

2023

# The different factors affecting Chiroptera emergences with a focus on *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*

McCabe, H.

McCabe, H. (2023) 'The different factors affecting Chiroptera emergences with a focus on *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*', *The Plymouth Student Scientist*, 16(2), pp. 285-313.

<https://pearl.plymouth.ac.uk/handle/10026.1/21836>

---

The Plymouth Student Scientist  
University of Plymouth

---

*All content in PEARL is protected by copyright law. Author manuscripts are made available in accordance with publisher policies. Please cite only the published version using the details provided on the item record or document. In the absence of an open licence (e.g. Creative Commons), permissions for further reuse of content should be sought from the publisher or author.*

## Appendix 1

Table 1 meta data used within this study

Table Heading	Description of data included under heading
Location	Represents the building/site name
Building	Specific building within site as multiple sites have more than two buildings included within the data set
Date	The date at which the survey took place at each site (up to three different dates)
Sites I've visited	If I have personally surveyed this site or if the data has been provided by Ecosupport
Habitat Scale	A self-assessment of the habitat type for each survey location, presented in a ranked scale of 1-5, this is the scale as follows: 1 rural- one off buildings within a rural habitat with such as an SSSI with no agriculture, residential or industrial interferences, 2 Agricultural- this includes, farm buildings as well as rural buildings surrounded by agricultural practices including crops and livestock, 3 semi-rural- small residential areas and villages still surrounded by green spaces or woodlands, 4 semi urban- buildings located within larger towns or towards town centers with a higher human population and human interference, 5 urban- buildings located within cities with high levels of industry and residential areas, also higher light levels from street lights and cars such as Winchester
Start Temp (°C)	The start temperature at the beginning of each bat survey taken by using a digital thermometer
Finish Temp (°C)	The finish temperature at the end of each bat survey taken by a digital thermometer
Cloud Cover (%)	The estimated cloud cover taken at the start of each survey
Wind (beaufort scale)	Wind flow speed calculated using the beaufort scale
Start Time	The start time of each survey measured using a 24-hour clock
Sunset/Sunrise Time	The time at which the sun set or rose within the survey measured using a 24-hour clock
Finish time	The finish time for each bat survey measured using a 24-hour clock
General Info	General comments included within the reports such a rain, insect levels etc
Emergences	The total number of bats which emerged from the building
Re-entries	The total number of bats which re-entered buildings
Common Pip	Species of bat: <i>Pipistrellus pipistrellus</i> (Common pipistrelle)
Soprano pip	Species of bat: <i>Pipistrellus pygmaeus</i> (Soprano pipistrelle)
Natterer	Species of bat: <i>Myotis nattereri</i> (Natterer's bat)
Brown Long-eared	Species of bat: <i>Plecotus auritus</i> (Brown Long- eared bat)
Serotine	Species of bat: <i>Eptesicus serotinus</i> (Serotine Bat)
Plecotus spp	Species of bat: <i>Plecotus spp</i> (an unidentified bat which falls under the <i>Plecotus</i> genus- the potential bats could be: <i>Plecotus auritus</i> (Brown Long-eared bat) or <i>Plecotus austriacus</i> (Grey Long-eared bat) however due to the areas surveyed the most likely species is <i>Plecotus auritus</i>
Myotis spp	Species of bat: <i>Myotis spp</i> (an unidentified bat which falls under the <i>Myotis</i> genus- the potential bats could be: <i>Myotis alcathoe</i> (Alcathoe bat), <i>Myotis bechsteinii</i> (Bechstein's bat), <i>Myotis brandtii</i> (Brandt's bat), <i>Myotis daubentonii</i> (Daubenton's bat), <i>Myotis nattereri</i> (Natterer's bat) <i>Myotis mystacinus</i> (Whiskered bat), <i>Myotis myotis</i> (Greater mouse-eared bat) however due to the areas surveyed the most likely species is <i>Myotis Nattereri</i> )
Total species	The total number of different species measured at each site location
Tiles	Feature on a building that bats emerged or re-entered from: unspecified tiles
Hanging tiles	Feature on a building that bats emerged or re-entered from: tiles normally found on the roof or the side of a building that 'hang' off it
Ridge Tiles	Feature on a building that bats emerged or re-entered from: a rounded or angled tile situated at the top of a roof on a building designed to prevent rain entering the top of the roof
Gable	Feature on a building that bats emerged or re-entered from: a triangular piece of wall protruding from a wall or the edges of intersecting roof pitches

Openings (window or large gaps)	Feature on a building that bats emerged or re-entered from: either open/broken windows- large holes usually found in run down houses or large gaps where walls have caved in or in the absence of barn doors
Dormer window	Feature on a building that bats emerged or re-entered from: triangular structure containing a window protruding outwards from the main roof
Roof	Feature on a building that bats emerged or re-entered from: non-specific roof features
Wooden Cladding	Feature on a building that bats emerged or re-entered from: cladding made from wood (also known as weather boards) usually found on farm buildings to protect from excess moisture and rain
Soffit	Feature on a building that bats emerged or re-entered from: a horizontal exterior or interior feature on the underside of any constructional element usually found within the eaves of a building
Northern	Direction of where bat emerged from or re-entered into on building: a northern entrance/exit
Southern	Direction of where bat emerged from or re-entered into on building: a southern entrance/exit
Eastern	Direction of where bat emerged from or re-entered into on building: an eastern entrance/exit
Western	Direction of where bat emerged from or re-entered into on building: <u>a</u> eastern entrance/exit
Time of first emergence/RE	Time of first emergence measured using a 24-hour clock
Time of Last Emergence/RE	Time of last emergence measured using a 24-hour clock
Average Emergence/RE time	Average time of emergence/ re-entries, calculated by the mean time of both the first and last emergence/re-entry times- other bat times were not included due to them being shortened within the reports to average times

## **Appendix 2**

*Table 2 Risk assessment used throughout this project*

<b>Assessment Ref. No.</b>	ENVS3001	<b>Activity Assessed</b>	Bat surveys.  Taking place within Hampshire, Berkshire and parts of Devon.  Dates (TBC).  Timings: 15 minutes before sunset and 1.5 hours – 2 hours after sunset 1.5 hours – 2 hours before sunrise – 15 minutes after sunrise  Single surveys will be undertaken by Hannah McCabe and any larger surveys will be undertaken by a larger group (potentially Catherine Gutmann Roberts TBC)  All participants are required to read this risk assessment and be and are thus aware of the risk's/ hazards involved and therefore aware their individual responsibly in mitigating these risk's/hazards during this fieldwork activity.							
<b>Assessment Date</b>		<b>Faculty / Directorate</b>	Science and Engineering							
<b>Assessor</b>	Hannah McCabe	<b>School / Service</b>	School of Geography, Earth and Environmental Sciences							
<b>Version No.</b>	1	<b>Additional individuals involved in developing the RA</b>								
<b>Signature of Assessor</b>				<b>Signature of Academic Supervisor / Approver</b>						
<b>Risk Score Matrix</b>						<b>Risk Score and Description</b>				
<b>Severity</b>						<b>Risk Score</b>	<b>Risk Level</b>	<b>Category</b>	<b>Description</b>	
<b>Likelihood</b>		Insignificant	Minor	Moderate	Major					Fatal
	Very Unlikely	1 Green	2 Green	3 Green	4 Green	5 Amber	1 – 4	Low	Acceptable	No further actions needed
	Unlikely	2 Green	4 Green	6 Amber	8 Amber	10 Red	5 – 9	Medium	Tolerable/Adequate	Should be reviewed to ensure that there is nothing else which could be done
	Possible	3 Green	6 Amber	9 Amber	12 Red	15 Red	10 – 15	High	Undesirable	Immediately review current control measures, and where appropriate decide on further actions
	Likely	4 Green	8 Amber	12 Red	16 Red	20 Red	16 - 25	Very High	Unacceptable	Stop activity and make immediate improvements
	Almost Certain	5 Amber	10 Red	15 Red	20 Red	25 Red	<b><i>Likelihood (L) x Severity (S) = Risk Score (RS)</i></b>			

What is/are the hazard(s) involved with the activity being undertaken?	Who might be harmed and how?	What are you already doing to control the risk?	Risk Score with current controls in place			What further action is necessary? (Add these actions to the action plan below).	Target Risk Score Likelihood x Severity = Risk Score		
			L	S	RS		L	S	RS
Environmental: cold temperatures	Team members  Hyperthermia Frost bite	<ul style="list-style-type: none"> <li>- Consult weather forecasts before departure</li> <li>- Wear appropriate clothing for the expected weather as well as any sudden changes in this case layers, hats, gloves, and waterproof</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk		Choose an item.	Choose an item.	Choose an item.

		clothing including footwear would be appropriate <ul style="list-style-type: none"> <li>- Cold weather reduces energy levels ensure that there are adequate amounts of food and drink</li> <li>- Be aware of places to shelter if necessary</li> <li>- All members of the fieldwork team will be aware of how to spot the basic signs of hypothermia and frostbite</li> </ul>							
Environmental: hot temperatures	Team members  Dehydration Sunburnt Heatstroke/exhaustion	<ul style="list-style-type: none"> <li>- Consult weather forecasts before departure</li> <li>- Wear appropriate clothing for the expected weather as well as any sudden changes in this case prevent any unnecessary exposure of skin and wear sun hats and glasses Wear sunblock of a sufficient SP factor</li> <li>- Drink plenty of water</li> <li>- Avoids working under the sun where possible and move into the shade.</li> <li>- All members of the fieldwork team will be aware of how to spot the basic signs of dehydration and heatstroke</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk		Choose an item.	Choose an item.	Choose an item.

Environmental: Weather and climate, poor visibility	Team members  Darkness while driving Darkness while walking	<ul style="list-style-type: none"> <li>- Consult the weather forecasts before departure</li> <li>- Bring appropriate equipment such as a torch</li> <li>- If driving always have head lights illuminated at the appropriate beam. Use fog lights where appropriate</li> <li>- Drive at an appropriate speed</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk				
Environmental: Old and partially buried structures	Team members  Falling Collapsing Slips trips and falls	<ul style="list-style-type: none"> <li>- Take care when entering or being alongside run-down buildings., old barns</li> <li>- Be aware of falling bricks or other building materials</li> <li>- Take care when footing is not clearly visible. Look for signs nearby of structures e.g., partially collapsed fence.</li> </ul>	3 - Possible	2 - Minor	6 - Medium Risk				

		<ul style="list-style-type: none"> <li>- Slips trips and falls over building parts on the ground</li> </ul>							
Environmental: Sharp objects	Team members  Cuts and scrapes	<ul style="list-style-type: none"> <li>- Don't handle sharp objects unless wearing appropriate equipment., gloves</li> <li>- Do not handle sharp objects unless suitably trained</li> </ul>	3 - Possible	2 - Minor	6 - Medium Risk				
Environmental: Hazardous waste/fly tipping	Team members  Cuts and scrapes	<ul style="list-style-type: none"> <li>- Wear gloves when handling waste.</li> <li>- If unsure of contents of containers or if known to be hazardous contact emergency services.</li> <li>- Take care when footing is not clearly visible</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk		Choose an item.	Choose an item.	Choose an item.
Terrain: farmland	Team members  Uneven terrain Slips trips and falls	<ul style="list-style-type: none"> <li>- Take care when walking around farmland land due to uneven terrain</li> <li>- Slips trips and falls, watch where you're walking, wear appropriate shoes</li> </ul>	4 - Likely	2 - Minor	8 - Medium Risk		Choose an item.	Choose an item.	Choose an item.
Location: working beside a major road or motorway	Team members Pedestrians Motorists   Traffic incidents	<ul style="list-style-type: none"> <li>- Avoid working with back towards oncoming traffic</li> <li>- When crossing roads use designated crossing points when possible</li> <li>- Walk on designated footways when possible.</li> <li>- Wear bright/reflective clothing. high visibility jacket</li> </ul>	Choose an item.	Choose an item.	Choose an item.		Choose an item.	Choose an item.	Choose an item.

District/ neighbourhood: types	Team members of the public  Attack or abuse Getting lost and wanting into a higher risk area	<ul style="list-style-type: none"> <li>- Avoid areas that are known to be unpleasant</li> <li>- Study maps to familiarise yourself with the area before departure</li> <li>- Don't carry more money/valuables than necessary</li> <li>- Seek information about local areas before setting out</li> </ul>	1 - Very Unlikely	1 - Insignificant	1 - Low Risk		Choose an item.	Choose an item.	Choose an item.
Animals: livestock	Team members  Attacks Faeces and urine Diseases	<ul style="list-style-type: none"> <li>- Avoid approaching and interacting with livestock</li> <li>- Avoid livestock fields and enclosures where possible</li> <li>- Take measures to ensure no violent attacks., don't antagonise livestock</li> <li>- Wear protective clothing. Cover all cuts and broken skin with waterproof plasters before and during work.</li> </ul>	1 - Very Unlikely	2 - Minor	2 - Low Risk		Choose an item.	Choose an item.	Choose an item.

		<ul style="list-style-type: none"> <li>- Wash hands after handling contaminated clothing or other materials and always before eating, drinking or smoking</li> </ul>							
Animals: people's pets	Team members Pet owners  Attacks/violent animals Allergies	<ul style="list-style-type: none"> <li>- Be aware not all pets are friendly</li> <li>- Do not needlessly approach animals particularly without the owner's permission –</li> <li>- Any allergies should be mentioned to the team, and it is the responsibility of the individual to be carrying the appropriate medication (epi pens/antihistamines etc) if required</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk		Choose an item.	Choose an item.	Choose an item.
Animals: biting or stinging animals and insects	Team members  Bites Stings Allergic reaction Lyme disease	<ul style="list-style-type: none"> <li>- If known allergy to stings take appropriate medication on site If feeling unwell after a site visit seek medical attention.</li> <li>- Wear insect repellent and full-length clothing.</li> </ul>	4 - Likely	2 - Minor	8 - Medium Risk		Choose an item.	Choose an item.	Choose an item.
Chemical or Biological: Agriculture	Team members  Fertilisers Pesticides Pathogens	<ul style="list-style-type: none"> <li>- Avoid contact with fields coated in harmful fertilisers and pesticides</li> <li>- Look for signs indicating pathogens within soil or livestock within fields</li> </ul>	1 - Very Unlikely	2 - Minor	2 - Low Risk		Choose an item.	Choose an item.	Choose an item.



Chemical and Biological: cuts and grazes from plants	Team members  Poisonous plants Nettles Brambles	<ul style="list-style-type: none"> <li>- Avoid contact with poisonous/irritant plants .e.g., ivy and nettles Long sleeves, trousers, protective eyewear and protective gloves should always be worn.</li> </ul>	3 - Possible	2 - Minor	6 - Medium Risk				
Chemical or Biological: faeces or urine	Team members  Disease	<ul style="list-style-type: none"> <li>- Avoid touching/interacting with animal faeces</li> <li>- Wear protective clothing. Cover all cuts and broken skin with waterproof plasters before and during work. Wash hands after handling contaminated clothing or other materials and always before eating, drinking or smoking.</li> </ul>	1 - Very Unlikely	1 - Insignificant	1 - Low Risk				
Lone or out of hours working: acquiring help	Team members  Running into problems such as attacked or bothered	<ul style="list-style-type: none"> <li>- Always let project advisor know where I am and the timings I will be there</li> <li>- Tell a responsible adult at location if project advisor is not within helping distance</li> <li>- Turn on location device on phone and allow project advisor and</li> </ul>	3 - Possible	3 - Moderate	9 - Medium Risk				
		<p>responsible adult have access to location</p> <ul style="list-style-type: none"> <li>- Give contact information to all parties involved in project</li> <li>- Try to defuse any potentially confrontational situations. If possible, walk away.</li> <li>- Call the police if attacked or if feeling unsafe in areas after dark</li> </ul>							

Lone or out of hours working: traveling alone walking to site	Team members  Visibility Attacks	<ul style="list-style-type: none"> <li>- Always let project advisor know where I am and the timings I will be there</li> <li>- Tell a responsible adult at location if project advisor is not within helping distance</li> <li>- Turn on location device on phone and allow project advisor and responsible adult have access to location</li> <li>- Give contact information to all parties involved in project Try to defuse any potentially confrontational situations. If possible, walk away.</li> <li>- Always be visible. wearing reflective clothing</li> </ul>	3 - Possible	3 - Moderate	9 - Medium Risk				
Lone or out of hours working: Traveling alone by car	Team members  Breakdowns Visibility Pulled over	<ul style="list-style-type: none"> <li>- Check that vehicle is in full working order before travelling If break down occurs remove oneself from vehicle and stand at the side of the road (behind a barrier if on motor way)</li> <li>- Wear visible clothing</li> <li>- If pulled over, lock car doors and speak through a crack in the window</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk				
Health: first aid	Team members  Minor cuts and scrapes Fatigue Alcohol consumption	<ul style="list-style-type: none"> <li>- Always carry a first aid kit containing necessities for small injuries, cuts and scrapes</li> <li>- Any major injuries., broken bones, call 999 and call project leader as well as responsible adult Have a suitable amount of sleep/rest before undertaking project/surveying</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk				
Health: lack of food and drink	Team members  Dehydration Exhaustion	<ul style="list-style-type: none"> <li>- Drink plenty of water and bring water to each site</li> <li>- Eat plenty of good food before undertaking survey and bring food along to keep energy up</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk				

Global Pandemic: Covid 19	Team members Members of the public	<ul style="list-style-type: none"> <li>- Social distance If working with people outside of your household/bubble</li> <li>- Wear masks if inside anywhere that is not your household/ bubble</li> <li>- Wear masks if you are coming into contact with people who are not in your household/bubble</li> <li>- Bring hand sanitiser and apply regularly when exchanging equipment</li> </ul>	2 - Unlikely	3 - Moderate	6 - Medium Risk				
Dealing with the public: people's homes	Team members Members of the public  Attacks Offence Identification	<ul style="list-style-type: none"> <li>- Group members should be polite and courteous to the public while collecting field data</li> <li>- In the case of questioning from the public refer them to this number +44 1752 588400 for campus security</li> <li>- If necessary, group should remove themselves from the area to a safer one</li> <li>- Stay calm, speak gently and calm</li> <li>- Avoid an aggressive posture –</li> <li>- Keep your distance</li> </ul>	1 - Very Unlikely	3 - Moderate	3 - Low Risk				
Dealing with the public: obstructing pathways or roads	Team members  Obstruction Identification	<ul style="list-style-type: none"> <li>- Take care to not obstruct paths and roadways with equipment or personnel</li> <li>- Politely advise the public on what you are there for and carry University ID card and signed off permission to enter properties</li> </ul>	2 - Unlikely	2 - Minor	4 - Low Risk				

Refer to scoring matrix on page ¾

#### Action Plan and Monitoring

This section should be completed by the Risk Assessor and discussed with Manager / Academic Supervisor		This section should be completed by the Manager / Academic Supervisor for monitor and review		
Hazard	Action required	Action assigned to	Target date	Date Completed

#### Review

When reviewing this risk assessment remember to move completed actions into the 'what are you already doing.' column, as these actions should be in place by the time you review the risk assessment. You should review your risk assessment if you think it might no longer be valid (e.g. following an incident in the workplace or if there are any significant changes to hazards, such as new work equipment, work activities, personnel etc.)

#### Severity Table

Severity of injury	Examples	Score
Insignificant	None or very insignificant injuries, health effects, damage or disruption to work. Short-term and/or localised environmental harm.	1
Minor	Cuts bruises, mild skin irritations, mild headaches and pains requiring minor first aid treatment. Minor property damage or disruption to work. Notable contributor to environmental harm.	2
Moderate	More serious injuries or ill-health requiring time off work or a hospital visit for example burns sprains, strains, short term musculoskeletal disorders, cut requiring stitches, back injuries, fractures to fingers and toes. Short term absence relating to physical or mental health issues. More serious property damage or disruption. A significant contributor to environmental harm.	3

#### Likelihood Table

Severity of injury	Examples	Score
Very unlikely	Good control measures are in place. Controls do not rely on a person using them (i.e. personal compliance with safety rules). Controls are very unlikely to break down. People are very rarely in this area or very rarely engage in this activity.	1
Unlikely	Reasonable control measures are in place but they do rely on a person using them (some room for human error). Controls unlikely to breakdown. People are not often in this area / do not often engage in this activity.	2
Possible	Inadequate controls are in place, or likely to breakdown if not maintained. Controls rely on personal compliance. People are sometimes in this area or sometimes engage in this activity and situations sometimes arise from this activity.	3

Major	Broken limbs, amputations, long-term health problems or longer absence. Acute illness requiring medical treatment. Loss of consciousness, serious electric shock, loss of sight. Major property damage, major disruption to work. A major contributor to significant environmental harm.	4
Fatal	Injury or ill-health which leads to death either at the time, soon after the incident, or eventually, as in the case of certain occupational diseases, such as asbestos-related cancers. Catastrophic business losses. The major contributor to significant environmental harm.	5

Likely	Poor controls in place. Heavy reliance on personal compliance (lots of room for human error). People are often in this area / engage in this activity on a regular basis / situation often arise from this activity.	4
Almost certain	No controls in place where there should be, exposure to the hazard is expected to occur in most circumstances. The activity is considered such high risk that it will `certainly lead to injuries.	5