Passive Acoustic Survey of Bats in Dumbleton: Survey Centred on Golden Hay

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Background

The two main methods of surveying bats are walked activity surveys and passive acoustic surveys. Both focus on identification of bats based on frequency and sound patterns of bat echolocation calls. These calls are ultrasonic sounds made by bats as they move around the landscape and forage for nocturnal insects such as moths. Bats make these calls so they can listen to the echoes and "see through sound" – much in the same way as sonar works – but ecologists can use these calls to quantify bat use of an area by detecting, identifying, and enumerating the calls recorded.

Bat Echolocation Schematic
copyright Bat Conservation Ireland

Walked activity surveys involve identification of bats in real time using a "heterodyne detector" that listens for ultrasonic sounds and transforms the sounds down to human hearing range: species are identified based on call parameters. This requires an ecologist to be physically present throughout the survey and such surveys are thus usually 2-3 hr in duration starting at dusk. Passive acoustic surveys, by contrast, involve use of remote units that are deployed on site and both listen and record ultrasonic sounds. This means they can be left out all night, for multiple nights, and the data then processed.

Methods

In April 2023, two passive acoustic devices (Anabat Express units made by Titley Scientific) were deployed in four gardens in Dumbleton, overlooking areas with no lights around Golden Hay field, considered to be potential hotspots for bat activity. These collected data for 20 nights in total (five nights per garden).

Anabat unit in security box with microphone visible (above) and overlooking field (right)

Results

Across the 20 recording nights, there were 2,409 bat recordings (technically termed "bat passes"). This is an average of over 120 bat passes per night, which means bat activity in the greenfield areas around Dumbleton village is substantial. It should be noted that recorded activity is likely to be an underestimate as the work was done at the very start of the survey season, well before the seasonal peak in June-August.

Interestingly, these recordings showed that at least 11 of the 17 bat species breeding in the UK are using this small area (approximately 2 hectares), which makes the site extremely important in terms of bat species richness. This also suggests the open ground and greenfield sites around the village are vital for foraging of multiple species (technically termed a multi-species "Core Sustenance Zone"). The data were:

Species	Bat pass recordings over 20 nights in April 2023	Number of locations where species found (out of 4)
Common Pipistrelle	958	4
Soprano Pipistrelle	647	4
Noctule	473	4
Whiskered and/or Brandt's*	82	4
Daubenton's	75	4
Leisler's	55	4
Brown Long-eared	37	4
Lesser Horseshoe	35	4
Barbastelle	34	3
Natterer's	7	3
Serotine	6	3

* it is not possible to split closely-related Brandt's & Whiskered bats based on sound recordings; capture under licence and/or DNA analysis needed

All bats are legally protected in the UK under the Wildlife and Countryside Ac, and under EU legislation that has been subsumed into national legislation post-Brexit. This means that **all** 11-12 bat species detected here are important, especially given the high levels of activity observed. However, some species are rare (regionally, nationally, or internationally), whilst others have very specific habitat requirements and are only found in specific locations. It was, therefore, especially interesting to record:

Barbastelle (*Barbastella barbastellus*)	Near Threatened globally (International Union for Conservation of Nature) AND rare in a UK context so a UK conservation priority species (Biodiversity Action Plan listed).
Brown Long-eared (*Plecotus auratus*)	Specialist forager on tree lines and woodland edges.
Leisler's (*Nyctalus leisleri*)	Rare in the UK and Bat Conservation Trust advises special care should be taken of wooded areas where the species is present.
Lesser Horseshoe (*Rhinolophus hipposideros*)	One of the UK's rarest bats and still declining. UK conservation priority species (Biodiversity Action Plan listed). There is an active roost at Dumbleton Hall the open ground around the village is vital for foraging (technically a Core Sustenance Zone). Highly sensitive to disturbance. Bat Conservation Trust advises that "sensitive management of their foraging area is very important".
Noctule (*Nyctalus noctule*)	UK conservation priority species (Biodiversity Action Plan listed).