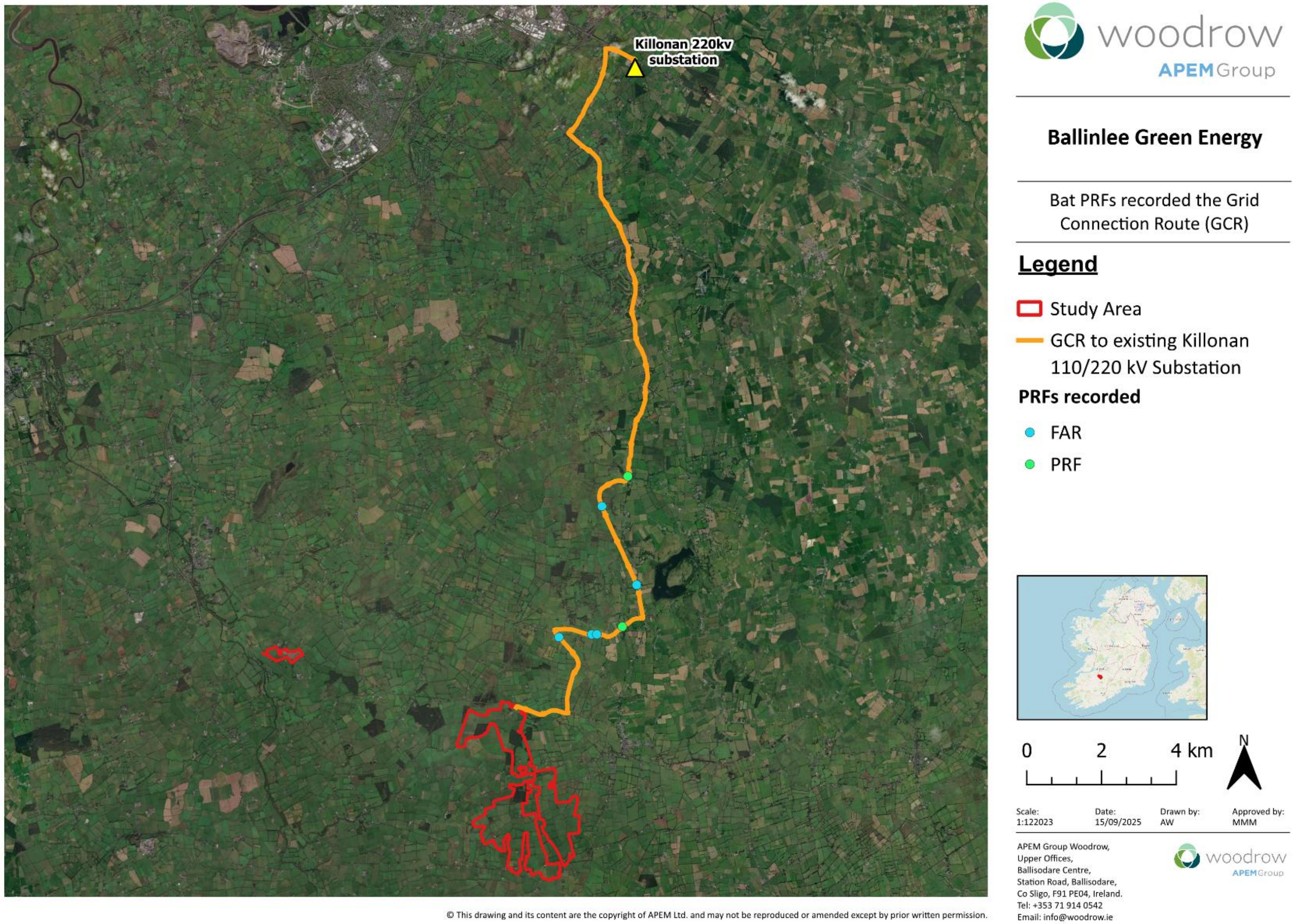

Figure 7: Grid connection route and results

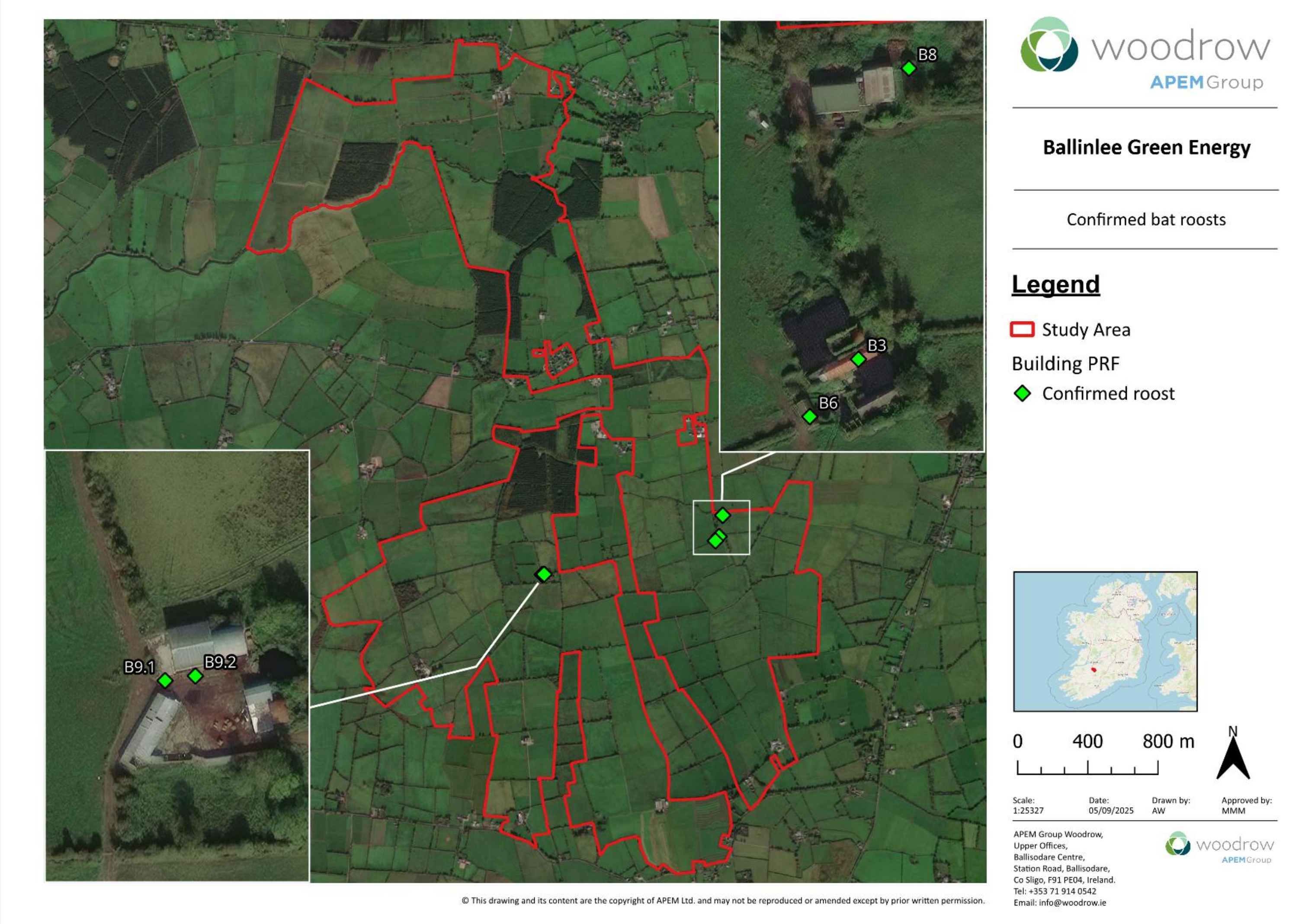

Figure 8: Confirmed bat roosts within the Study Area

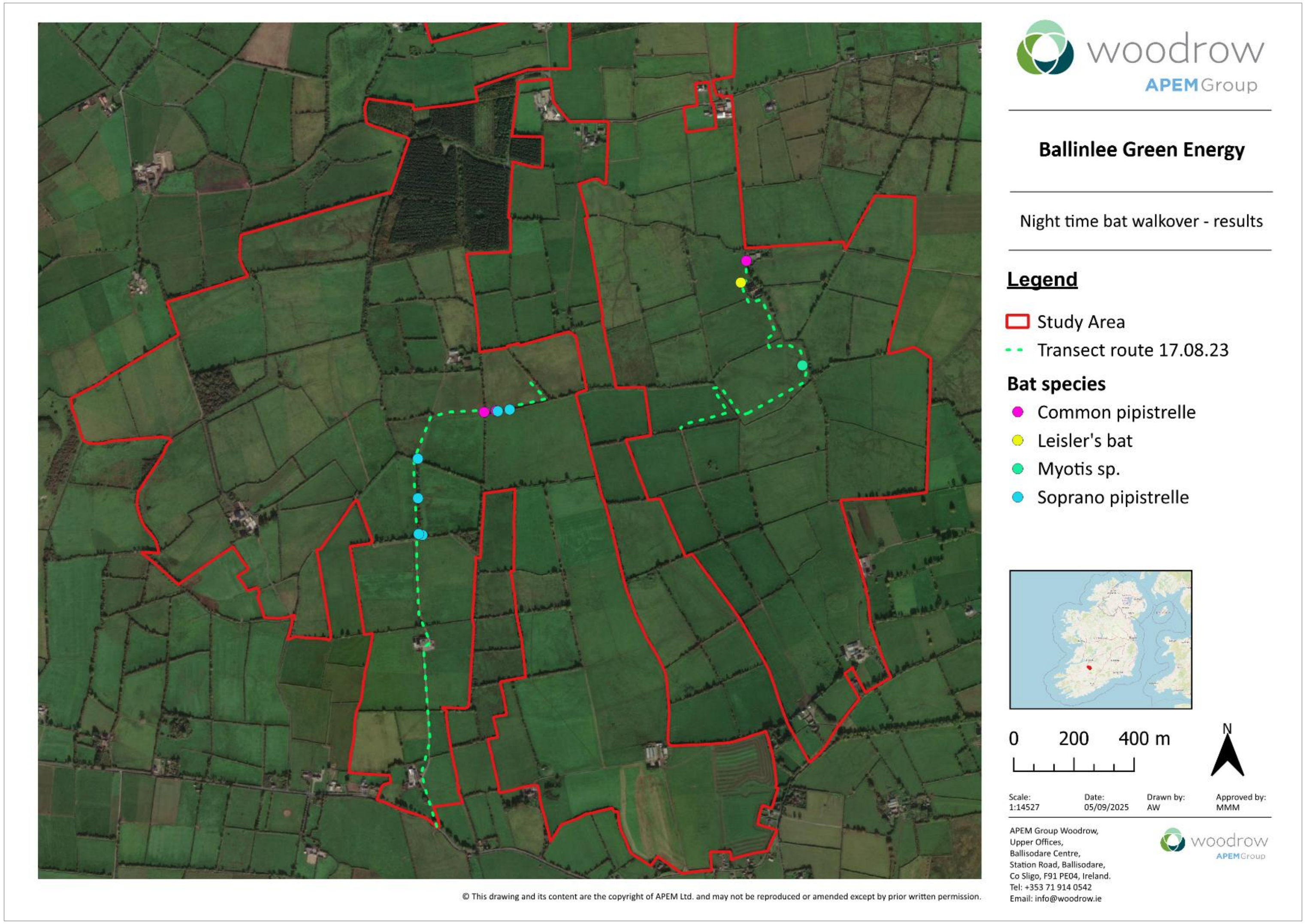

Figure 9: Transect route and results 17.08.2023

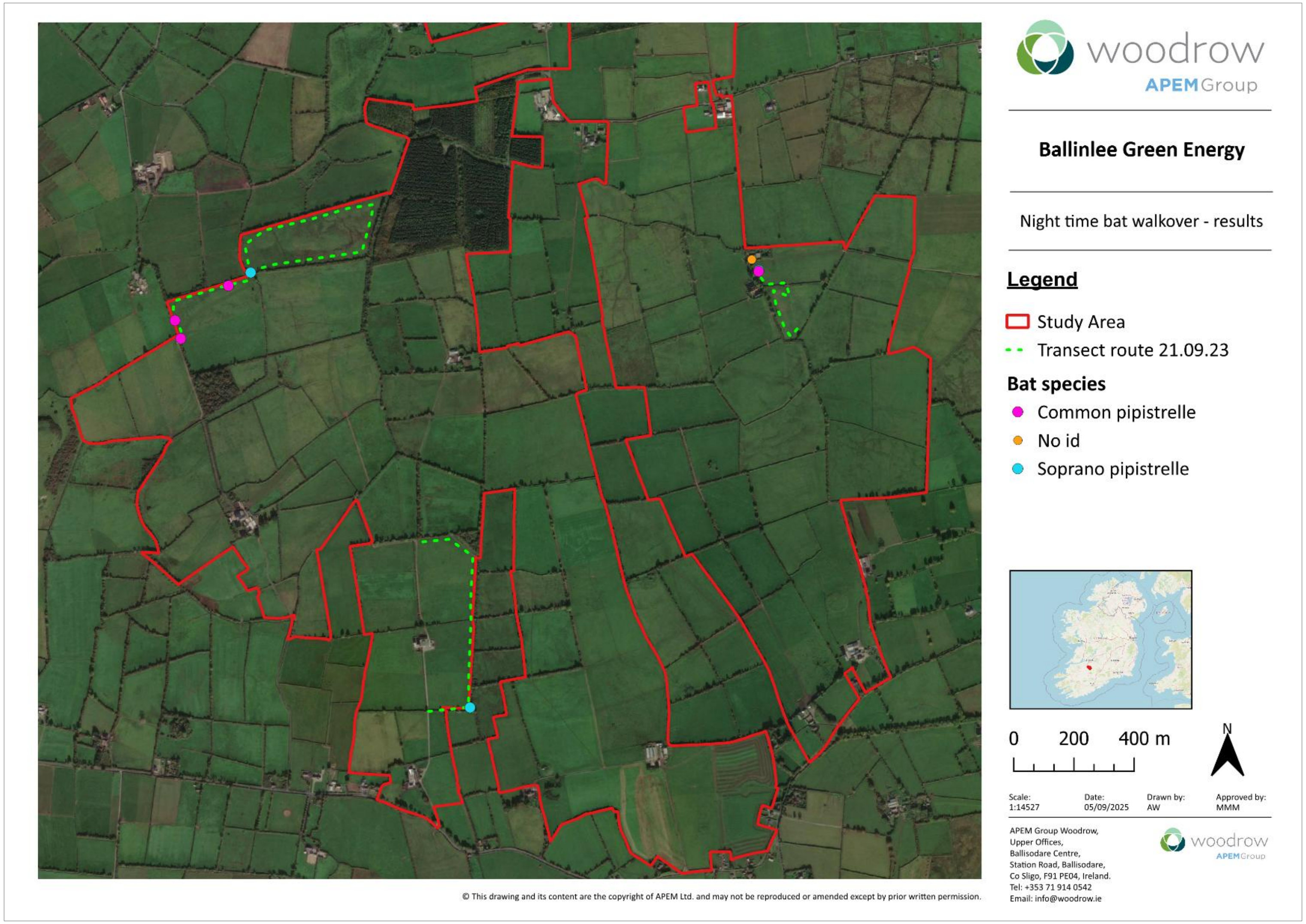

Figure 10: Transect route and results 21.09.2023

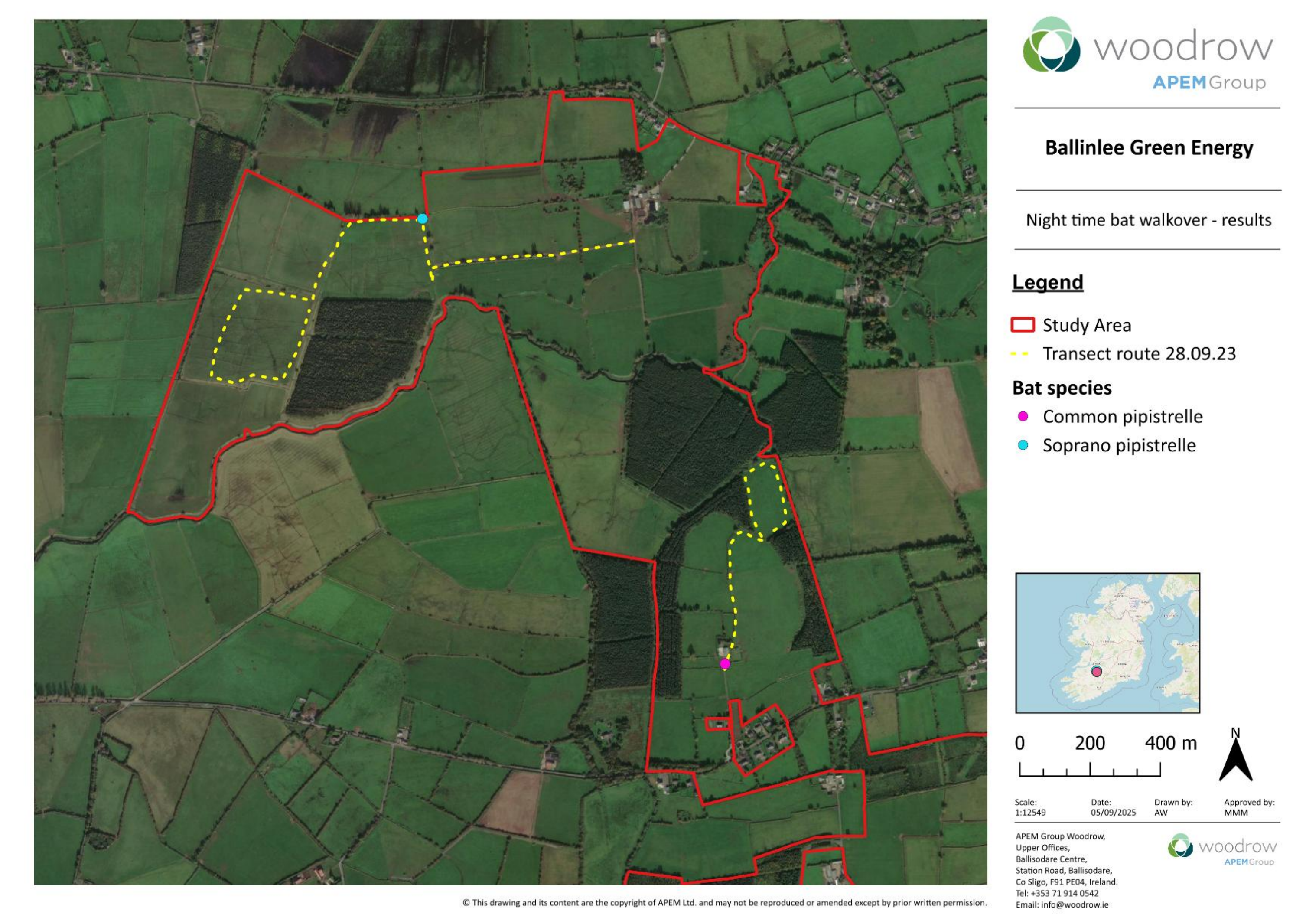

Figure 11: Transect route and results 28.09.2023

3.6. Static detector results

3.6.1. Spring

During the spring deployment there were a total of 37,457 passes recorded (refer to Table 11). Soprano pipistrelle account for 59% of the passes recorded, with 61% of all soprano calls having been recorded at D.01. Common pipistrelle account for the next highest number of recorded passes with 28%, followed by Leisler's bats with 11%, with the remaining species accounting for only 2% of the passes recorded.

With regards to mean activity within the Site (refer to Table 12), soprano and common pipistrelle are evenly distributed (with the exception of D.01) throughout the Site (refer to Figure 12), with Leisler's activity focused at D.05 to D.06 and D.07.

Figure 12 shows that soprano pipistrelle activity peaks around 01:00, while common pipistrelle and Leisler's activity peak around 22:00 and decrease throughout the night. This coincides with the activity relative to emergence times shown in Appendix F. The activity appears to be before, within and immediately after the expected emergence times for these species, indicating potential roosts at or near D.02, D.03, D.04 and D.10 for Leisler's bat and all locations (except D.01, D.12, D.13 and D.14) for pipistrelle species.

For other detectors, while activity was present, it generally occurred after the main emergence window (recognised times which the species are expected to emerge), suggesting foraging or commuting rather than direct roost proximity (refer to Appendix F).

Table 11: Total number of passes recorded per species per detector for spring

	MYSP (Myotis sp..)	NYCLEI (Leisler's bat)	PIPPIP (common pipistrelle)	PIPPYG (soprano pipistrelle)	PIPNAT (Nathusius' pipistrelle)	PLEAUR (brown long-eared bat)	Total
D.01				13435		26	**13461**
D.02	17	505	219	135		2	**878**
D.03	50	347	1767	2531	1	9	**4705**
D.04	29	576	455	464		20	**1544**
D.05	103	849	537	601		6	**2096**
D.06	146	612	2363	1766		2	**4889**
D.07	190	638	1344	396		48	**2616**
D.08							
D.09		3		1			**4**
D.10	54	133	1427	456		3	**2073**
D.11	7	41	11	3		3	**65**
D.12	4	35	254	149			**442**
D.13	41	125	980	1496		5	**2647**
D.14	15	83	1265	662		12	**2037**
	656	**3947**	**10622**	**22095**	**1**	**136**	**37457**

Table 12: Mean passes per detector and species for spring. Categorised using Table 7

	MYSP	NYCLEI	PIPPIP	PIPPYG	PIPNAT	PLEAUR
D.01						
D.02						
D.03						
D.04						
D.05						
D.06						
D.07						
D.08						
D.09						
D.10						
D.11						
D.12						
D.13						
D.14						

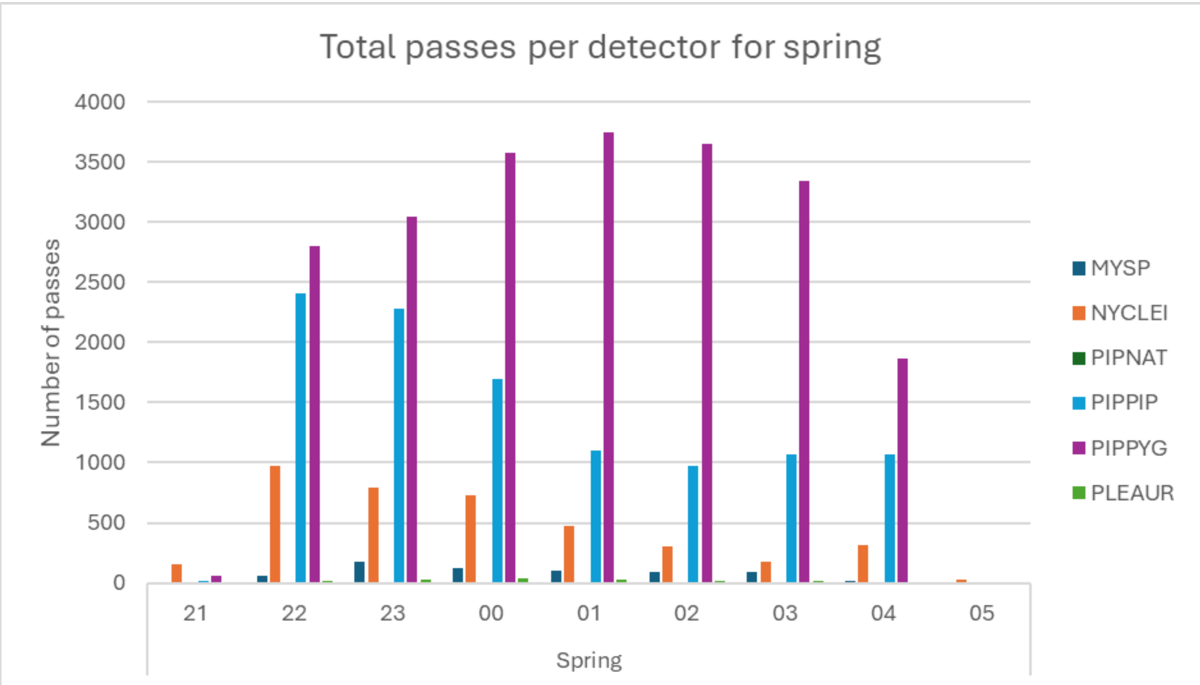

Figure 12: Total number of bat passes per hour per species for spring for all detector locations

3.6.2. Summer

During the summer deployment there were a total of 65,237 passes recorded (refer to Table 13). Soprano pipistrelle account for 55% of the passes recorded, common pipistrelle 33%, followed by Leisler's bats with 10%, with the remaining species accounting for only 2% of the passes recorded.

With regards to mean activity within the Site (refer to Table 14), soprano and common pipistrelle are evenly distributed throughout the Site, while Leisler's activity is highest at D.05.

Figure 13 shows that soprano pipistrelle activity peaks around 22:00, decreasing to 01:00 and then increasing again till 04:00. Common pipistrelle and Leisler's activity peak around 22:00 and decrease throughout the night with a final peak around 04:00-05:00. While this shows a potential for the detectors to be near potential roosts, Appendix F shows there is no activity for any species within their known emergence windows at any of the detector locations.

Table 13: Total number of passes recorded per species per detector for summer

	MYSP	NYCLEI	PIPPIP	PIPPYG	PIPNAT	PIPSP	PLEAUR	Total
D.01	155	835	4125	5710			28	**10853**
D.02	30	237	188	439			17	**911**
D.03	48	656	3366	5257			17	**9344**
D.04	74	541	1118	3197			28	**4958**
D.05	145	1310	4085	3542			37	**9119**
D.06	155	319	1186	6850			27	**8537**
D.07	107	679	481	511			19	**1797**
D.08	89	589	1071	2851			29	**4629**
D.09	20	203	109	80		1	6	**419**
D.10	121	293	3282	3515			9	**7220**
D.11	79	278	341	1046		3	22	**1769**
D.12	22	191	524	330	2		7	**1076**
D.13	59	290	1839	2408			9	**4605**
	1104	**6421**	**21715**	**35736**	**2**	**4**	**255**	**65237**

Table 14: Mean passes per detector and species for summer. Categorised using Table 7

	MYSP	NYCLEI	PIPPIP	PIPPYG	PIPNAT	PIPSP	PLEAUR
D.01							
D.02							
D.03							
D.04							
D.05							
D.06							
D.07							
D.08							
D.09							

	MYSP	NYCLEI	PIPPIP	PIPPYG	PIPNAT	PIPSP	PLEAUR
D.10							
D.11							
D.12							
D.13							
D.14							

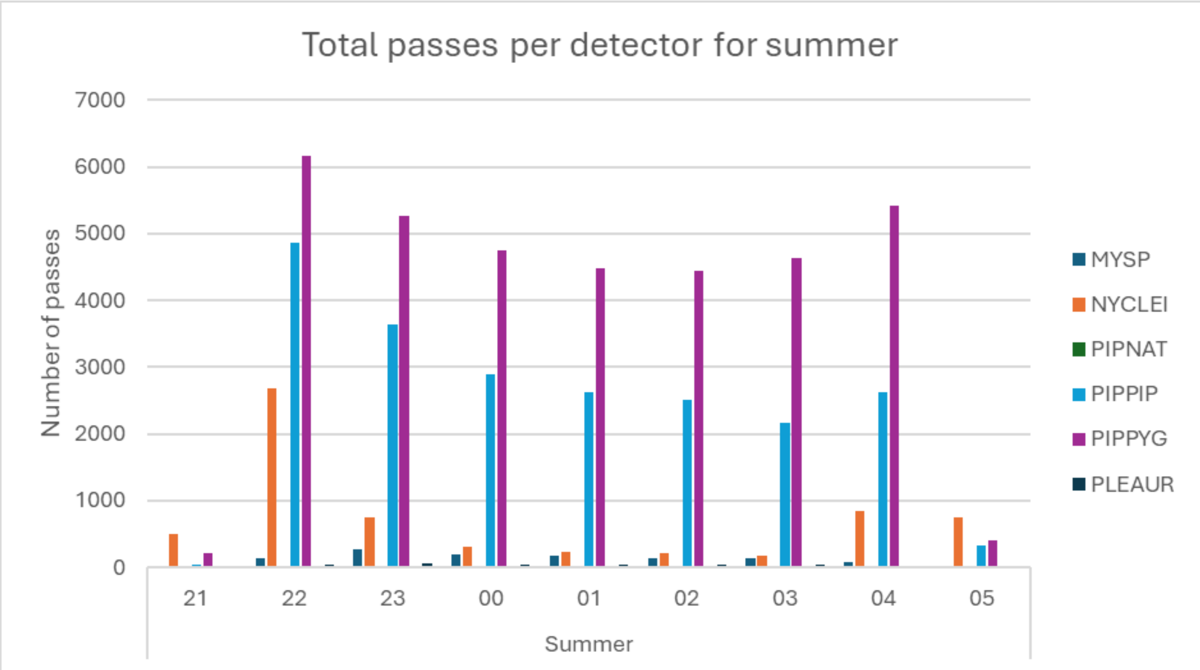

Figure 13: Total number of bat passes per hour per species for summer for all detector locations

3.6.3. Autumn

During the autumn deployment there were a total of 47,013 passes recorded (refer to Table 15

Table 15). Soprano pipistrelle account for 58% of the passes recorded, common pipistrelle 27%, followed by Leisler's bats with 11%, with the remaining species accounting for only 3% of the passes recorded.

With regards to mean activity within the Site (refer to Table 16), soprano activity is highest at D.01, D.03, D04 and D05, while common pipistrelle activity is highest at D.11 and D.14 (refer to Figure 14) and Leisler's at D.01.

Figure 14 shows that soprano pipistrelle activity peaks around 20:00, decreases till around 23:00 then remains steady throughout the night. Common pipistrelle and Leisler's activity peak around 20:00 and decrease throughout the night. While this shows a potential for the detectors to be near potential roosts, Figures within Appendix F show there is no activity for any species within their known emergence windows at any of the detector locations.

Table 15: Total number of passes recorded per species per detector for autumn

	MYSP	NYCLEI	PIPPIP	PIPPYG	PIPNAT	PLEAUR	RHIHIP	Total
D.01	22	1706	1408	5511	22	76		**8745**
D.02	5	167	35	73	1	2	1	**284**
D.03	30	183	467	6841		6		**7527**
D.04	913	118	970	6414	2	16		**8433**
D.05	209	123	619	666	1	23		**1641**
D.06	75	164	1026	3792		9		**5066**
D.07	58	1442	1073	140		13		**2726**
D.08	38	122	248	510	1	14		**933**
D.11	13	55	2858	607	1			**3534**
D.12	27	1038	643	576		19		**2303**
D.13	65	122	578	814	1	1		**1581**
D.14	13	55	2858	1309	1	4		**4240**
	1468	**5295**	**12783**	**27253**	**30**	**183**	**1**	**47013**

Table 16: Mean bat passes per hour for autumn 2023. Categorised using Table 7

	MYSP	NYCLEI	PIPPIP	PIPPYG	PIPNAT	PLEAUR	RHIHIP
D.01							
D.02							
D.03							
D.04							
D.05							
D.06							
D.07							
D.08							
D.09							
D.10							
D.11							
D.12							
D.13							
D.14							

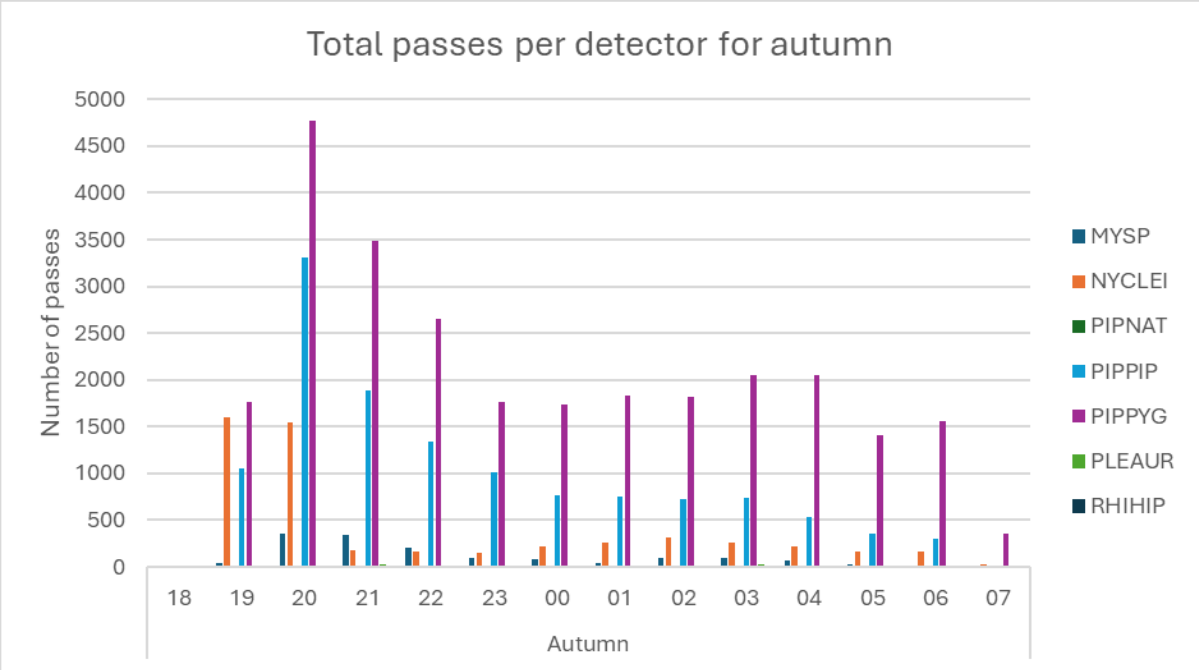

Figure 14: Total number of bat passes per hour per species for autumn for all detector locations

3.6.4. 2023

As indicated in Figure 15 the highest level of activity during all seasons was at D.01, with significantly higher activity in spring than all the other detector locations. D.01 was placed on a hedgerow next to a ditch on the northern boundary of the site with connectivity to the River Morningstar. However, due to the other detectors in the vicinity, it is assumed that the majority of movement from the dominant species, soprano pipistrelle, was to the north of the Site.

Summer and autumn had similar activity at the detector locations throughout the site, although slightly higher to the north or at woodland edges. D.02 and D.09 showed expected levels of activity for detectors placed in the centre of fields for all seasons.

D.08, D.10 and D.13 show higher activity in the summer for the southern section of the site, suggesting possible east / west commuting in the summer season. All three detectors showed significantly lower activity in the spring and autumn.

Figure 16 shows that the majority of activity for all species within the Site occurred below wind speeds of 3 m/s, refer also to Appendix G, which shows activity per wind speed at each of the detector locations. The clear correlation between low wind speeds and peak activity suggests that, under normal operating conditions (cut-in speed of 3 m/s for the proposed development), the turbines would rarely be active during times of peak bat flight activity. This also suggests, if a roost is within the vicinity of a turbine, there are not expected to be any impacts to the local bat populations. However, should a precautionary approach be adopted, accepting that 2023 could have been a mild year for wind speeds, then any curtailment strategies if implemented based on a 5.5 m/s wind speed threshold would be sufficient to prevent impacts to high-risk collision species (Whitby *et al.*, 2024). There is no correlation between temperature and activity within the Site.

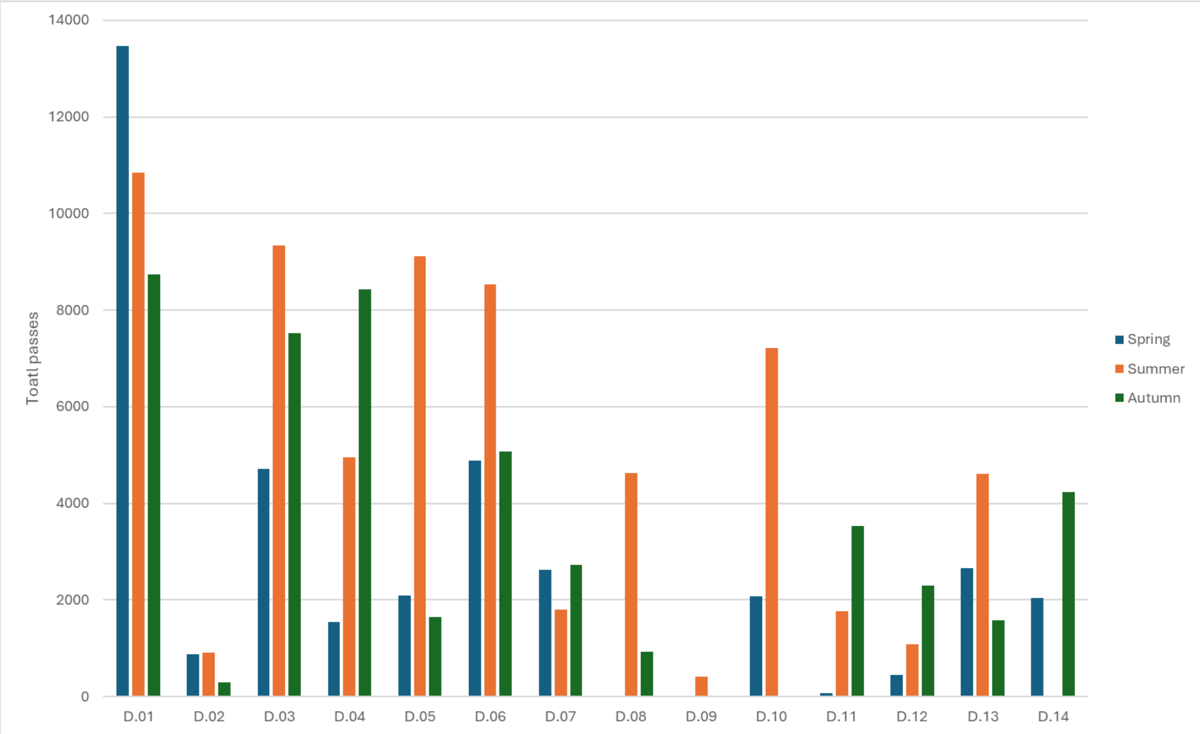

Figure 15: Total sum of all species per detector location for all seasons

Figure 16: Bat passes per species relative to temperature and wind speed in 2023 with 95% confidence ellipses

3.7. Association of bat activity with habitat features

While some of the static locations were not at the exact locations of the proposed turbines, as per NatureScot detectors were placed to provide a representative sample of bat activity at or close to turbine locations and distributed according to a system of stratified sampling based on the availability of different habitats and topographical features on the site, as shown in Figure 2 and Figure 3. Table 17 identifies the detector and habitat and therefore activity relevant to the appropriate proposed turbine location. It further identifies if the activity level is accurate (static present at exact location of the turbine) or representative (activity levels within similar habitat within the Site) for further NatureScot analysis. This is in line with NatureScot *et al*. 2021 methodology for siting static detectors. Table 17 refers to Figure 15 which shows the total sum of all species per detector location for all seasons when describing activity levels per detector.

Table 17: Turbine locations and associated detectors

Proposed Turbine (T.)	Detector Location Accurate (A)	Detector Location Representative (R)	Closet Detector	Rationale
1		D.02 D.09 D.11	D.01	While D.01 is the closest detector to T1, the detector represents data collected on a field boundary with hedgerow and mature trees and not within an open field, therefore, D.02, D.09 and D.11 are more representative of the activity levels expected to occur at T1. D.02 is the closest detector location within the centre of a field and has the least amount of activity for all species for the northern section of the Study Area. D.09 has the least amount of activity for the Study Area for all seasons, followed by D.02 and then D.11. All these location are within the centre of a field. D.01 has the highest activity levels for all species for all seasons, with at least 3x the activity levels of any of the other detector locations for spring.
2	D.02		D.02	D.02 is located in the centre of the field at the location of T2, therefore the data collected is representative of the turbine location. D.02 shows the lowest activity levels for all bat species for the northern section of the Study Area.
3		D.02 D.09 D.11	D.03	While D.03 is the closest detector to T3, the detector represents data collected at a field boundary watercourse connected to the River Morningstar and not within an open field, therefore, D.02, D.09 and D.11 are more representative of the activity levels expected to occur at T3. D.09 has the least amount of activity for the Study Area for all seasons followed by D.02 and then D.11. All these location are within the centre of a field. As D.04 is located in the middle of a field, all detector locations within the middle of fields have been compared for activity levels that would be assumed for T3. D.03 shows the highest activity levels for the northern section of the Study Area (apart from D.01) for summer. The activity levels at D.03 are almost 10x that of D.02 which is located to the north, in the centre of the field.
4		D.02 D.09 D.11	D.04	While D.04 is the closest detector to T4, the detector represents data collected on a plantation woodland edge and not within an open field, therefore, D.02, D.09 and D.11 are more representative of the activity levels expected to occur at T4. D.09 has the least amount of activity for the Study Area for all seasons followed by D.02 and then D.11. All these location are within the centre of a field. As T4 is located in the middle of a field, all detector locations within the middle of fields have been compared for activity levels that would be assumed for T4. D.04 shows the lowest level of activity of all the detectors placed on linear features within the northern section of the Study Area for spring and summer, and the highest (apart from D.01) for autumn. While showing almost double the activity levels for spring compared to D.02, this level is still low compared to the rest of the Study Area.
5	D.05		D.05	D.05 is located on the woodland edge connected to T5, therefore the data is representative of the turbine location. D.05 shows low activity level during the spring and autumn and c. 4x the activity levels of the other seasons in the summer and almost 2x that of D.04 which is located on the opposite side of the same plantation. The summer activity levels are in line with the other detector locations on linear features for the northern section of the Study Area. However, the spring and autumn are much lower.
6		D.02 D.09 D.11	D.06	While D.06 is the closest detector to T6, the detector represents data collected on a mature hedgerow parallel to a plantation woodland edge and not within an open field, therefore, D.02, D.09 and D.11 are more representative of the activity levels expected to occur at T6 and the southern section of the Study Area. D.09 has the least amount of activity for the Study Area for all seasons followed by D.02 and then D.11. All these location are within the centre of a field. As T6 is located in the middle of a field, all detector locations within the middle of fields have been compared for activity levels that would be assumed for T6 D.06, due to its location, shows high activity for all seasons, with the highest being summer. This location is more in line with activity levels for the northern section of the Study Area than the southern section.
7		D.07 D.09 D.11	D.07	While D.07 is the closest detector to T7, the detector represents data collected on a hedgerow and not within an open field, therefore, D.09 and D.11 are more representative of the activity levels expected to occur at T7 and the southern section of the Study Area. D.09 has the least amount of activity for the Study Area for all seasons and D.11 shows very low activity in spring, low activity in summer and highest activity in autumn, but still low compared to the rest of the Study Area or detectors placed along linear features. D.07 has low activity levels for hedgerow in this area and lower activity levels compared to the closest detectors D.08 and D.13, both of which are also along hedgerows in the southern section of the Study Area, but have recorded at least twice as much activity in summer.
8	D.08		D.08	D.08 is located at the turbine location for T8, which is along a hedgerow. D.08 shows no activity in the spring for all species, highest activity in the summer, reflective of similar activity at D.13 (also along a hedgerow) and low activity in autumn, again similar to D.13.
9	D.09		D.09	D.09 is located at the turbine location for T9, which is in the centre of the field and shows the lowest activity levels of all locations within the Study Area for all bat species.
10		D.09 D.11	D.13	While D.13 is the closest detector to T10, the detector represents data collected on a hedgerow and not within an open field, therefore, D.09 and D.11 are more representative of the activity levels expected to occur at T10. D.09 has the least amount of activity for the Study Area for all seasons and D.11 shows very low activity in spring, low activity in summer and highest activity in autumn, but still low compared to the rest of the Study Area or detectors placed along linear features. D.13 has similar activity levels to D.07 in spring, D.08 in summer and D.14 in autumn, highlighting this is a regular commuting corridor but still has low activity levels compared to the northern section of the Study Area.
11		D.14	D.14	T11 is within 20m of the western hedgerow to warrant it being removed as part of a bat exclusion buffer within any mitigation strategy for the Study Area. D.14 is located to the south, along this hedgerow, therefore the data collected is representative of T11. D.14 shows that the activity levels for all species in this area are low in spring and highest in autumn. This area is still low in activity levels compared to the northern section of the Study Area or detectors placed along linear features.
12		D.09 D.11	D.14	While D.14 is the closest detector to T12, the detector represents data collected along a hedgerow and not within an open field, therefore, D.09 and D.11 are more representative of the activity levels expected to occur at T12.

Proposed Turbine (T.)	Detector Location Accurate (A)	Detector Location Representative (R)	Closet Detector	Rationale
				D.09 has the least amount of activity for the Study Area for all seasons and D.11 shows very low activity in spring, low activity in summer and highest activity in autumn, but still low compared to the rest of the Study Area or detectors placed along linear features.
13		D.09 D.11	D.11	As T13 is located within the centre of a field, D.09 and D.11 are representative of the activity levels expected. D.09 has the least amount of activity for the Study Area for all seasons and D.11 shows very low activity in spring, low activity in summer and highest activity in autumn, but still low compared to the rest of the Study Area or detectors placed along linear features.
14		D.12	D.11	While D.11 is the closest detector to T14, the detector represents data collected within the open field and not along a hedgerow, therefore, D.12 is more representative of the activity levels expected to occur at T14. D.12 shows very low activity for all species at this location and while there is assumed commuting/foraging along the hedgerow in this area, it is much lower than other areas within the Study Area.
15		D.09 D.11	D.12	While D.12 is the closest detector to T15, the detector represents data collected along a hedgerow and not within an open field, therefore, D.09 and D.11 are more representative of the activity levels expected to occur at T15. D.09 has the least amount of activity for the Study Area for all seasons and D.11 shows very low activity in spring, low activity in summer and highest activity in autumn, but still low compared to the rest of the Study Area or detectors placed along linear features.
16		D.10	D.10	T16 is within 20m of the eastern hedgerow to warrant it being removed as part of a bat exclusion buffer within any mitigation strategy for the Study Area. D.10 is located along the northern section of this hedgerow, therefore the data collected is representative of T16. D.10 shows the highest activity of the southern section of the Study Area during the summer and no activity during the autumn. This activity is more in line with the northern section of the Study Area than the southern section.
17		D.09 D.10 D.11	D.10	While T17 is within an open field, it is close enough to the eastern hedgerow to warrant it being removed as part of a bat exclusion buffer within any mitigation strategy for the Study Area. Therefore, activity levels along a hedgerow (D.10 being the closest detector representing this data) shows that the activity levels for all species in this area are low in spring, highest in summer and no activity in autumn. The activity levels for all species within the open field are represented by D.09 and D.11. D.09 has the least amount of activity for the Study Area for all seasons and D.11 shows very low activity in spring, low activity in summer and highest activity in autumn, but still low compared to the rest of the Study Area or detectors placed along linear features.

4. DISCUSSION

Comprehensive monitoring carried out in 2023 provides a clear and consistent picture of bat activity across the proposed development Site. Static detectors, supported by emergence/re-entry and transect surveys, revealed strong spatial patterns in bat use of the landscape. As seen across a growing body of literature (Collins, 2023; Froidevaux *et al.*, 2019; Berthinussen & Altringham, 2012), bat activity was markedly higher along linear features, particularly hedgerows, treelines, and woodland edges, than in open fields. These features offer shelter, foraging opportunities, and navigational aids, making them critical components of bat habitat, especially in more open, agricultural environments.

The highest levels of activity were recorded at detectors positioned along these linear features, including D.01, D.03, D.05, and D.06. Of particular note was D.01, located beside a mature hedgerow and ditch system with hydrological connection to the River Morningstar, which recorded over three times the bat activity of any other detector in spring. In contrast, detectors located within open areas such as D.02 and D.09 recorded the lowest levels of bat activity across all seasons. These patterns reaffirm the importance of habitat connectivity and support earlier findings that bats avoid open areas lacking the linear features or dense vegetation preferred by most bat species within the Site, particularly when commuting or foraging (Straka *et al*., 2016; Fensome & Mathews, 2016).

Seasonally, bat activity was recorded throughout the active period, with peaks occurring during the summer and autumn months. Soprano pipistrelle accounted for over half of all detections in each season, followed by common pipistrelle and Leisler's bat. This composition aligns closely with national monitoring trends for the UK (Mathews *et al*., 2018) and Ireland (Augney *et al*., 2018), where pipistrelles dominate acoustic recordings, followed by the presence of Leisler's bat. Leisler's bats were especially active at D.05 and D.06, locations adjacent to mature hedgerows and plantation woodland, consistent with their preference for open flight above canopy level, placing them within the operational range of turbine blades (Wellig *et al*., 2018; Zeale *et al*., 2022).

In addition to landscape-level patterns, the survey confirmed the presence of five transitional roosts within the Site, primarily within old buildings and bird boxes. Although these roosts were not classified as maternity or hibernation sites, their use confirms regular occupancy by local bat populations. No roosts were found in trees; however, the Site includes a number of trees with suitable features (PRFs), and their potential to support temporary or opportunistic roosting, particularly by fission-fusion species such as Myotis and pipistrelles, should not be discounted (Hinds & Davidson-Watts, 2022). All confirmed roosts were located at least 190 m from proposed turbine locations, comfortably exceeding the recommended bat habitat buffer distances outlined in best practice guidance (NatureScot, 2021).

A key finding from the detector data was that bat activity overwhelmingly occurred at wind speeds below 3 m/s, the turbine cut-in speed for the proposed development, well below the findings by Whitby *et al*. (2024), who advocate for curtailment thresholds of 5.5 m/s to avoid bat mortality without compromising turbine efficiency. The clear correlation between low wind speeds and peak activity suggests that, under normal operating conditions, the turbines would rarely be active during times of peak bat flight activity.

Should a precautionary approach be adopted, implementing a curtailment strategy where turbines are temporarily paused at wind speeds below 5.5 m/s, would provide effective protection for the local bat population. This mitigation would particularly benefit high-risk species such as Leisler's bat and pipistrelles.

In summary, bat activity within the Site is strongly associated with linear features, while open areas show significantly lower use. The proposed turbine layout reflects these patterns, avoiding key habitats and prioritising low-use areas. Leisler's bat has been identified as the species most at risk of collision, which will be addressed in the EIAR. Mitigation measures, including habitat manipulation and buffers, align with best practice guidance from NatureScot (2021) and Whitby *et al*. (2024). Based on current data, no significant adverse effects on the local bat population are anticipated, and the development represents a precautionary and ecologically responsible approach.

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Appendix A: Detector locations

Location	Ref. image	Grid ref
D.01		52.483009, -8.60308
D.02		52.481433, -8.608887
D.03		52.478884, -8.611658
D.04		52.476273, -8.592542
D.05		52.475907, -8.587792

D.06		52.462538, -8.59237
D.07		52.458809, -8.596263
D.08		52.455327, -8.589028
D.09		52.451851, -8.588048
D.10		52.456583, -8.577267

D.11		52.460467, -8.571559
D.12	No image	52.460551, -8.568084
D.13		52.457228, -8.585348
D.14		52.452272, -8.58277

Appendix B: Weather conditions during the bat static deployment in 2023

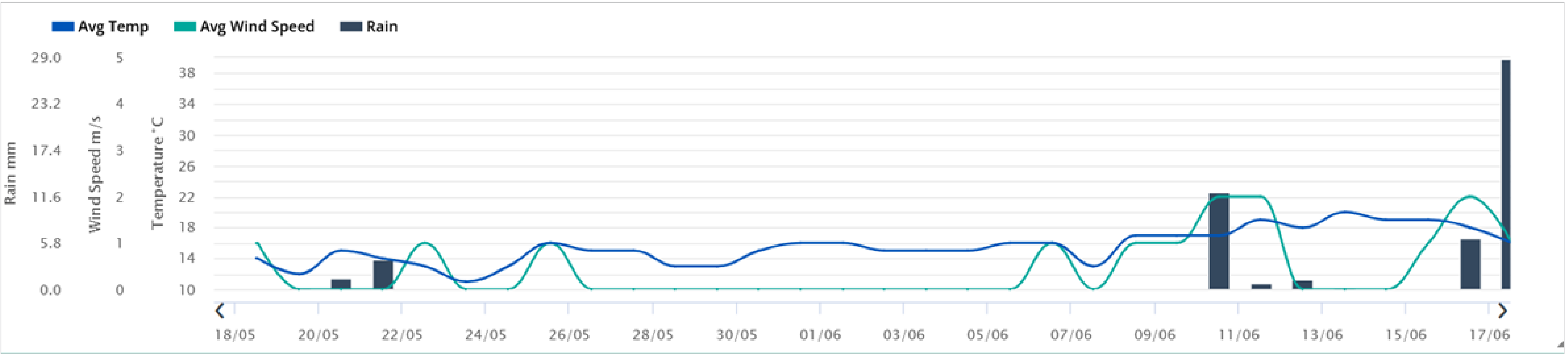


Figure B. 1: Spring deployment weather conditions for the Site.

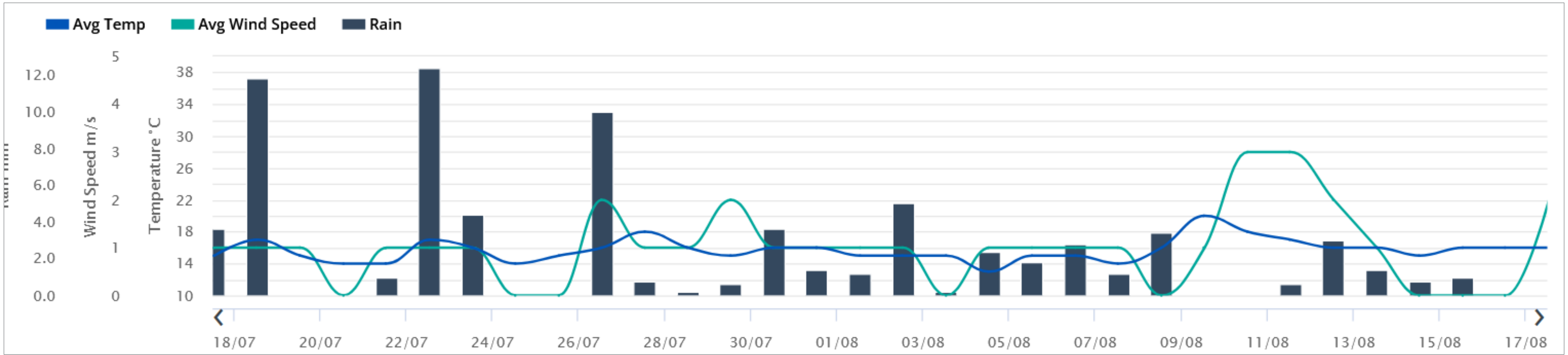


Figure B. 2: Summer deployment weather conditions for the Site.

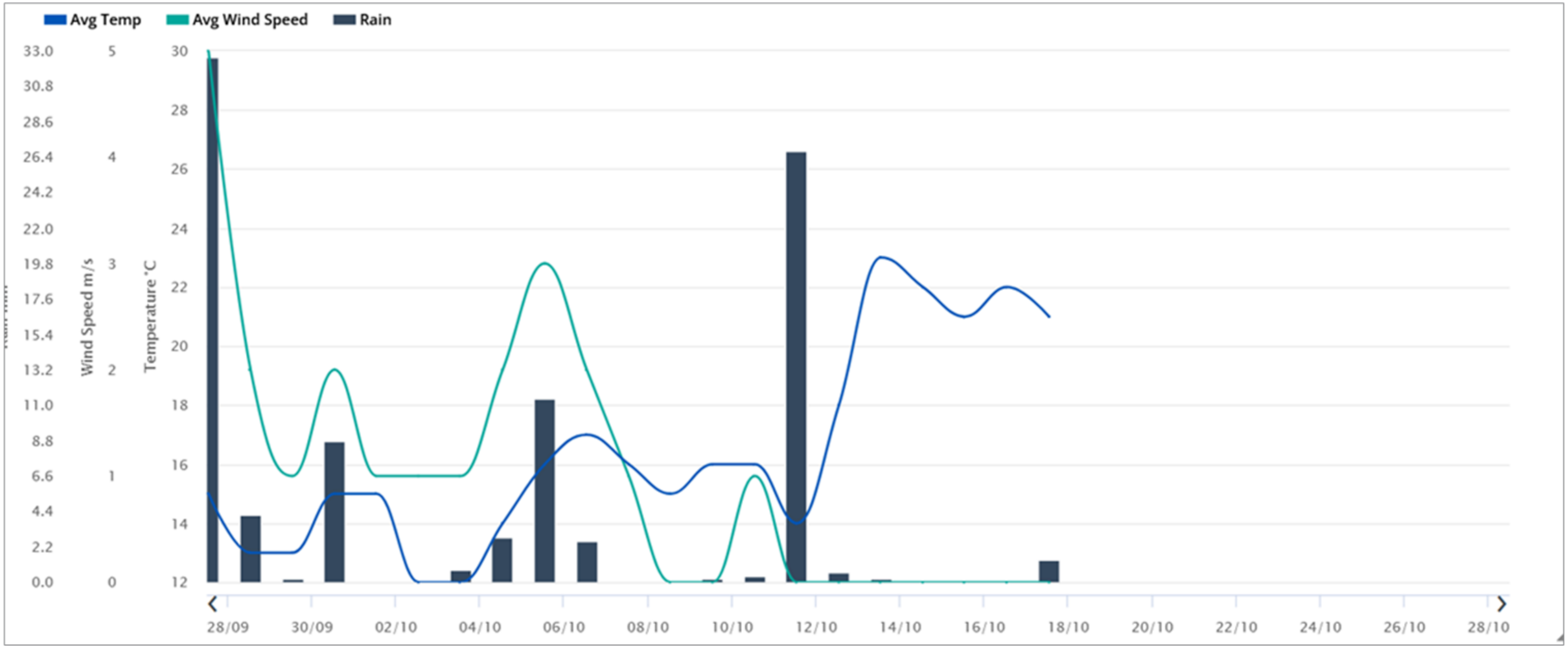


Figure B. 3: autumn deployment weather conditions for the Site.

Appendix C: Bat Conservation Ireland roost location data within 10km of the Site

*Actual roost locations replaced with a letter to protect their location.

Roost ID*	Distance from centre of Site (Km)	Species observed
A	3.12	*Plecotus auritus*
B	3.12	*Unidentified bat*
C	4.07	*Plecotus auritus, Pipistrellus spp. (45kHz/55kHz)*
D	4.24	*Plecotus auritus, Pipistrellus pygmaeus, Nyctalus leisleri*
E	5.05	*Pipistrellus spp. (45kHz/55kHz)*
F	6.3	*Plecotus auritus*
G	6.38	*Pipistrellus spp. (45kHz/55kHz), Plecotus auritus*
H	6.98	*Pipistrellus spp. (45kHz/55kHz), Plecotus auritus*
I	7.57	*Pipistrellus spp. (45kHz/55kHz)*
J	7.57	*Myotis daubentonii*
K	7.57	*Myotis spp., Pipistrellus pygmaeus, Rhinolophus hipposideros*
L	8.19	*Plecotus auritus*
M	8.19	*Myotis nattereri*
N	9.38	*Pipistrellus spp. (45kHz/55kHz), Plecotus auritus*
O	9.74	*Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri*
P	9.89	*Unidentified bat*
Q	9.89	*Unidentified bat*
R	10	*Nyctalus leisleri, Plecotus auritus*

Appendix D: Tree potential roosting features on the Site.

PRF	Roost potential for trees	Commuting and Foraging	PRF Feature Description	
1	PRF-I	Moderate	Knothole in willow	
2	PRF-I	High	Broken willow along ditch	
3	PRF-M	High	Number of broken branches	
4	PRF-I	High	High up broken branch	
5	PRF-I	Moderate	Lifting bark	

6	PRF-I	Moderate	Peeling bark	
7	PRF-I	Moderate	Hole at top of knothole	
8	PRF-M	Moderate	Large crack in branch beside drains.	
9	PRF-I	Moderate	Tree beside access track potential roost	

				
10	PRF-I	High	Good roost resource and some veteranisation of trees in deciduous plantation, needs to be checked prior to construction	
11	PRF-I	High	PRF-I requires endoscope survey	
12	PRF-I	High	Y fork in tree	
13	PRF-I	High	Knothole	

14	PRF-I	High	Cracked branches in willow over river	 
15	PRF-I	High	Broken branch	
16	PRF-M	High	Broken willow tree, multiple crevices, some ivy	
17	PRF-M	High	Large veteran willow, heartwood rot, broken branches	 

18	PRF-I	High	Snapped branch of willow tree in immature woodland. Two large cracks visible, but too high for visual inspection	
19	PRF-I	High	Large branch snapping off tree. Cannot determine how far cavity might extend into branch. Most of the tree covered in ivy, so only this feature could be a PRF	
20	PRF-I	High	Branch snapped off tree. Approx 3.5 m up. Ivy encroaching on opening so only suitable for 1-2 bats	 
21	PRF-M	Moderate	High up knothole	
22	PRF-I	Moderate	Small branch knothole on ivy covered ash	
23	PRF-I	Moderate	High up knothole	

24	PRF-I	Moderate	Knothole in sycamore	
25	PRF-I	Moderate	Broken branch oak	
26	PRF-I	High	Frost crack	
27	PRF-I	High	Weld	
28	PRF-M	Moderate	Large willow with multiple cracks fissures and heartwood rot, suitable for multiple bats	
29	PRF-I	High	Large wound in ash	

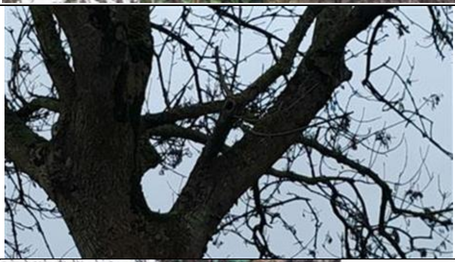
30	PRF-M	High	Large knothole and broken trunk willow	
32	PRF-I	High	Welds in ash	
33	PRF-I	High	Willow broken branch FAR	
34	PRF-I	Moderate	Snapped branch on ash	
35	n/a	High	High foraging	
36	PRF-M	High	Butt rot on ash	
37	PRF-M	High	Wound crevice	

38	PRF-M	High	Ash with significant butt rot and high up knothole	
39	PRF-I	High	Snapped branch and knothole	
40	PRF-M	High	Hollow branch	
41	PRF-I	High	Butt rot	
42	PRF-I	High	Snapped branch with rot	
43	PRF-I	High	Snapped branch lifting bark	

44	PRF-M	High	Multiple crevices and welds	
45	PRF-I	High	Heartwood rot hollow branch	
46	PRF-I	High	Knothole	
47	PRF-I	High	Knothole on ash	
48	PRF-I	High	Broke trunk ash	
49	PRF-I	High	Crack in willow	

50	PRF-I	High	Knothole in willow	
51	PRF-I	High	Snapped branch	
52	PRF-I	High	Snapped trunk	
53	PRF-I	High	Snapped willow branch	
54	PRF-I	High	Knothole in alder	
55	PRF-I	High	Standing deadwood	
56	PRF-I	High	Low knothole	

57	PRF-I	High	Broken branches on willow	
58	PRF-I	High	High up knotholes, broken branches, lifting bark	
59	PRF-I	High	Several high up branches with crevices and rot	
60	PRF-M	High	Low knothole in ash	
61	PRF-I	High	Ash with knotholes and burls	
62	PRF-I	High	Large ash high up broken branch	

65	PRF-I	Moderate	Snapped branch, 4m high. Potential roost but cannot reach for closer inspection	
66	PRF-I	Low	Small knot, approx. 5 m up.	
67	PRF-I	Low	Long cavity at side of tree, worth noting there is an active beehive at the base of the tree in a hollow	
68	PRF-I	Low	Cavities in snapped branches, ivy encroaching, feature approx. 5 m high	  

69	PRF-I	Low	Hollow left from when branch snapped off tree in the past. Approx. 4.5 m high	
70	PRF-I	Moderate	Knot hole in tree, approx. 3 m high.	
71	PRF-M	High	Knothole 4m over river	

Appendix E: Building potential roosting features on the Site

PRF	Roost potential	Commuting and Foraging	PRF Feature Description	Image
B1	Moderate	High	Old House with a roof fully intact.	
B2	Moderate	High	Old house with roof fully intact.	
B3	Low	High	Derelict agricultural building	
B4	Moderate	Low	Slated agricultural shed with good features in the cavities of block work and some features in roofing.	 

B5	Low	low	Agricultural milking parlour.	 
B6	Low	High	Old house, multiple entry points	
B7	Low	High	Old cottage now used as a chemical store for farm. Has 4 entry points but no signs of usage by bats.	 
B8	Low	High	Old agricultural building with some roosting capabilities. No signs of bats upon inspection.	 
B9	Moderate	high	Bat and bird boxes (confirmed roosts).	  

B10	Negligible	High	Agricultural building	
B11	Negligible	High	Agricultural building	 
B12	Negligible	High	Agricultural building	
B13	Negligible	High	Agricultural building. This agricultural building has the bird/bat boxes situated on it.	 
B14	Negligible	High	Agricultural building with some potential roosting features. They are very exposed.	  

B15	Moderate	High	Bird boxes on tree adjacent to the agricultural buildings. Located on trees on treeline surrounding the agricultural buildings.	
B16	Moderate	High	Bird and bat boxes on tree adjacent to the agricultural buildings. Located on treeline surrounding the agricultural buildings.	 
B17	Moderate	High	Bird and bat boxes on tree adjacent to agricultural buildings. Located on treeline surrounding the agricultural buildings.	
B18	Moderate	High	Bat box on tree adjacent to agricultural buildings. Located on treeline surrounding the agricultural buildings. These were damaged.	

B19	Low	High	Bat/bird boxes – Could not be inspected due to a bull in the field.	
B20	Low	High	Horse stables.	 
B21	Low	High	Agricultural storage building.	 

Appendix F: Emergence time compared to sunset time for bats recorded during static deployment in 2023

Spring

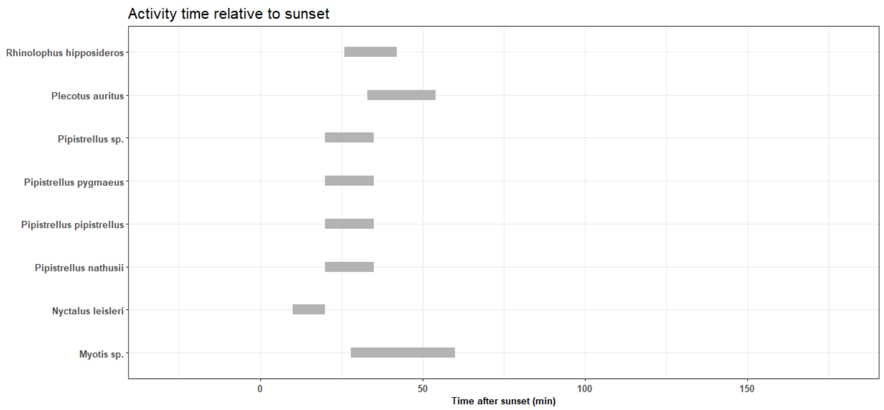


Figure F. 1: D.01

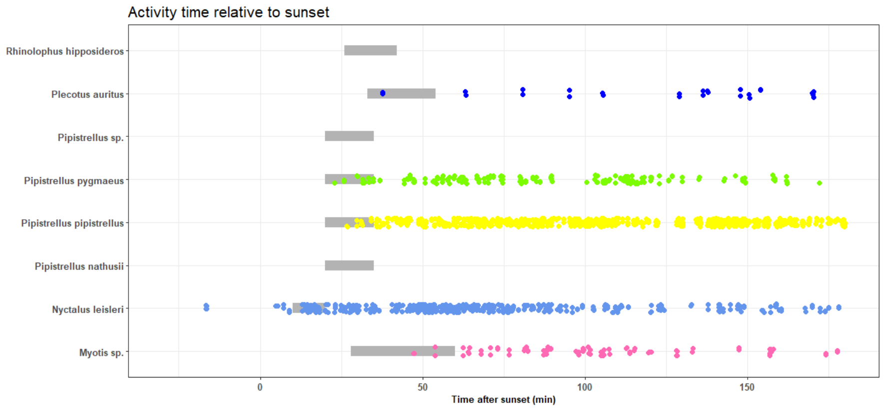


Figure F. 2: D.02

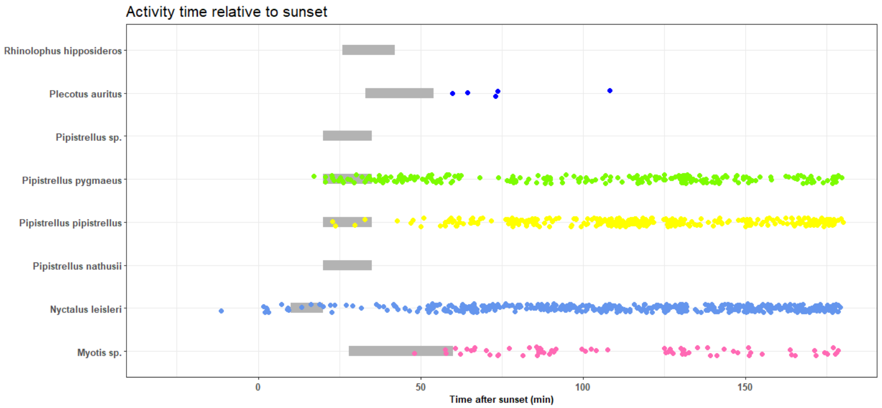


Figure F. 3: D.03

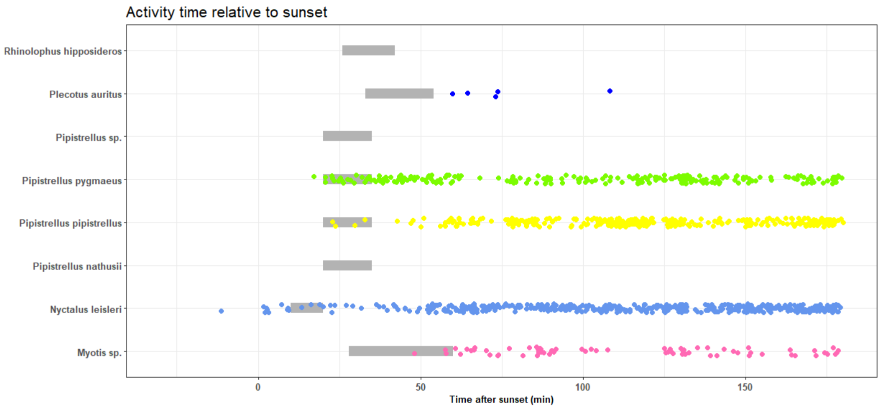


Figure F. 4: D.04

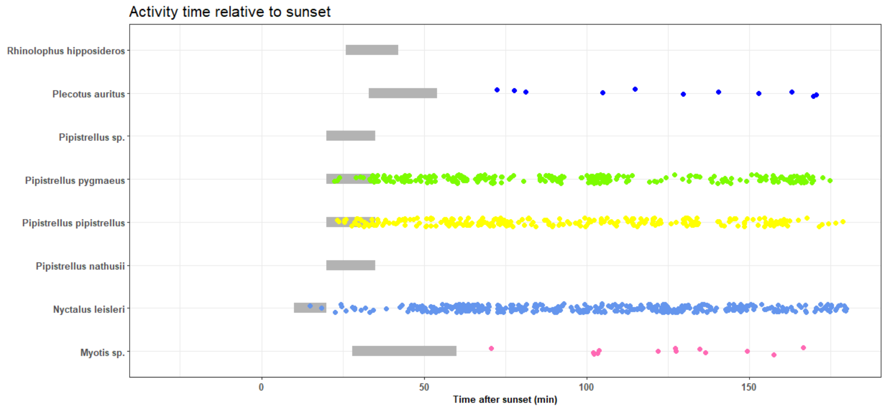


Figure F. 5: D.05

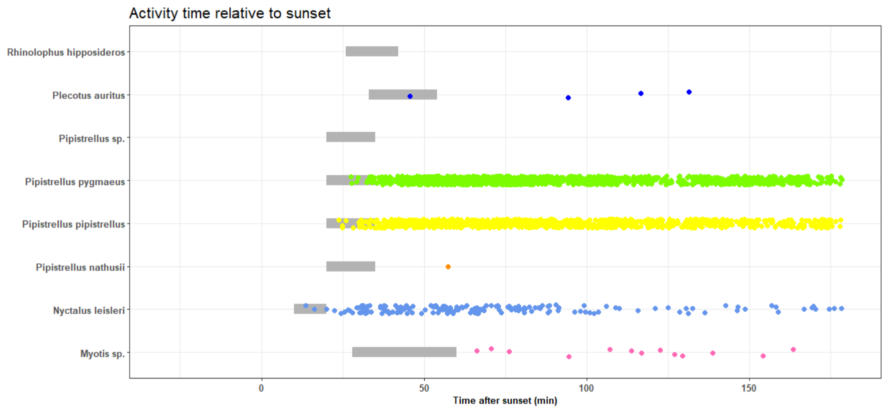


Figure F. 6: D.06

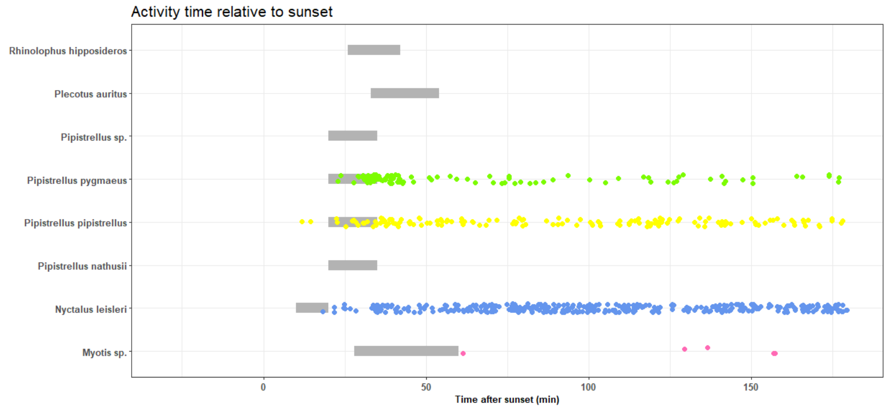


Figure F. 7: D.07

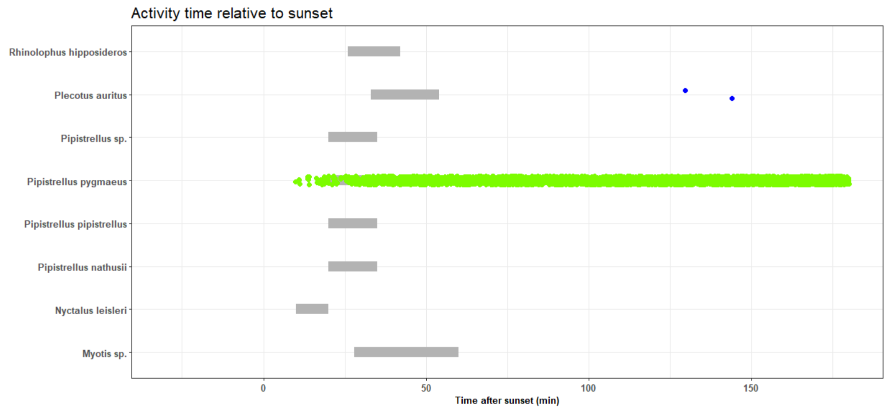


Figure F. 8: D.08

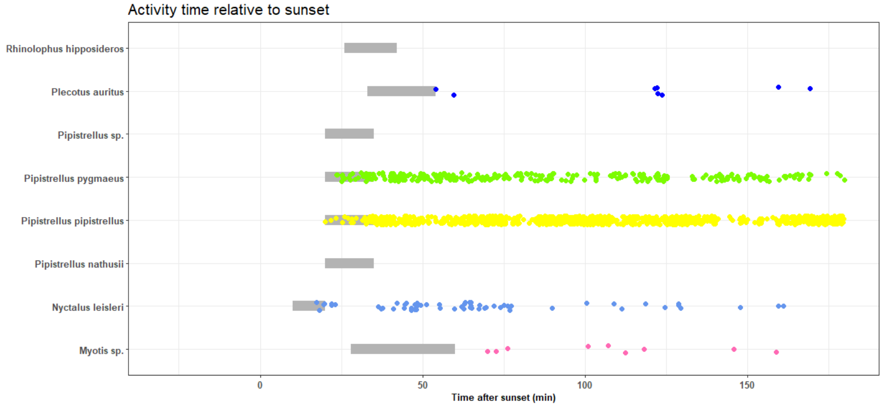


Figure F. 9: D.09

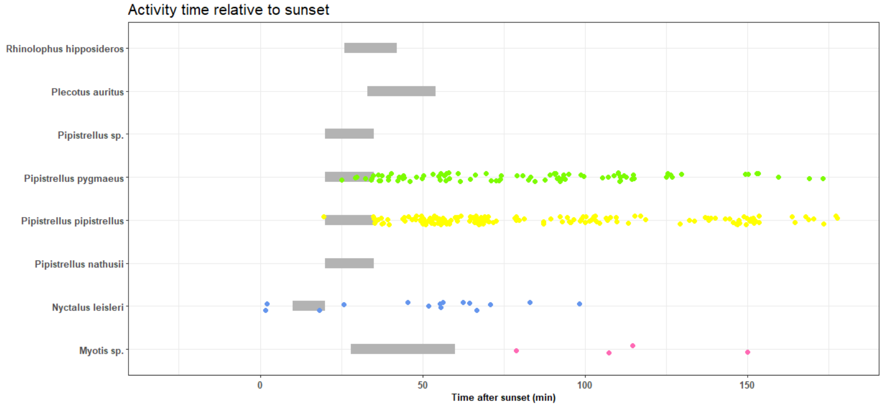


Figure F. 11: D.11

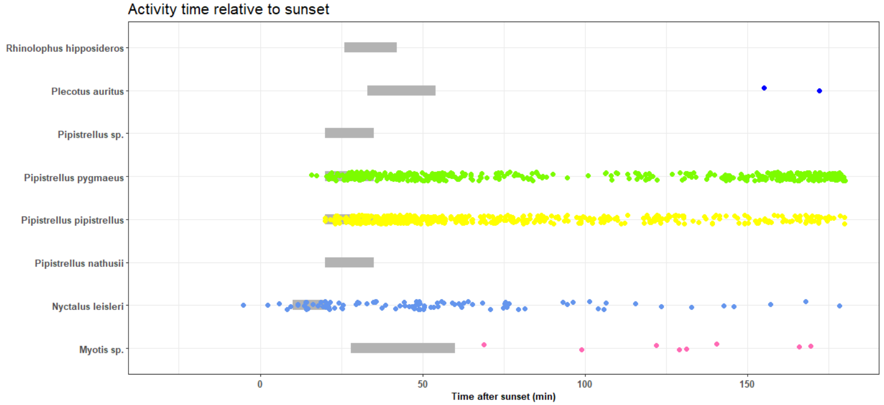


Figure F. 10: D.10

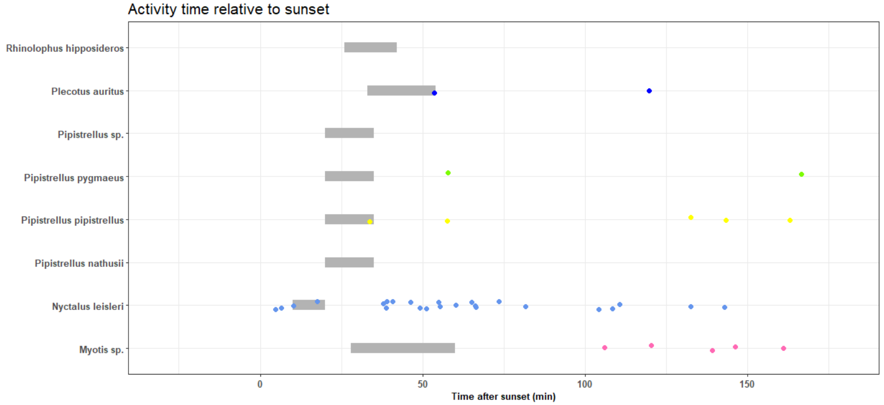


Figure F. 12: D.12

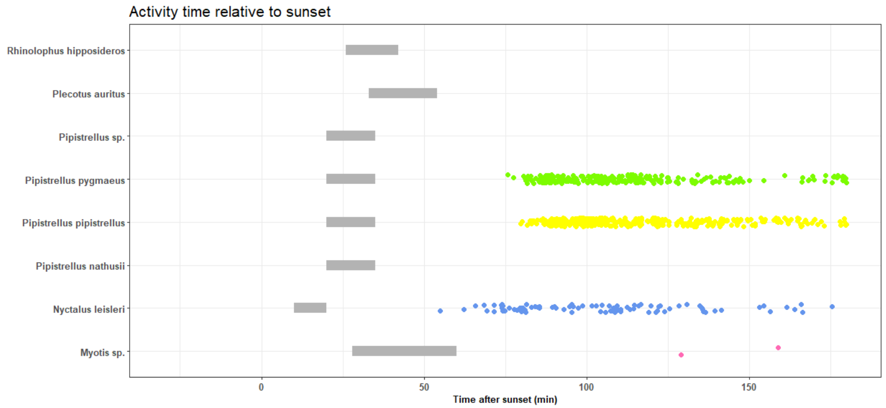


Figure F. 13: D.13

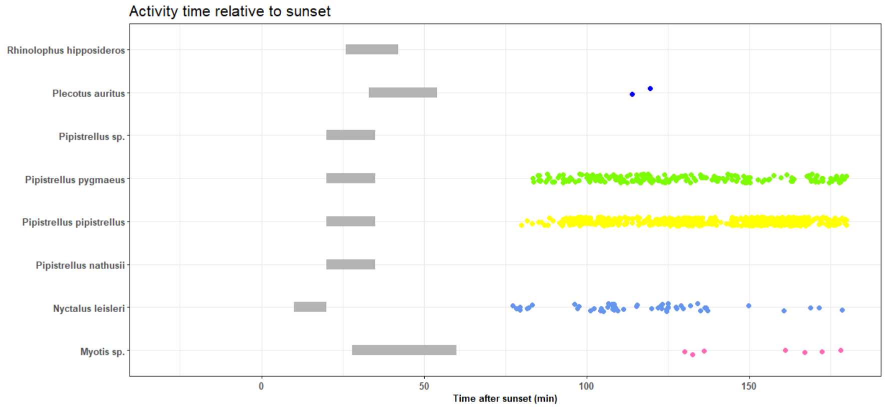


Figure F. 14: D.14

Summer

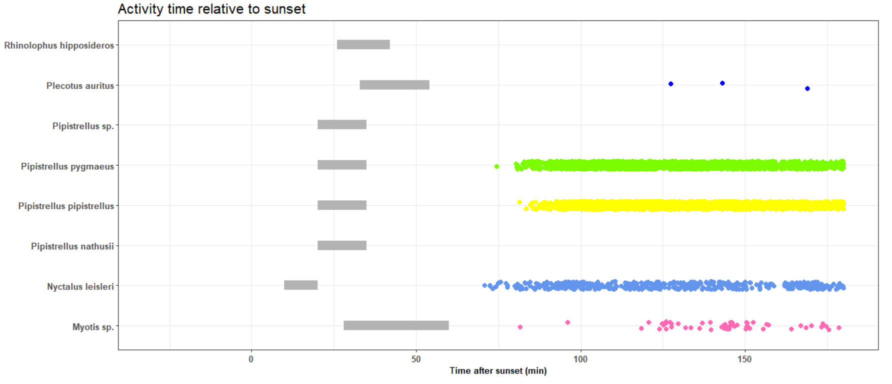


Figure F. 15: D.01

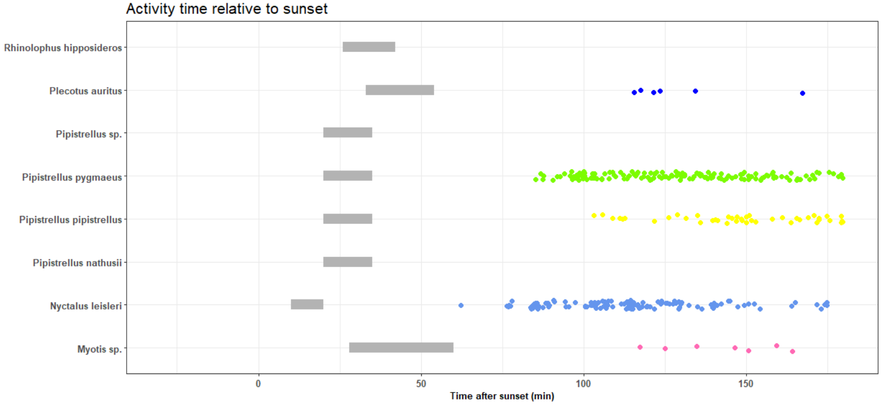


Figure F. 16: D.02

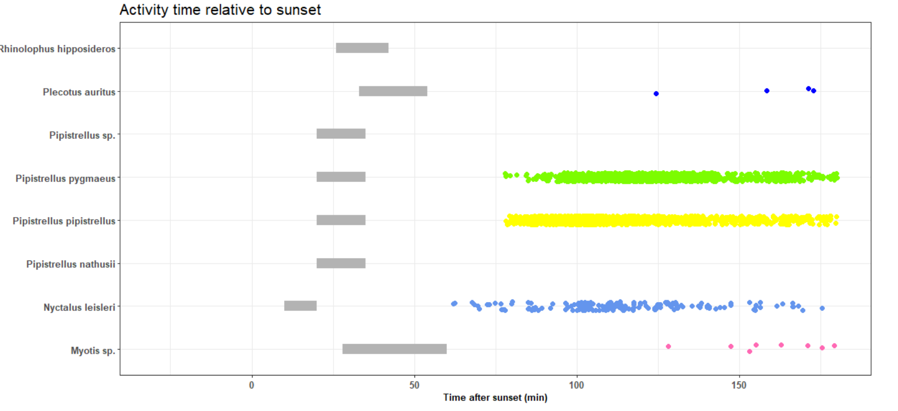


Figure F. 17: D.03

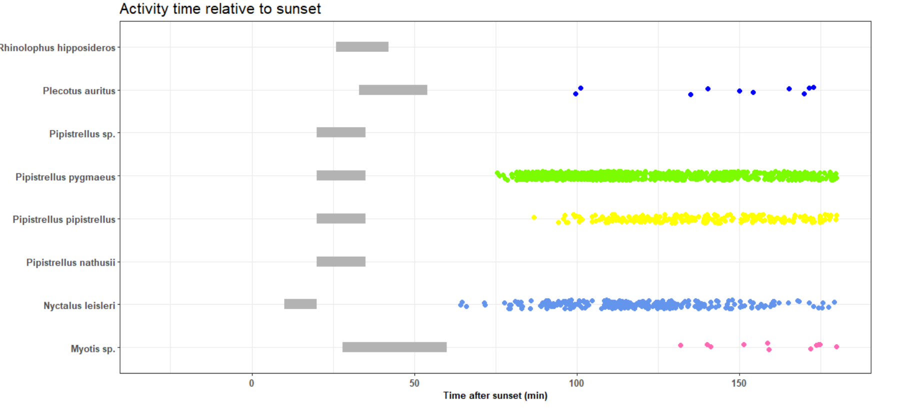


Figure F. 18: D.04

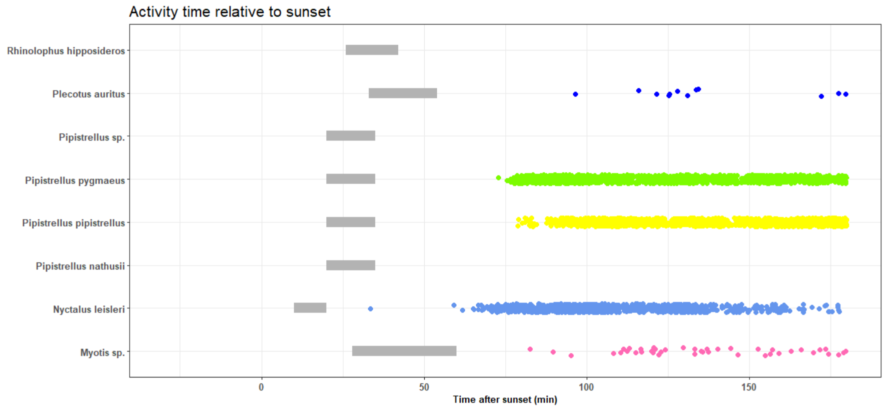


Figure F. 19: D.05

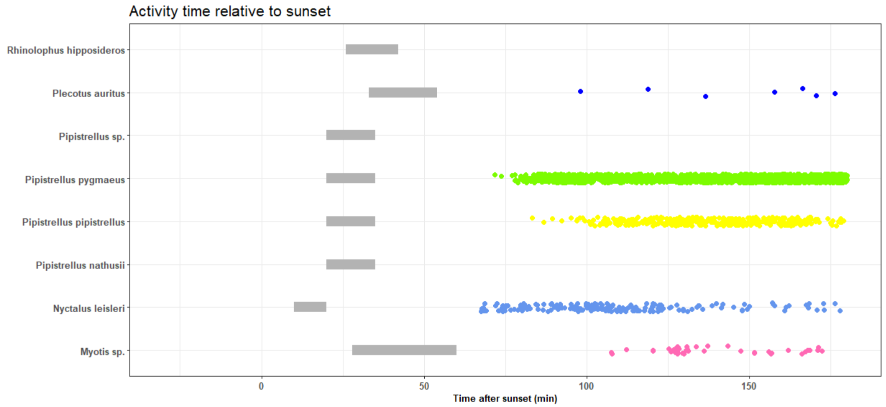


Figure F. 20: D.06

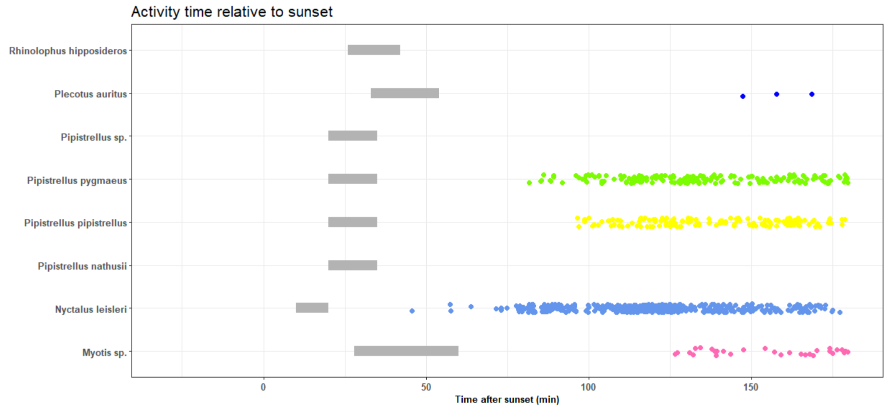


Figure F. 21: D.07

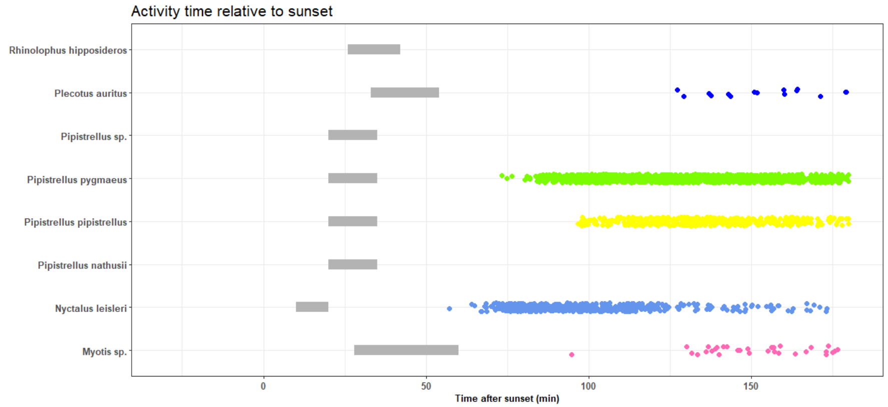


Figure F. 22: D.08

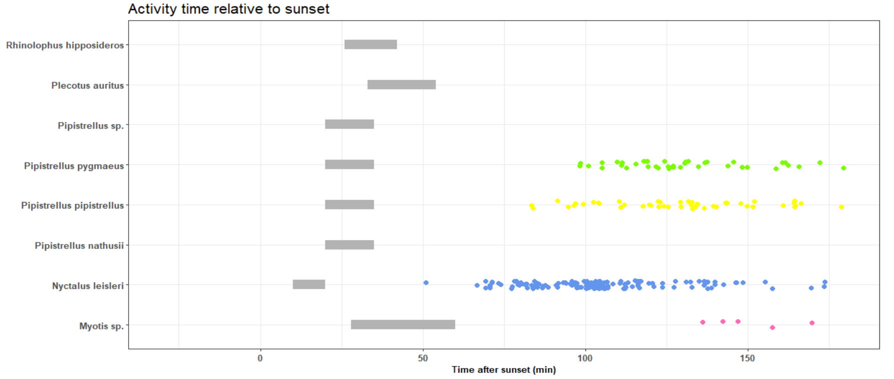


Figure F. 23: D.09

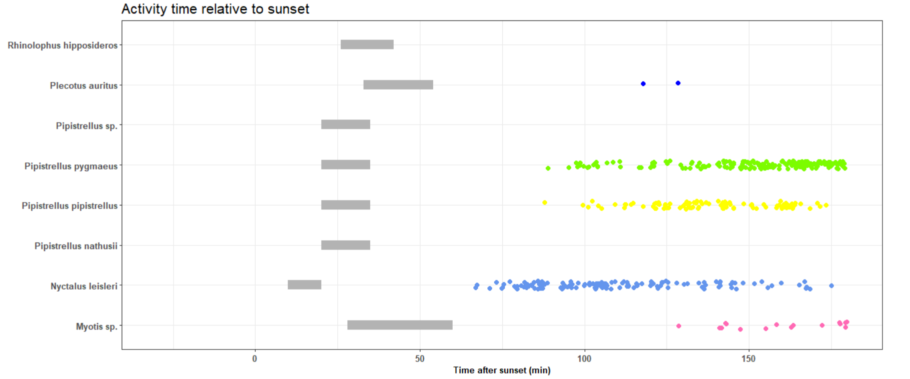


Figure F. 25: D.11

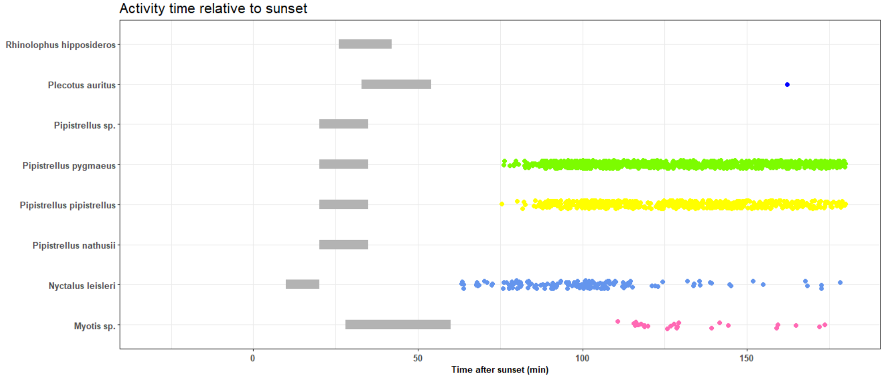


Figure F. 24: D.10

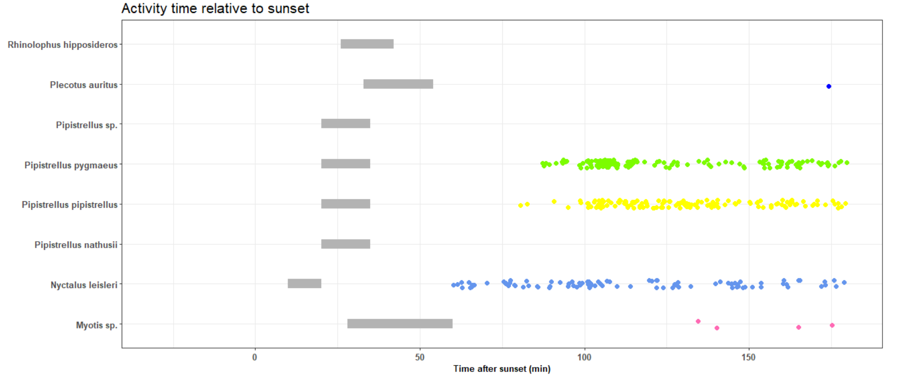


Figure F. 26: D.12

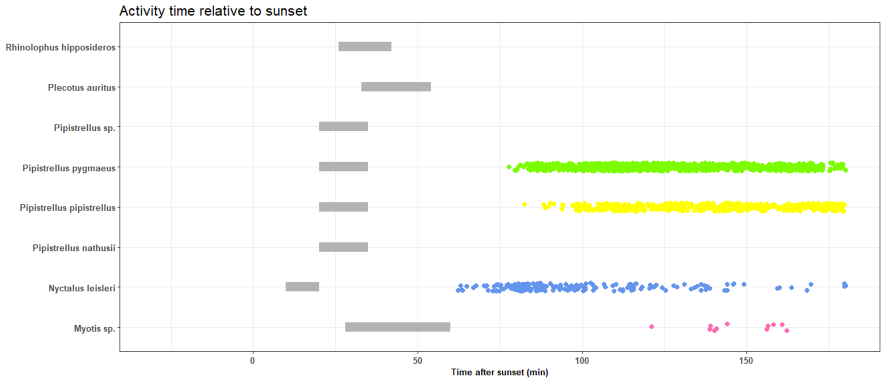


Figure F. 27: D.13

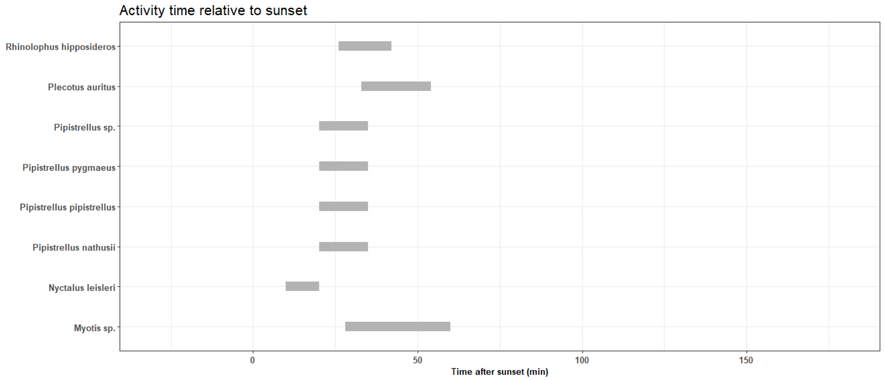


Figure F. 28: D.14

Autumn

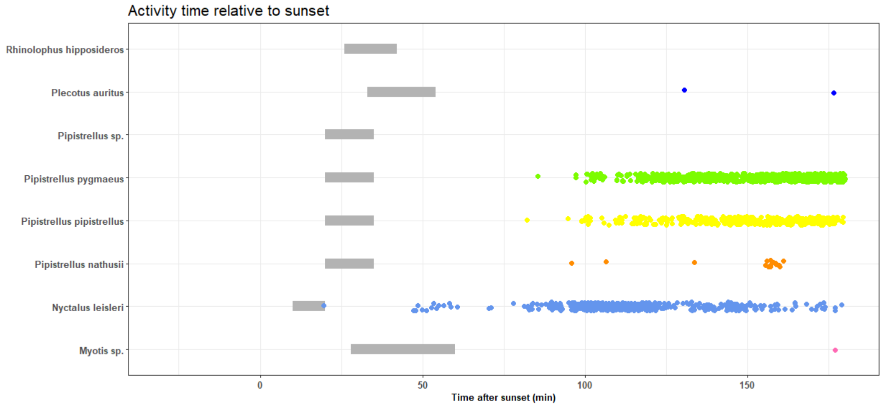


Figure F. 29: D.01

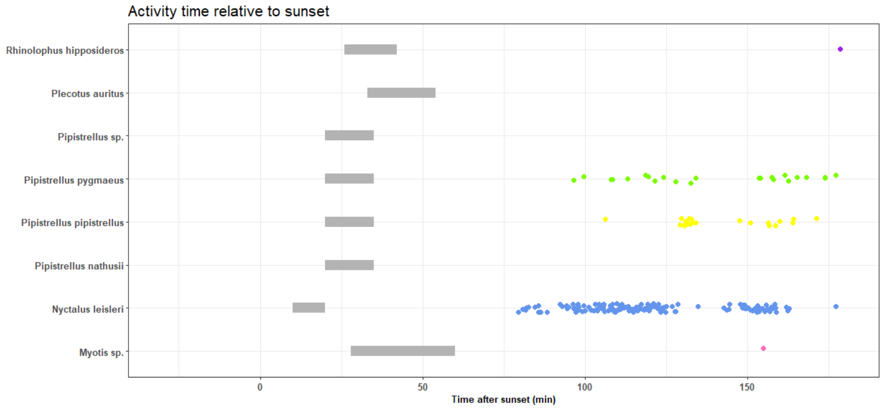


Figure F. 30: D.02

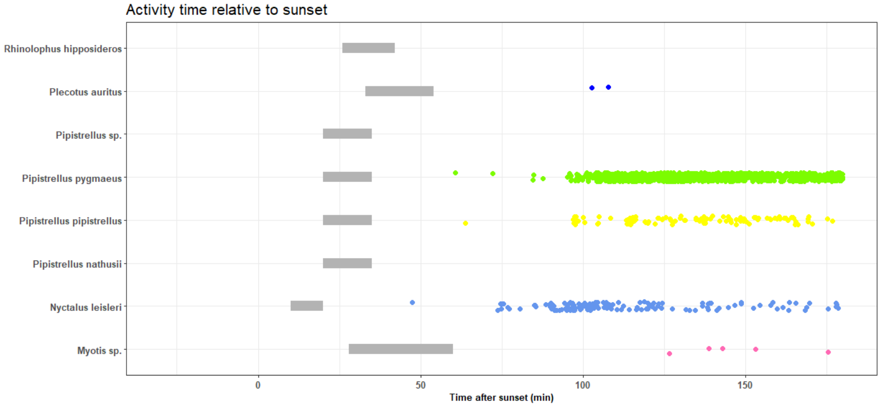


Figure F. 31: D.03

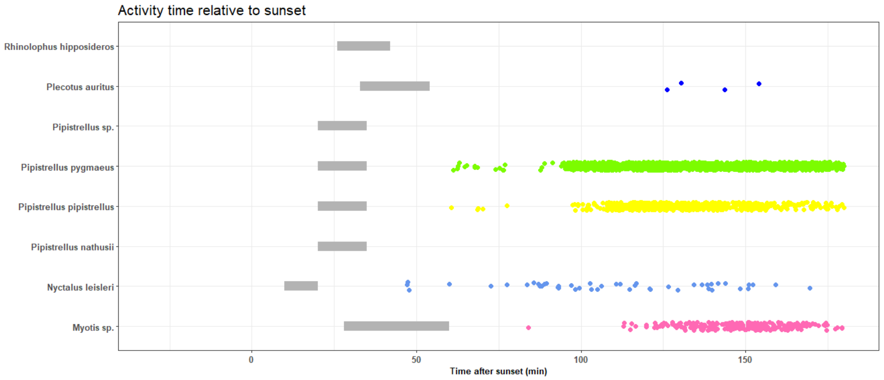


Figure F. 32: D.04

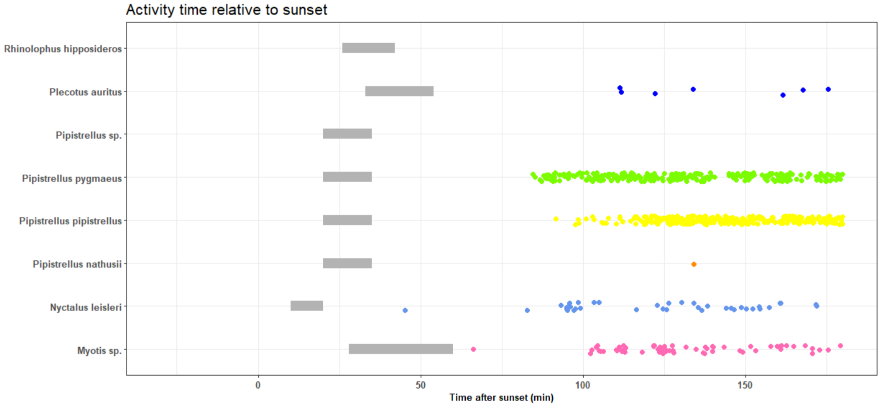


Figure F. 33: D.05

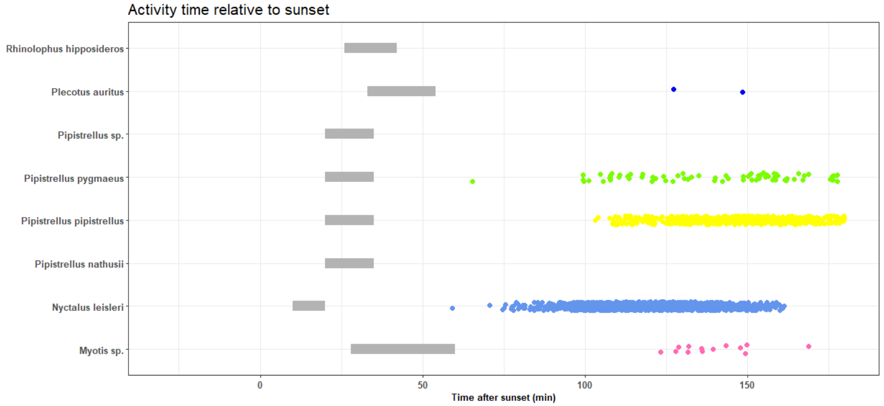


Figure F. 35: D.07

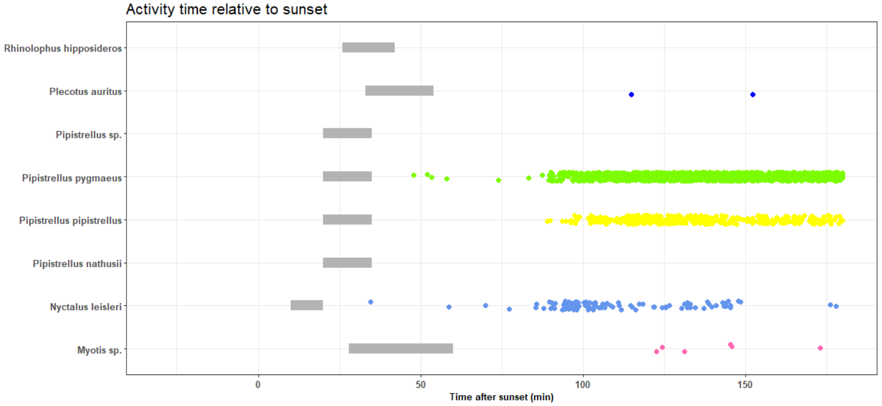


Figure F. 34: D.06

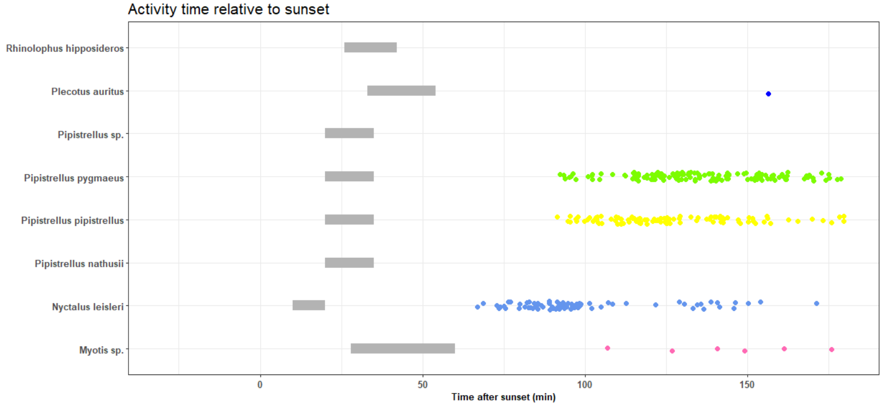


Figure F. 36: D.08

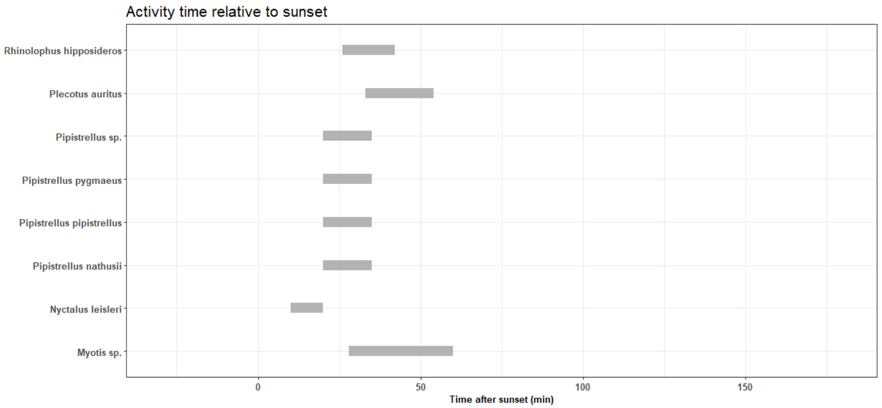


Figure F. 37: D.09

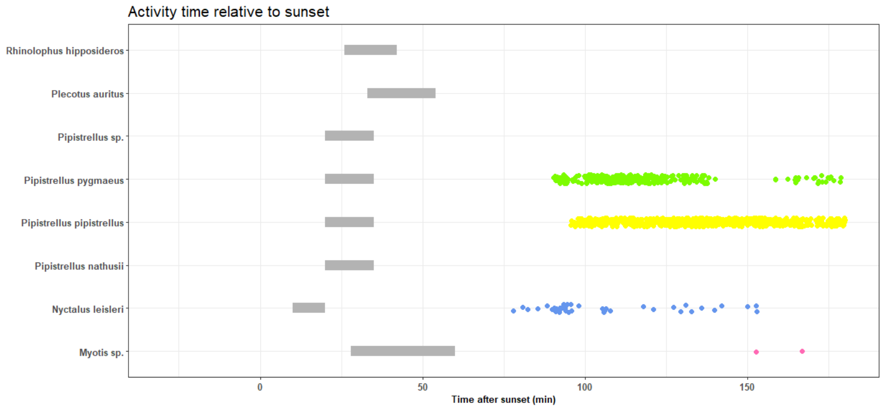


Figure F. 39: D.11

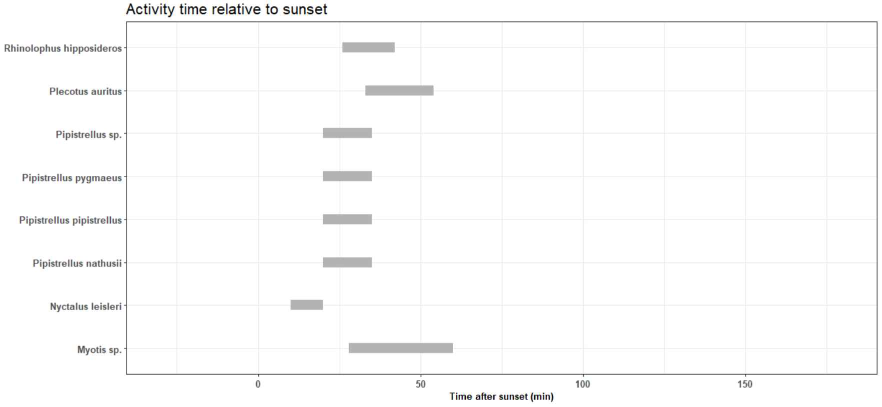


Figure F. 38: D.10

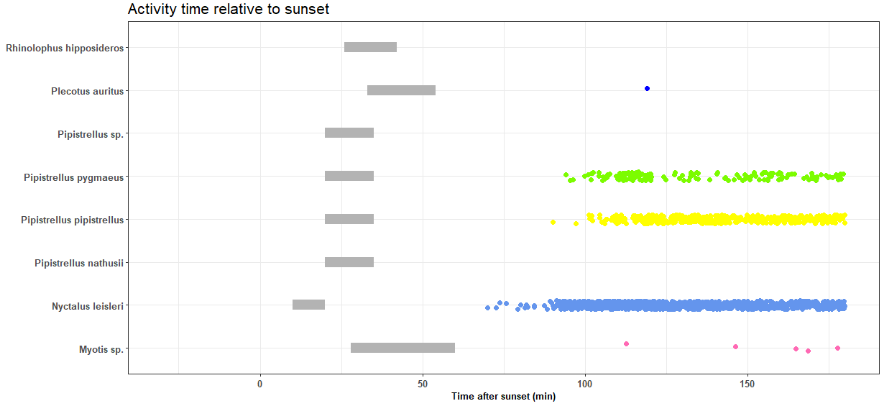


Figure F. 40: D.12

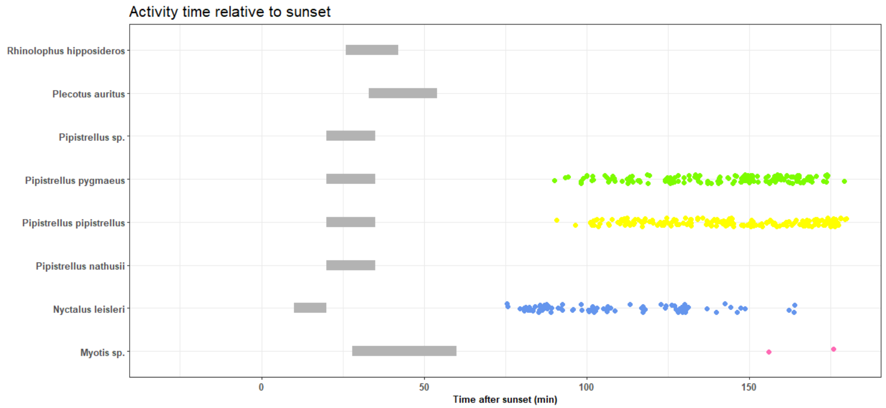


Figure F. 41: D.13

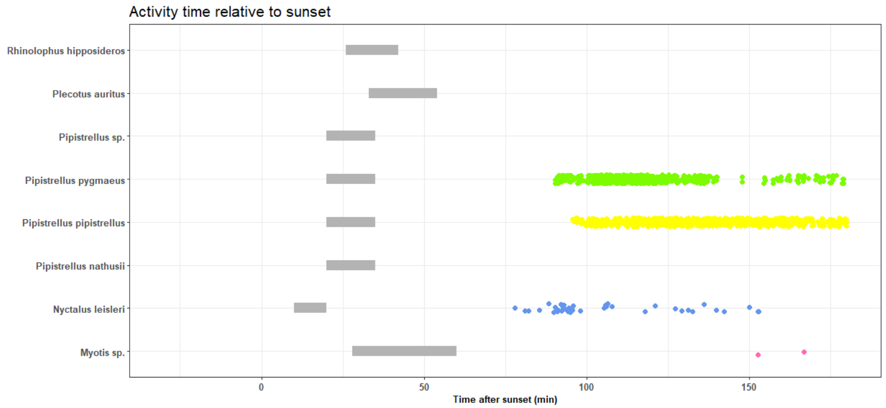


Figure F. 42: D.14

Appendix G: Weather data showing 95% interval eclipse of individual bat passes by wind speed (m/s) vs Temperature (°C).

Spring

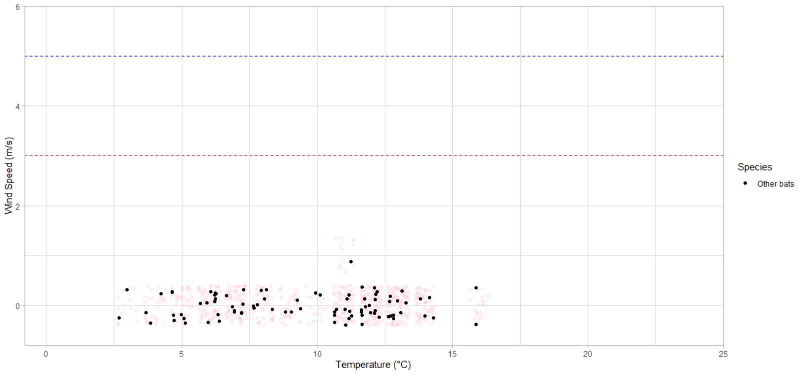


Figure G. 1: D.01

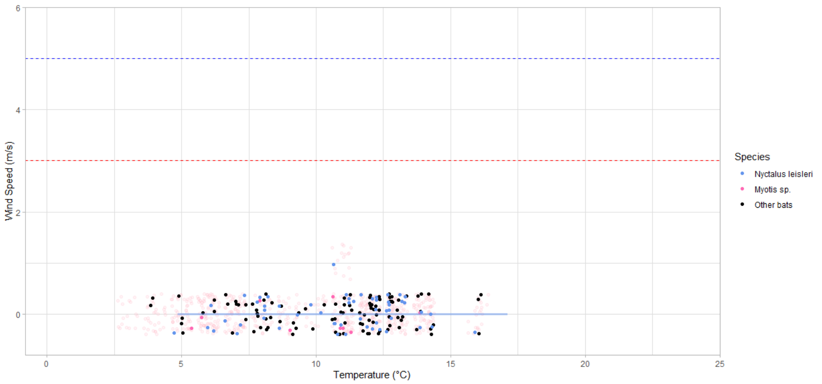


Figure G. 2: D02

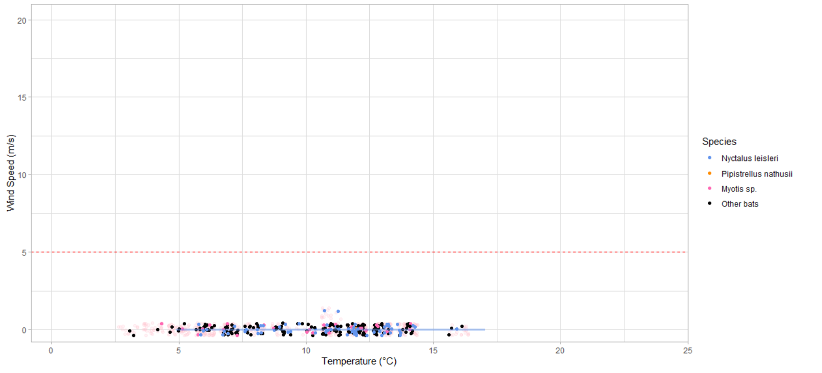


Figure G. 3: D03

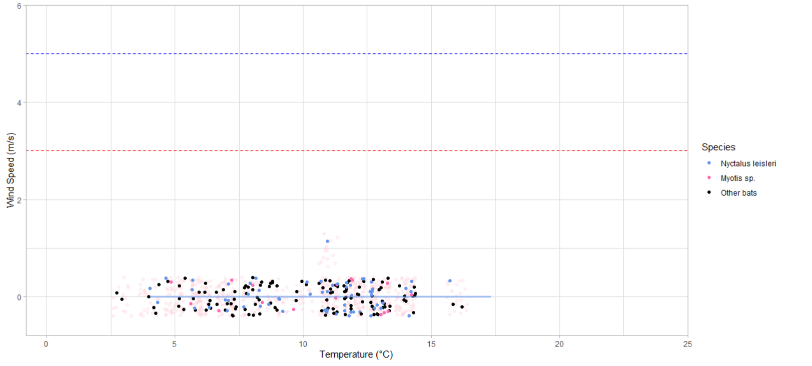


Figure G. 4: D.04

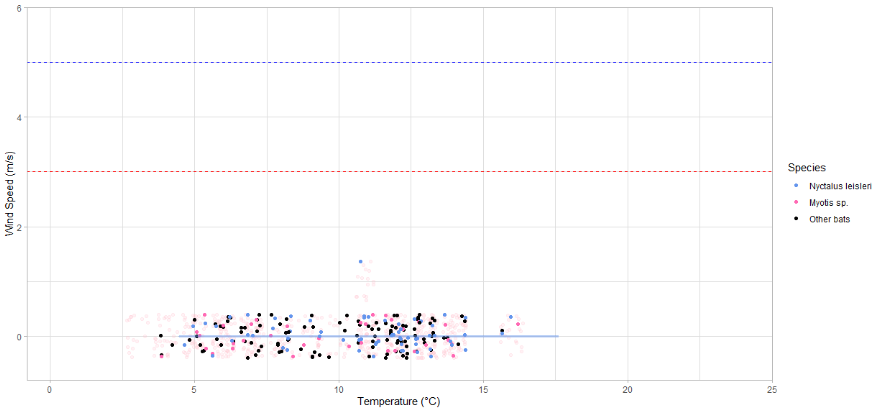


Figure G. 5: D.05

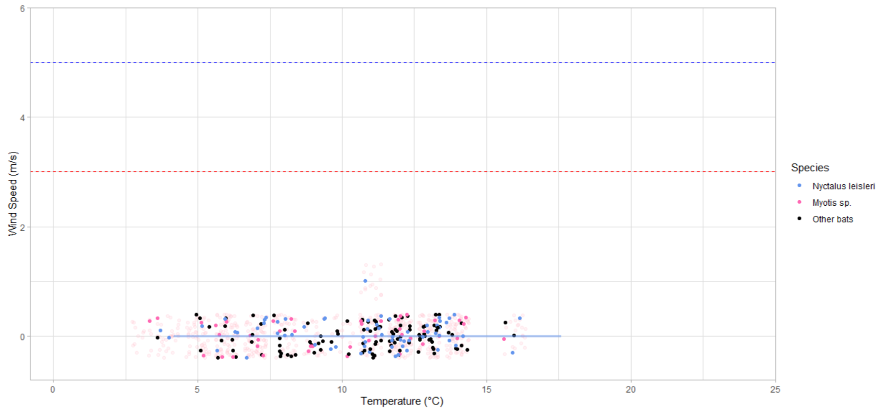


Figure G. 7: D.07

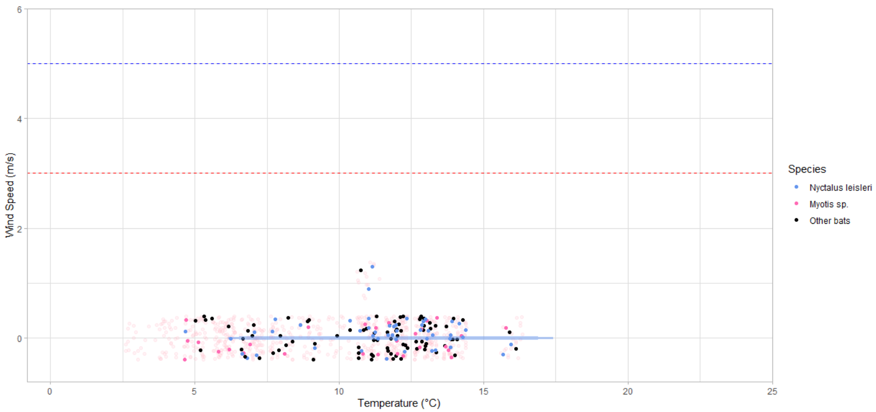


Figure G. 6: D06

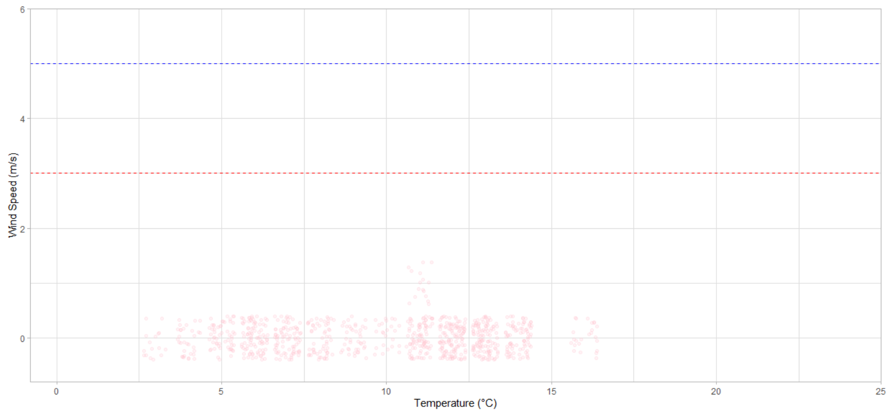


Figure G. 8: D.08

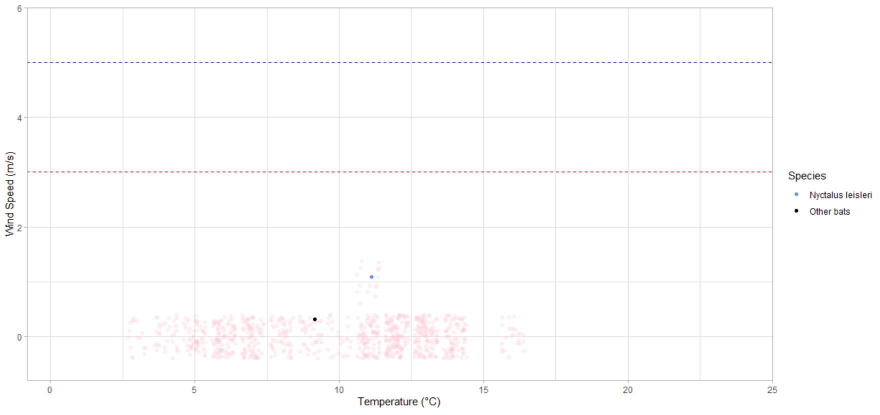


Figure G. 9: D.09

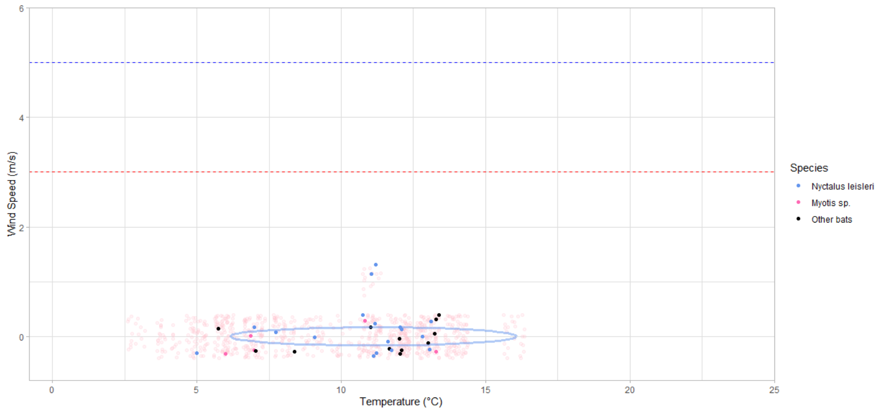


Figure G. 11: D.11

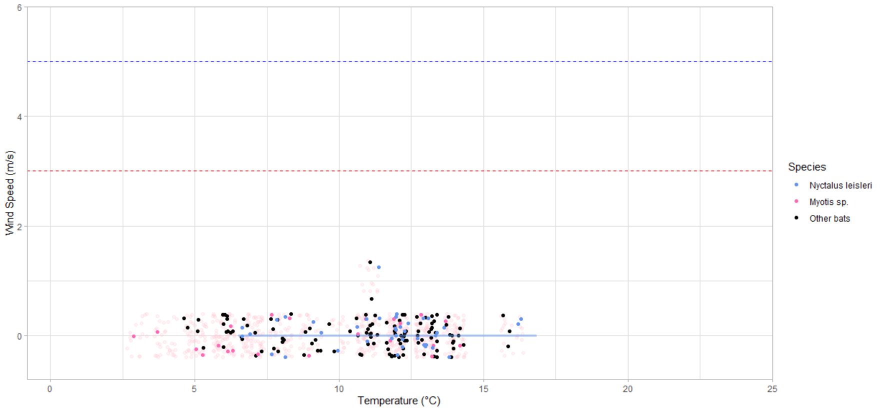


Figure G. 10: D.10

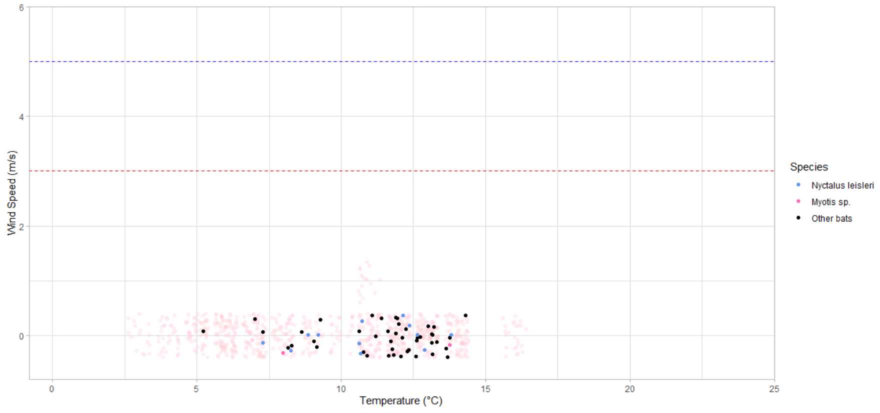


Figure G. 12: D.12

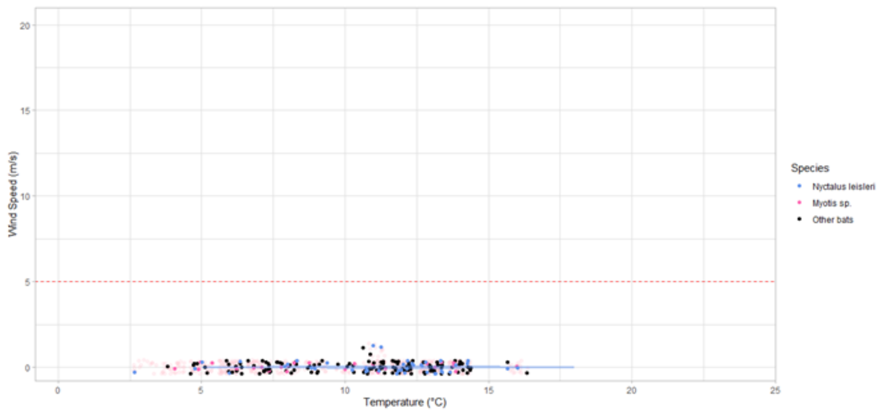


Figure G. 13: D.13

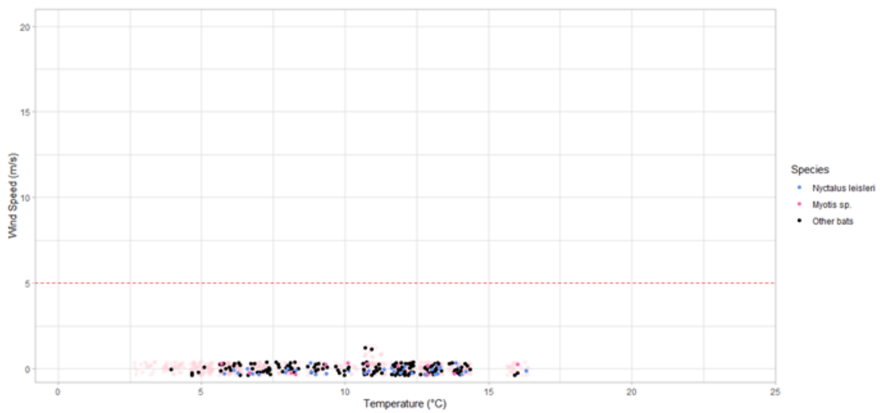


Figure G. 14: D.14

Summer

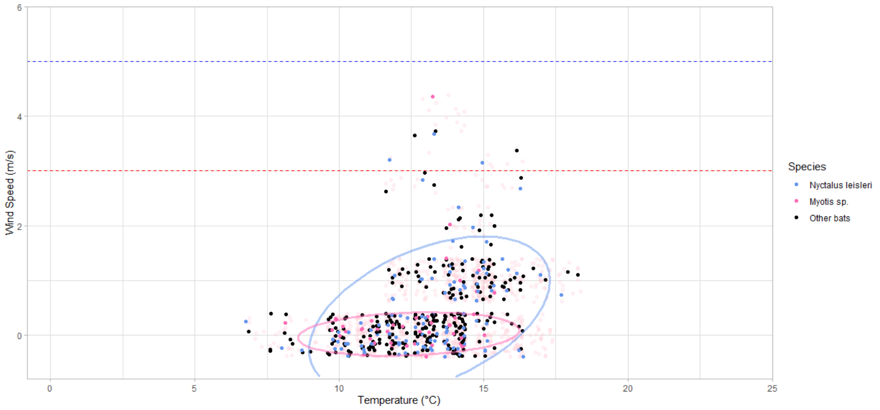


Figure G. 15: D.01

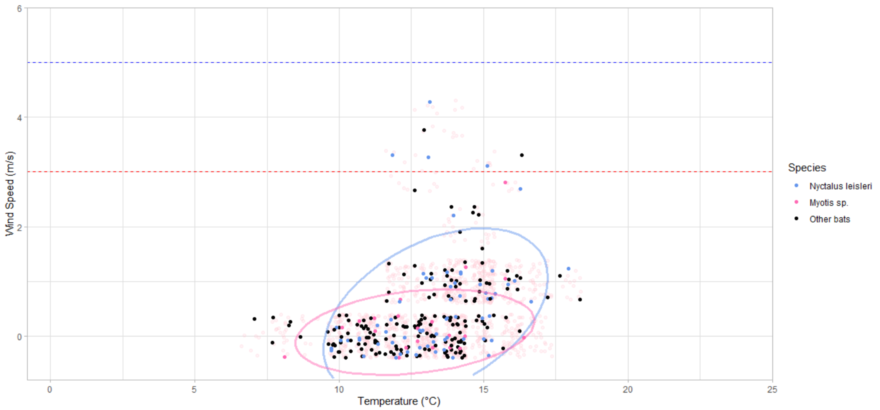


Figure G. 16: D.02

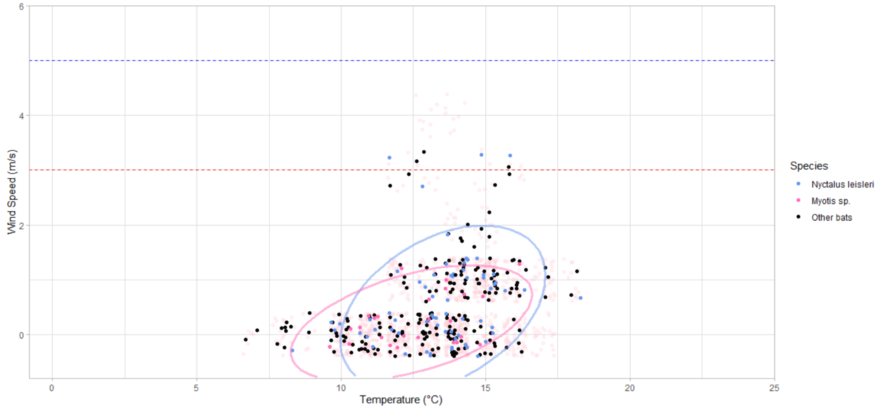


Figure G. 17: D.03

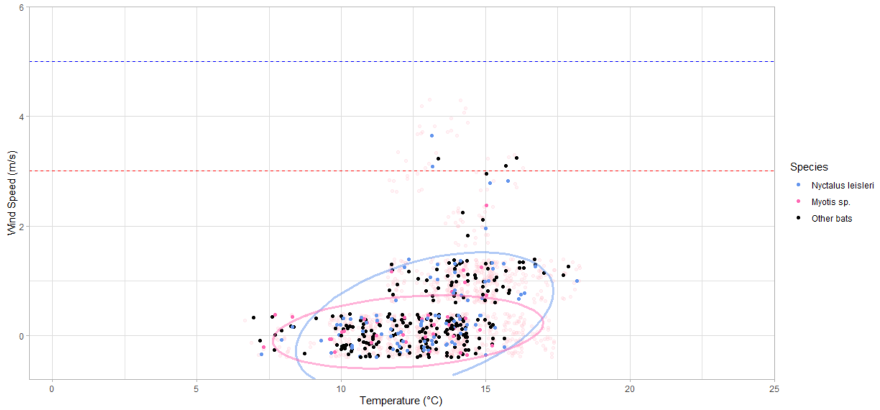


Figure G. 18: D.04

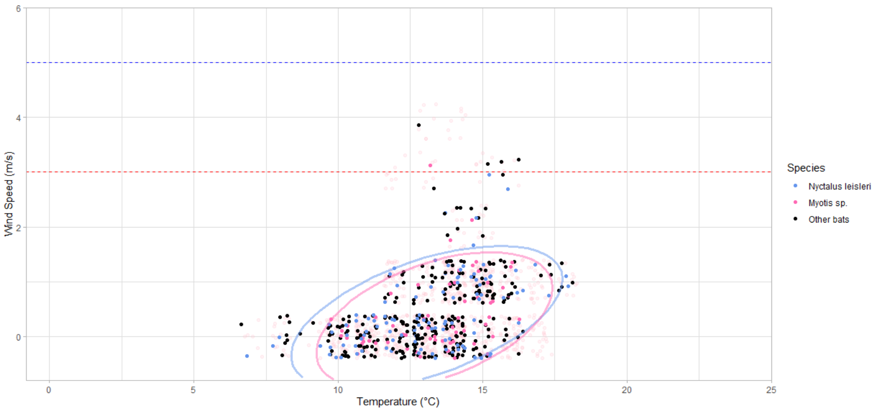


Figure G. 19: D.05

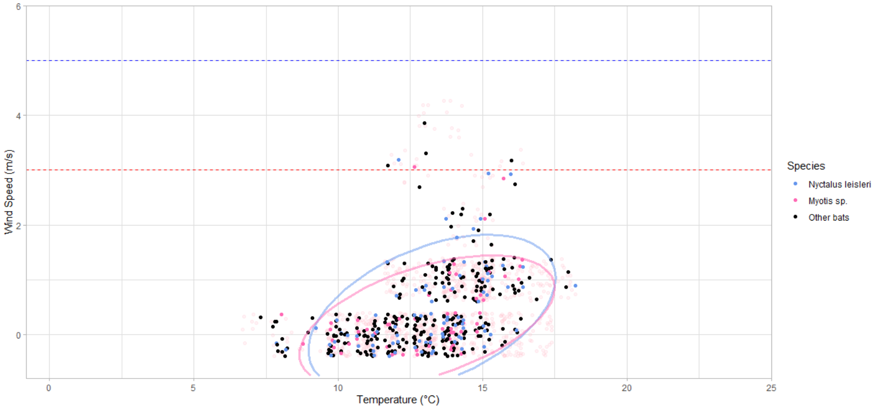


Figure G. 20: D.06

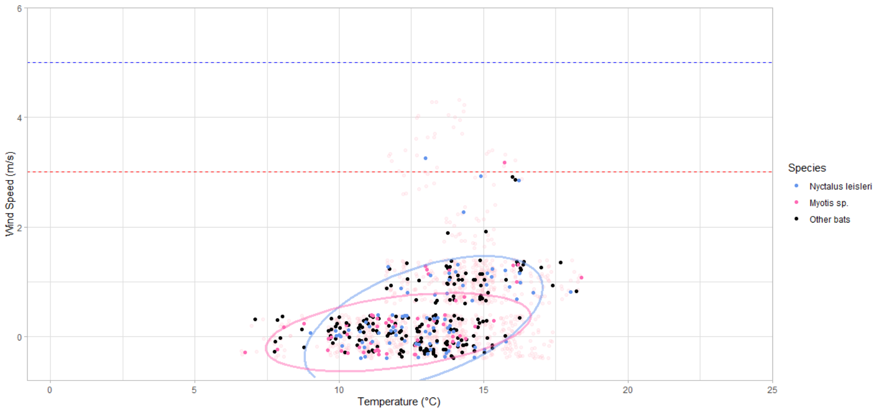


Figure G. 21: D07

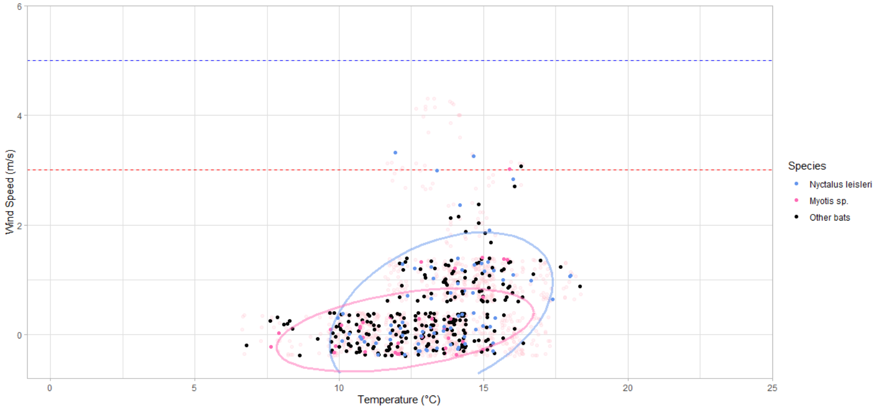


Figure G. 22: 08

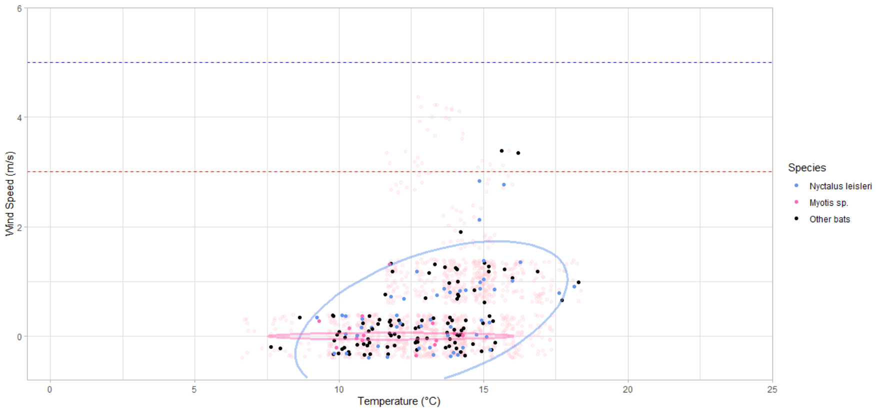


Figure G. 23: D.09

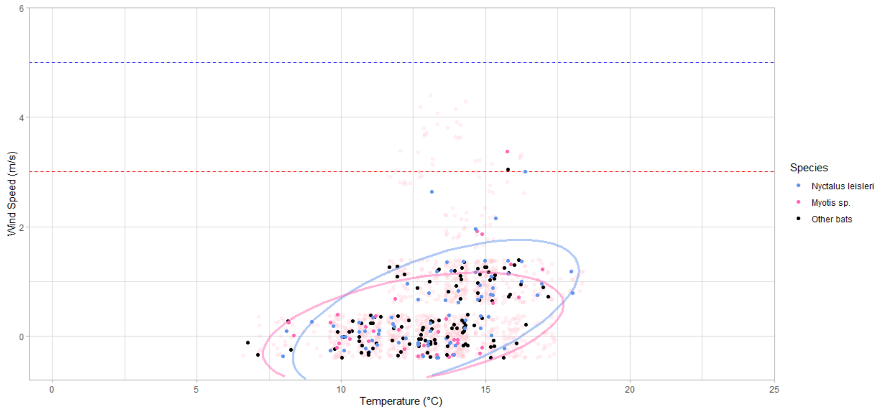


Figure G. 25: D.11

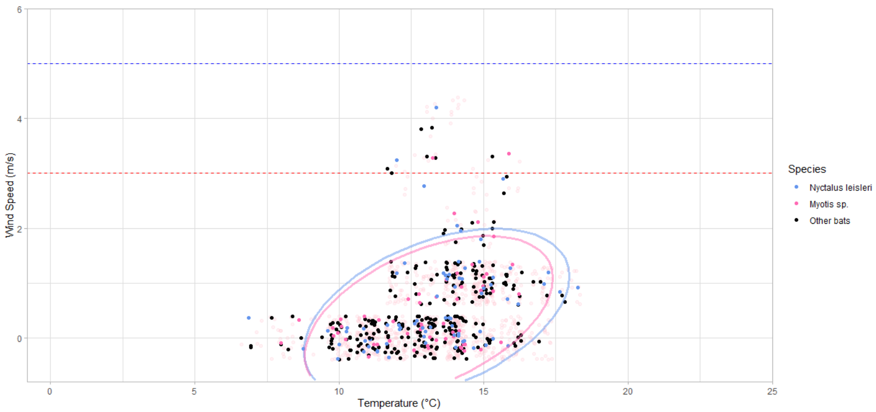


Figure G. 24: D.10

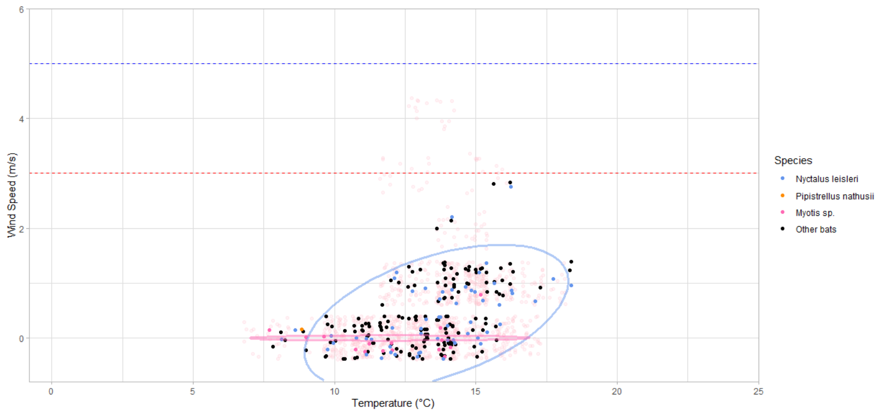


Figure G. 26: D.12

Figure G. 27: D.13

Autumn

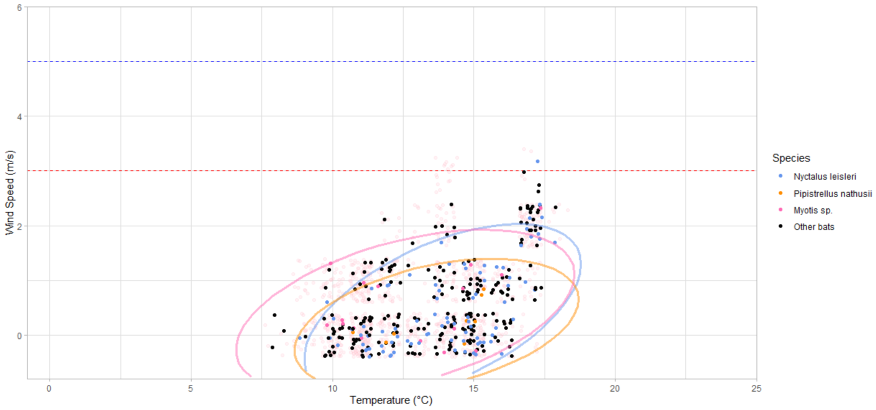


Figure G. 28: D.01

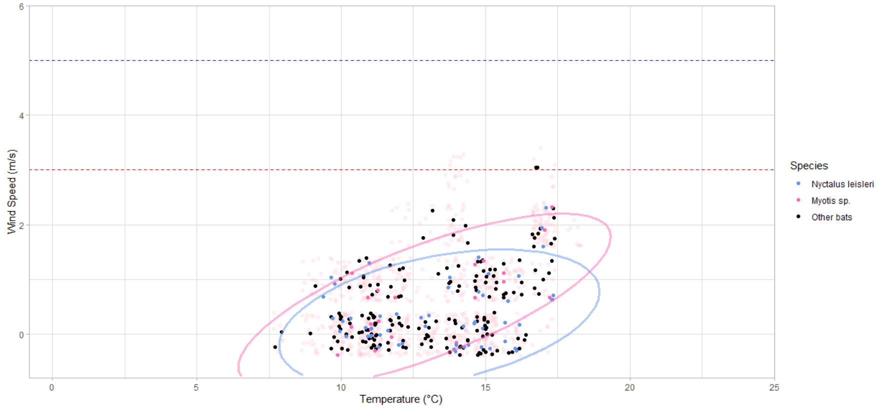


Figure G. 30: D.03

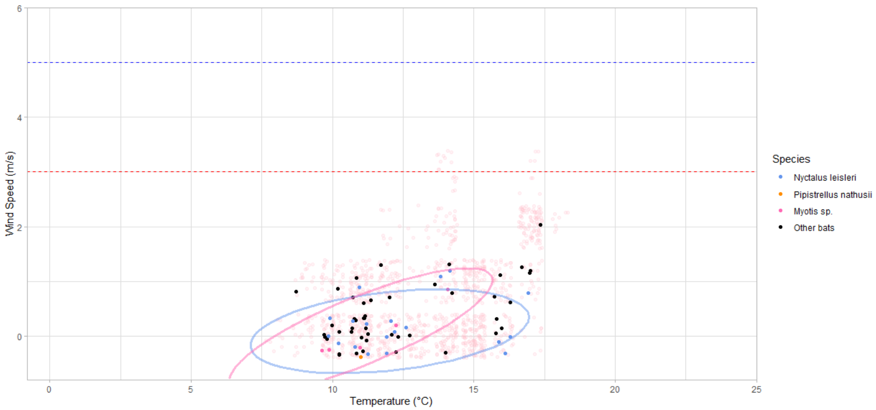


Figure G. 29: D.02

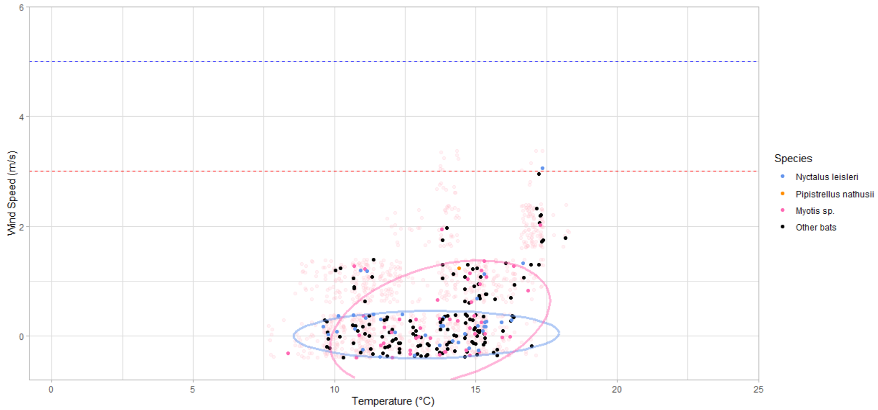


Figure G. 31: D.04

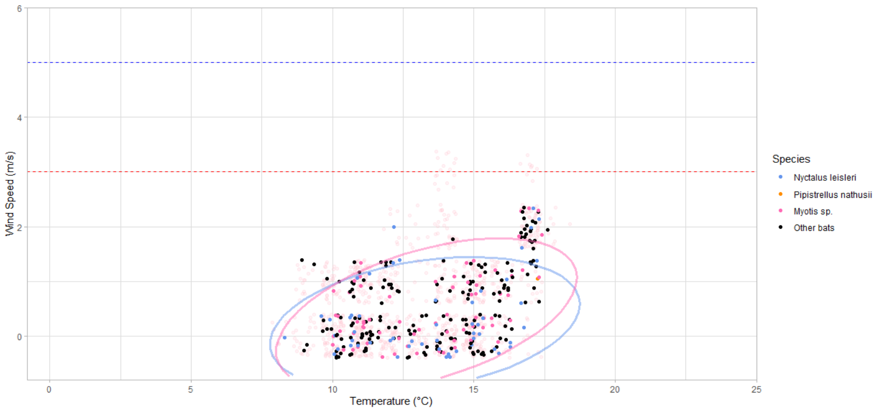


Figure G. 32: D.05

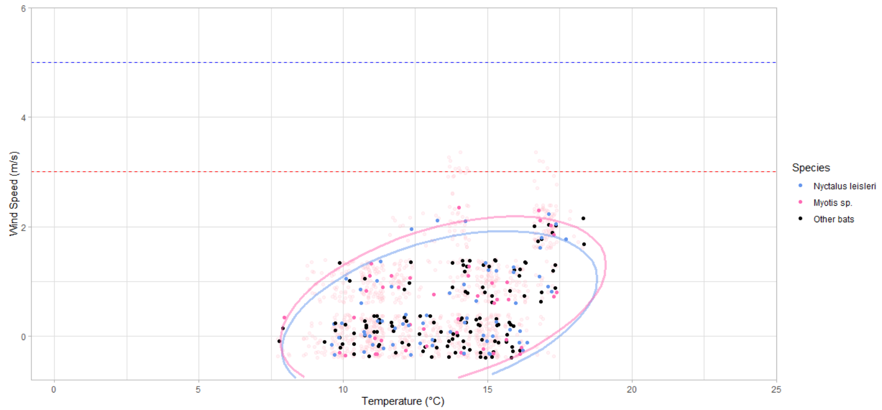


Figure G. 34: D.07

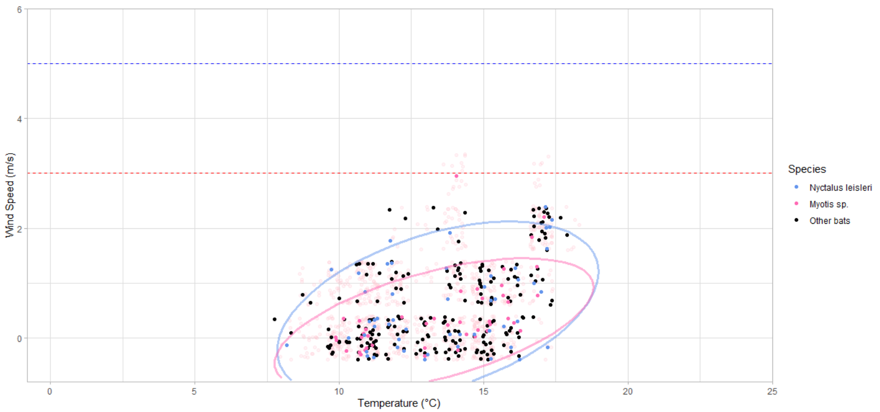


Figure G. 33: D.06

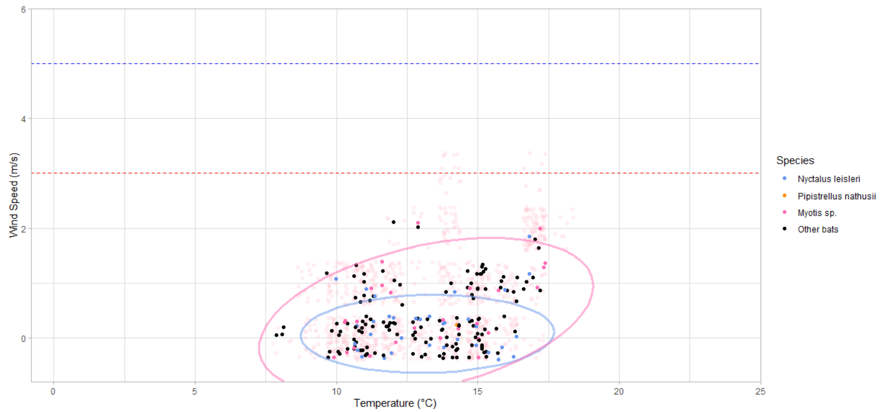


Figure G. 35: D.08

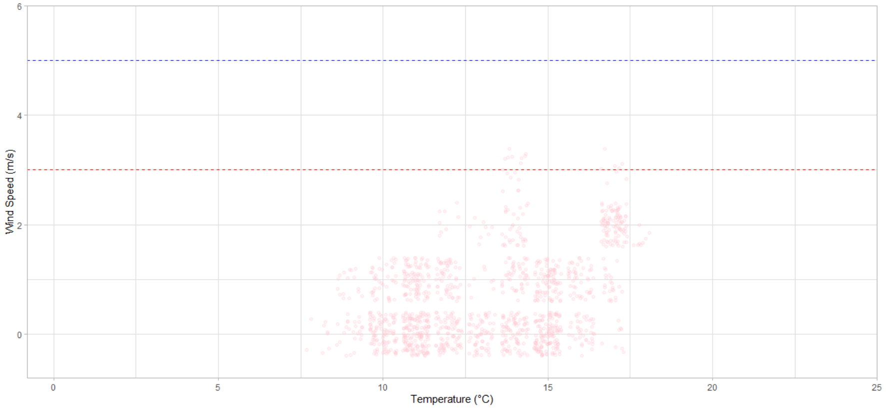


Figure G. 36: D.09

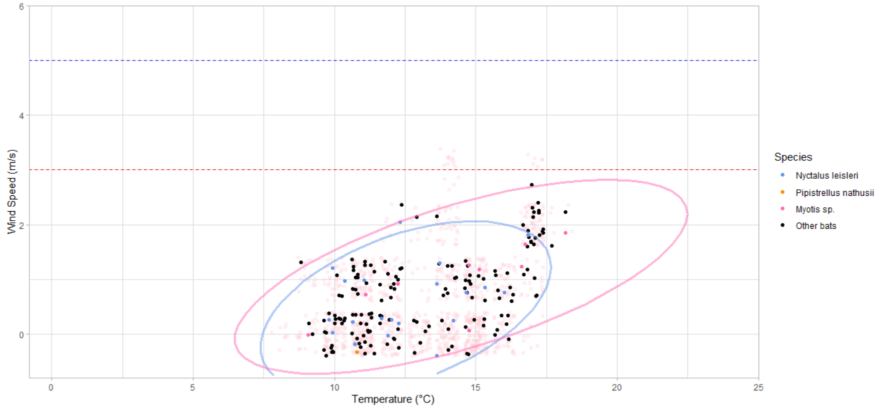


Figure G. 38: D.11

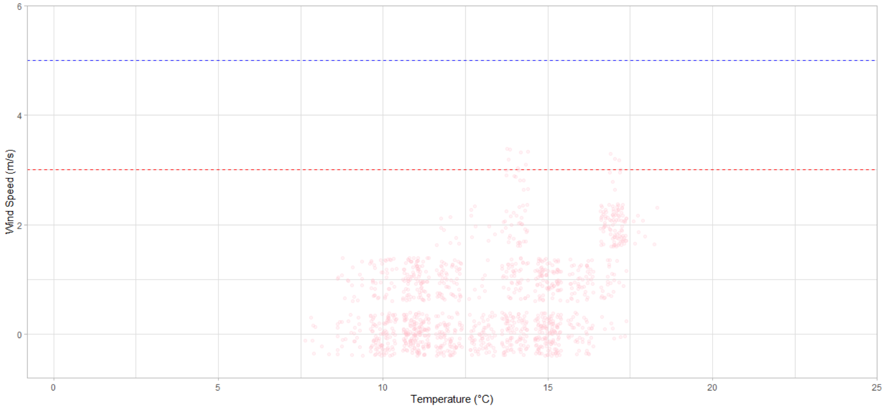


Figure G. 37: D.10

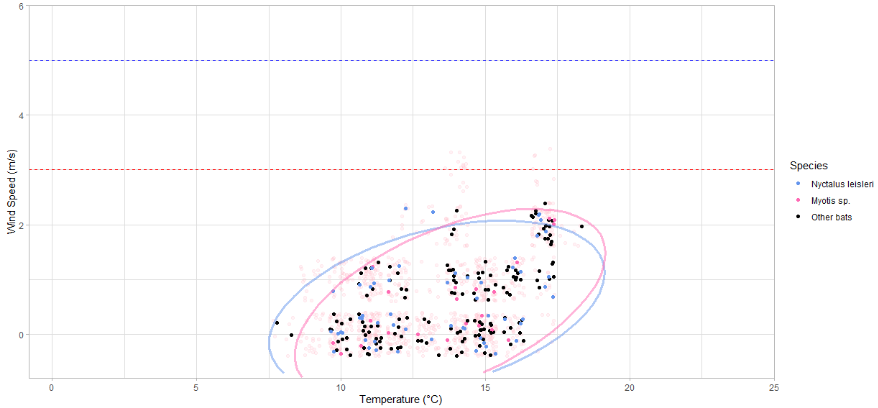


Figure G. 39: D.12

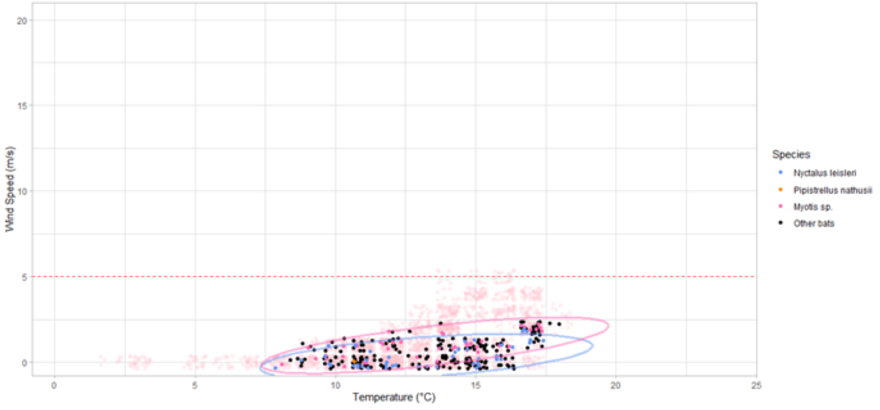


Figure G. 40: D.13

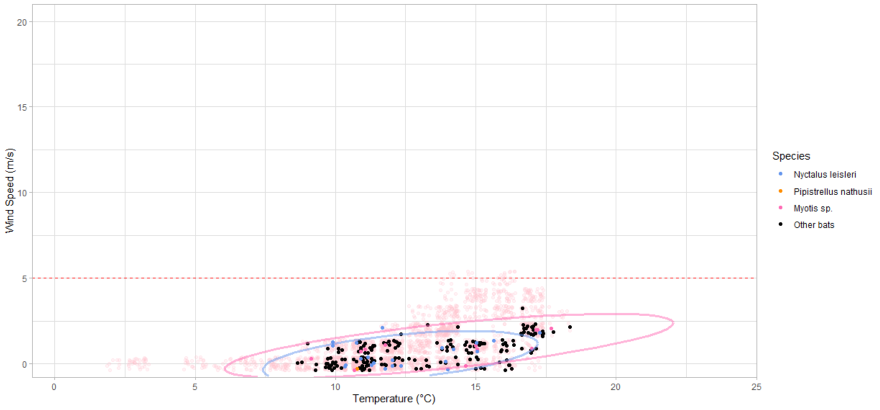


Figure G. 41: D.14