INFORMATION

Title: GREENBAT: Migratory bats and offshore wind energy in Ireland

Project holders: Dr. Samantha Ball and Dr. Allan McDevitt

Research Institute: Marine and Freshwater Research Centre, Atlantic Technological University

Project Dates: March 2025- November 2027

Project Funders: Sustainable Energy Authority of Ireland (SEAI) and the National Parks and Wildlife Service (NPWS).

Species:

Nathusius' pipistrelles (Pipistrellus nathusii) and Leisler's bat (Nyctalus leisleri)

No of individuals: 200 (100 of each species)

PROJECT DESCRIPTION

Justification:

Ireland has ambitious goals under the Climate Action Plan to reduce emissions by 50% by 2030 and to reach net zero emissions by 2050, with offshore windfarm (OWF) development being an important tool in achieving these targets. Studies worldwide have demonstrated that windfarms can cause high instances of bat mortality, particularly for migratory species (e.g., Kruszynski et al. 2022). However, there remains a paucity of information not just on the potential impacts of offshore windfarm development on Irish bats, but the extent to which bats migrate over open marine waters to and from Ireland in the first place. Therefore, it is currently unknown whether further development of Ireland's offshore wind energy infrastructure has the potential to negatively impact on Irish bats.

Aims:

The overall aim of this project is to identify whether offshore windfarms (OWF) are a potential threat to migratory bat species in Ireland. In order to first address this question, it needs to be established whether or not Irish bat species are migrating in and out of Ireland, namely the Nathusius' pipistrelle and the Leisler's bat. These species have been selected, as they are known to migrate over large distances elsewhere within their natural range (Alcalde et al. 2013, 2021).

Objectives:

By collecting tissue and hair samples from current Irish populations of Nathusius' pipistrelles and Leisler's bats, along with samples sourced from the UK and continental Europe, we will compare the following two distinct methods to determine if migration or movement is occurring between these regions:

• Method 1; Genomics

Using tissue samples collected from wing punches from Nathusius' pipistrelles and Leisler's bats, we will use double digest restriction-site associated DNA (ddRAD) sequencing for the detection and genotyping of thousands of single nucleotide polymorphisms (SNPs). This will allow us to determine the genomic structure of bat populations in each region (Ireland, UK, continental Europe) to identify potential gene flow/migration.

• Method 2; Stable Isotope Analysis

Using hair samples collected by snipping a small number of hairs from the backs of Nathusius' pipistrelles and Leisler's bats, stable isotope analyses for five stable isotopes will be carried out, focusing on carbon, nitrogen, sulphur, hydrogen and oxygen, as complementary isotopic tracers. This will allow us to understand the origin of Irish individuals and to identify potential migration events.

LICENSE REQUIREMENT

Derogation License Requirement:

In order to understand whether Irish bat species are migrating, biological samples (hair and tissue) need to be sourced from extant, wild Irish populations. As it is not possible to gain sufficient DNA from bat faecal samples for downstream genomics applications, the collection of tissue samples is necessary. Likewise, stable isotope ratios can vary across space due to variables such as rainfall patterns and ambient temperature and the body tissue or hair/fur of animals are composed of the elements that animals consume (e.g. through food and water). Therefore, hair samples need to be collected for these analysis and will be comparable with other studies conducted elsewhere (Kruszynski et al. 2021, 2022). Therefore, as no alternative to sample collection is available, a derogation license is required. This derogation licence is being submitted alongside a Sections 23 and 34 license.

Evidence that actions permitted by a derogation will not be detrimental to the maintenance of the populations of the species:

We will not be permanently removing, or causing any lasting damage, to any individuals in the population. All bats will be trapped, handled and have a tissue/ hair sample collected prior to being released back to the wild in the capture location. Expected mortality rates are low, with studies demonstrating that bat trapping methods generally have a <1% mortality rate (de Moura et al. 2023). Bats can rapidly heal wounds in their wing membranes, which often naturally occur. Studies have demonstrated that wounds caused by wing punch biopsy are closed within 16 (Weaver et al. 2009) to

34 days (Pollock et al. 2016) of the sample being taken. Hair sample collection is expected to have no impact on the bats.

All capturing, handling and sampling will be overseen by a licensed, trained bat expert, until the point that the applicant is deemed to be competent.

Details of any mitigation measures:

As no disturbance will be caused to the bats outside of immediate handling and sampling, no mitigation measures are required. However, strict operating procedures have been developed and will be followed in the interest of the bats comfort and safety.

SAMPLE COLLECTION

Time frame:

It is anticipated that bats (Nathusius' pipistrelles and Leisler's bats) are sampled from May- September 2025 and during the same time frame in 2026.

Methodologies:

It is anticipated that bats will be captured using a method deemed appropriate by a bat handling expert at the time of sampling (i.e., mist nets, harp traps, acoustic lure, hand nets or directly removed by hand from bat boxes). Capturing and handling of bats will be outsourced to, or overseen by, an external licensed, experienced professional, until the point when/if the project lead is deemed suitably trained by said professional. This will include, but may not be limited to, Dr. Tina Aughney of Bat Eco Services (Bat Eco Services - Profile, Wildlife Surveys, Bat Surveys and Ecological Consultants Ireland), Scott Cawley Limited (Scott Cawley), NPWS rangers and Dr. Emma Boston.

Biometric parameters will be recorded for captured bats, including sex, age (i.e., juvenile or adult), weight and sexual condition (Boston 2012).

For the collection of tissue samples for ddRAD sequencing, a 3mm sterile biopsy tool will be used to collect a non-destructive tissue sample from the wing membrane of Nathusius' pipistrelles and Leisler's bats (Boston 2012). The biopsy tool will be positioned on the wing membrane, ensuring that veins and bones are missed. The biopsy will be taken close to the body wall due to faster healing times in this area (as recommended by USGS 2024), or where is deemed most suitable by the bat handling expert at the time of sampling.

For the collection of hair samples for Stable Isotope Analysis, we assume a minimum requirement of 0.3mg of hair for each element for SIA (Pylant et al. 2014). As we intend on investigating five stable isotopes (carbon, nitrogen, sulphur, hydrogen and oxygen), a small tuft of hair removed from each individual will be sufficient. As bat skin is elastic, hairs will be gently removed from the back or

between the shoulder blades, by using a small pair of scissors (Collins 2023) instead of plucking, to prevent injury or discomfort through the skin being stretched.

CONCLUSION

This collaborative project intends to identify whether movement/ migration is occurring in two bat species between Ireland, the UK and continental Europe, through the use of ddRAD sequencing and stable isotope analysis. This project will require the catching and handling of bats for two seasons, across 2025 and 2026, to facilitate the collection of hair and tissue samples from Nathusius' pipistrelles and Leisler's bats.

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