

# 1 Introduction

## 1.1 About Ardee Bog and the Friends of Ardee Bog (FAB)

Ardee bog is a raised bog complex which includes multiple bogs between Ardee in Co.Louth, and Drumconrath in Co.Meath. It has some of Ireland's most easterly raised bogs. A map of the bog complex can be seen below in Fig 1, which is taken from the book

*"The Great Bog of Ardee"*. In 2019 a local community group called Friends of Ardee Bog (FAB) was established. The aims of the group include, protecting the bog, studying the ecology of the bog, preserving the history of the bog, arranging educational and art events on the bog, and mapping the bog. The formation of the FAB group has been integral in raising awareness of Ardee Bog and has brought many people together in the locality



Fig 1. Friends of Ardee Bog Logo

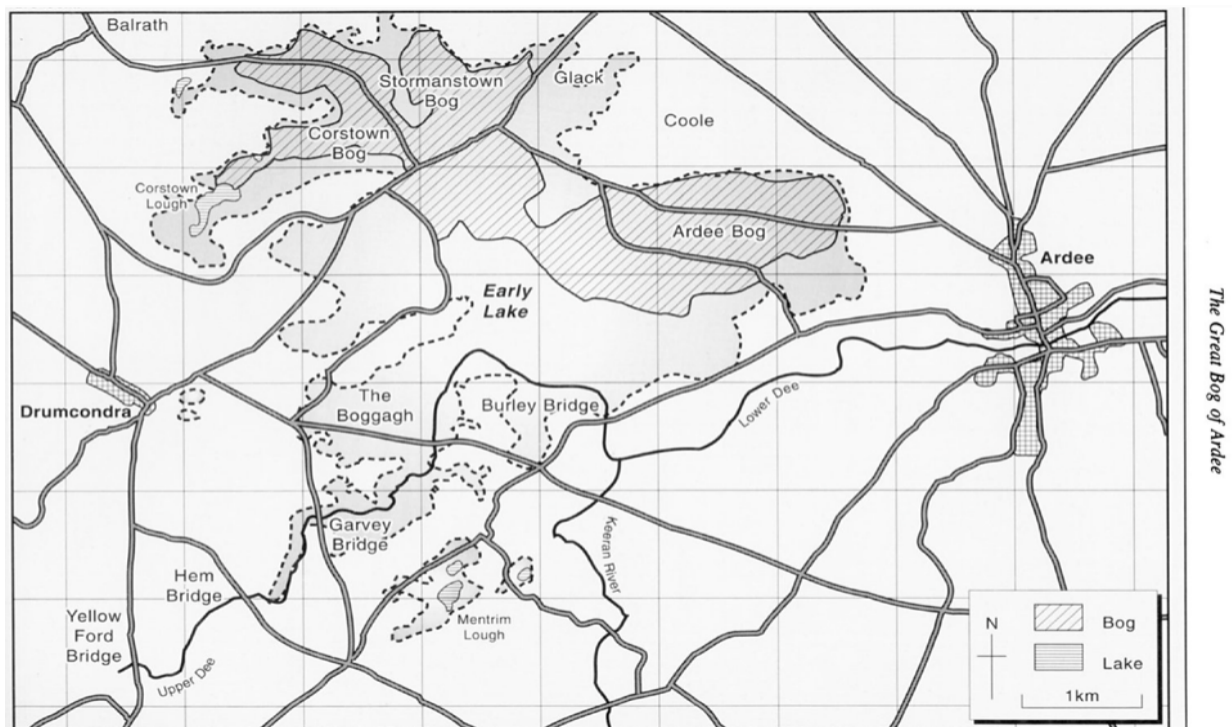


Fig.2 Map of Ardee Bog Complex, *"The Great Bog of Ardee"*, Breedra Tuite and Frank Mitchell

## 1.2 Audio Visual Survey Project background

Since 2019 members of FAB have been monitoring the sights and sounds of the bog. Adrian Crawley is our principal photographer who has been photographing the flora, fauna, and the general landscape of the bog. Dean McDonnell is a birdwatcher and audio field recordist who has been using passive microphones to monitor what vocalising birds are active in the bog. Another important member of the Audio-Visual project is Anne Lennon whose local knowledge of the bog assisted us greatly when deploying the recorders.

The title of this monitoring project is; The Audio-Visual Environment of Ardee Bog. It is hoped that with the aid of this grant FAB can set up a permanent “recording station” that can gather data over the coming years. The station will include a trail camera and a passive acoustic recorder and will be placed in a suitable location on the bog. The station will enable high quality visual and audio records of active species in the area. In the past members of Friends of Ardee Bog have recorded Woodcock roding calls and drumming snipe, as well as a singing Cuckoo. Curlew and Lapwing have also been seen on the bog. It is hoped that the permanent recording station will result in many new finds and will allow for the continuous monitoring of fauna in the area over the coming years. We hope to create and keep a detailed Audio-Visual record of species in Ardee Bog. The proposed project will help to improve our knowledge and understanding of the species found within the Ardee Bog complex. This information gathered will be used to raise awareness of species that use Ardee Bog. The audio and visuals will be shared the local community and also shared with relevant national bodies, such as NPWS.

## 2 Methodology

### 2.1 Overview

The main purposes of this project were as follows.

1. To monitor fauna (Birds, Mammals and Invertebrates) that may inhabit the bog or pass through the bog.
2. To gather audio and visual media for use in future projects and for archival/educational purposes.

NPWS awarded FAB the small recording project grant on the 17<sup>th</sup> of May, 2024 and the equipment was purchased in June. This included a Wildlife Acoustics Song Meter Mini Li-on (Audio Recorder) and a Bushnell 4K Camera (Trail Camera). There was a delay in receiving the equipment as it had to be ordered from mainland Europe. The equipment was received in early July and both the Song Meter and Bushnell Train camera were deployed on our first site on July. This deployment date resulted in us missing the breeding window for most bird species, therefore it was anticipated that it would not be possible to identify song territories of certain species. As the scope of this project extended into the autumn/winter period we also decided to monitor and record nocturnal migration calls. Nocturnal migration recording is known as Nocmig (Nocmig is the study of bird calls at night as they migrate). In terms of

stationary/resident species that have not been previously observed by Friends of Ardee Bog members, or birds that are red listed, will be noted in this report. Mammals were an important group that we wanted to concentrate on as we have very limited data on what mammals use the bog. Mammals form the reasoning behind acquiring a trail camera, however we also hoped some birds would trigger the camera. Realistically, identifying invertebrates by using a trail camera is not possible as they are too small to trigger the camera and the fidelity is not there. Therefore we concentrated on sound emitting invertebrates that would be picked up the Song Meter Mini. Bats were initially considered as part of this survey project however it became apparent that monitoring bats passively via an ultrasonic acoustic recorder is quite a skilled task and it is not always possible to accurately identify bat species in this way. We also lacked the necessary specialist time expansion and identifying software, (Raven), to help us accurately identify bat species. We hope to start bat surveys in the future after the necessary training is given to FAB and we acquire the specialist software. In general, Ireland does not have a large array of sound emitting mammals or invertebrates, it was anticipated that the majority of data recorded on the Audio Recorder would be vocalising birds

## 2.2 Deploying the recording devices

The Audio Recorder (Wildlife Acoustics Song Meter) and Trail Camera (Bushnell Dual 4k No Glow) are both passive devices, meaning they can record on their own autonomously without input from a user. The trail camera would be deployed in order to capture species that are often difficult to see in the field and therefore difficult to confirm the presence of, such as, Pine Marten, Deer, Badgers, Foxes, Stoat, Long-eared Owl, Barn Owl etc. Most of these species are nocturnal in their habits which is why a trail camera was crucial to confirm the existence of these fauna on the bog. The Audio Recorder would be deployed to mainly record bird songs and calls, however sound emitting invertebrates and mammals would also be analysed.



Fig 3 & 4. Song Meter Mini 2 Li-on and Bushnell 4k Trail Camera.

The use of passive recording devices is beneficial in that they can gather substantial amounts of data over an extended period of time without the need for continuous in-person visits to the bog. The equipment was deployed on two different sites on Stormanstown Bog, one of the many bogs that comprise the great bog of Ardee. The equipment alternated between two sites. Site 1 was our main site and was active in July, September and October. The equipment was moved to site 2 for the month of August. A map of the sites can be seen below.

Site 1 co-ordinates: 53.87115714454983, -6.615154665512253

Site 2 co-ordinates: 53.873505887684395, -6.61296981183617



*Fig 5. Google Maps of Site 1 and Site 2.*

Site 1 is located at an old cutover bog which up until very recently was still being used to harvest turf. Turf is no longer being harvested from this part of the bog and is now in private ownership. Emergent woodland and gorse also surround the bog. The new owners of this part of the bog are making steps towards restoring it.

As previously stated this project was initiated just outside of the bird breeding season. This meant that bird song was much reduced and therefore hard to confirm established male territories. For this reason, we decided to also include birds that were migrating over the bog at night as it coincided with autumn migration. Recording calling birds on migration at night is known as Nocturnal Migration recording (Nocmig). Nocmig is very much an emergent type of surveying but is gaining traction around Europe as it can provide interesting insights into the movements of migratory birds. As the project extended into October wintering birds are also noted.



Despite recording outside the breeding period numerous bird species in the bog still made themselves known. Common generalist species (Robin, Blackbird etc) were not the focus of this monitoring project. Focus for resident birds has been given to species that require specific food/shelter in which Ardee Bog provides. Any red listed birds as per the birdwatch Ireland designation are highlighted with a red box.



*Fig 6. Song Meter and Bushnell Trail Camera attached to wood post at Site 1.*



*Fig 7. Old cutover bog at Site 1. This is the point of view of the trail camera.*

Site 2 is located in the centre of Stormanstown Bog next to a bog pool. The centre of the bog itself is quite wet. A walking path is located along the edge of the bog which leads to the centre of the bog where this bog pool is located.



*Fig 8 . Audio Recorder and trail camera beside bog pool at Site 2.*



*Fig 10 Adrian Crawley deploying the monitoring station at Site 2.*



## 2.3 Analysing Data

The trail camera was programmed to record video for 30 seconds once it detects motion. This meant that it was easy to analyse what was picked by the trail camera as it could be quickly checked on a laptop on site and did not require further analysis. Data transferred from the Song Meter required considerably more analysis as it was set to record constantly (24 hours). It is possible to set “recording windows” i.e record at Dawn for two hours, however we wanted to record as much data as possible. Recordings must be transferred from the Song Meter and spectrum analysis software employed to scan through the recordings manually. In this case the free audio editing software, Audacity, was used. To enable quick analysis of audio recordings the spectrogram view was used. A spectrogram is a visual representation of an audio recording with shows time on the x axis and frequency on the y axis. The louder a sound is the more intense the colour is the spectrogram.

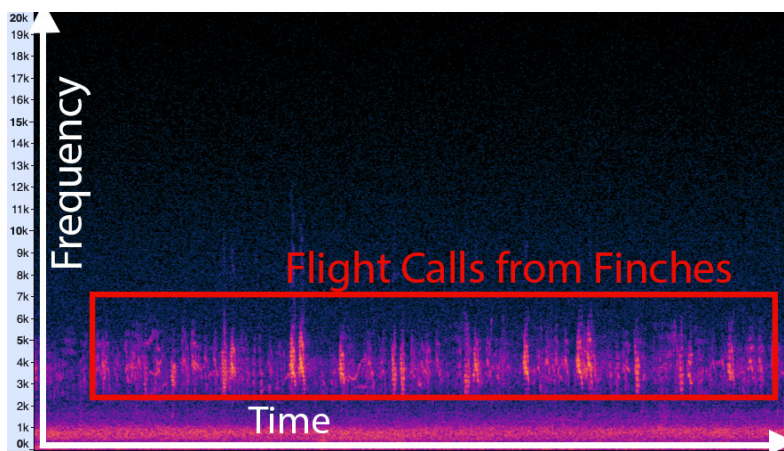


Fig 11. The spectrogram view in Audacity

## 2.4 Site 1 Data

This section outlines the pertinent data collected from the Song Meter Mini and the Trail Camera. As previously stated in the Methodology section.

### 2.4.1 Trail Camera

The trail camera was only triggered once during the entire recording period at site 1. A Grey Heron recorded on 14/10/24 at 14:04. A hooded crow can also be seen in the background.

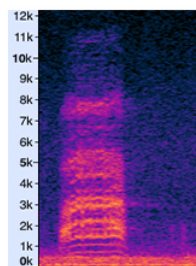


Fig 12. Grey Heron Captured on Trail Camera. Hooded crow and seen bathing in the background

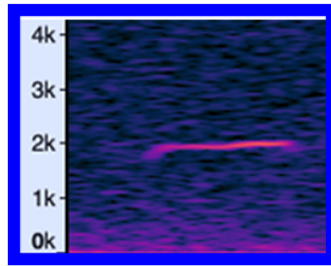
## 2.4.2 Song Meter Mini

### 2.4.2.1 Birds

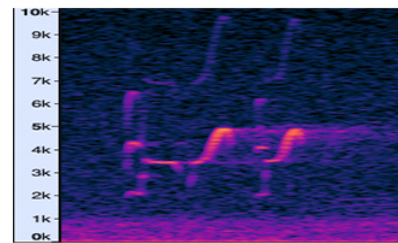
Attached below are spectrograms of bird songs/calls of interest recorded by the Song Meter in July, September and October at Site 1. Nocmig birds passing over the bog at night are highlighted by a blue box. Red listed birds as per BOCCI4 2020-2026 are highlighted with a red box. Only birds suspected of breeding in or wintering in the bog been given highlighted with the red box.



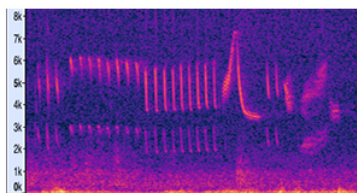
Jay\_16July24\_1000 (Call)



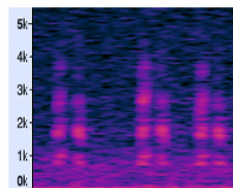
Curlew\_08July24\_0200 (Nocmig)



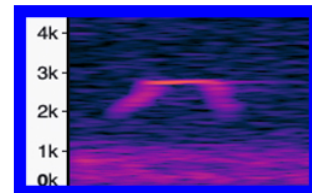
Green sandpiper\_15July24\_2100 (Migration)



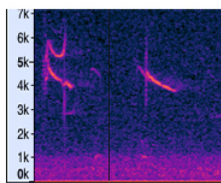
Linnet\_08July24\_2100 (Song)



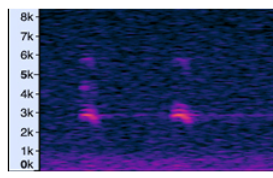
Moorhen\_08July24\_0800 (Call)



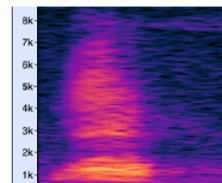
Oystercatcher\_12July24\_0000 (Nocmig)



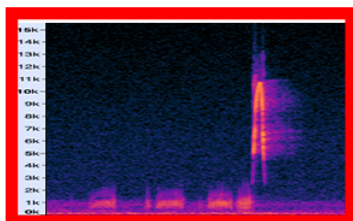
Siskin\_08July24\_0600 (Call)



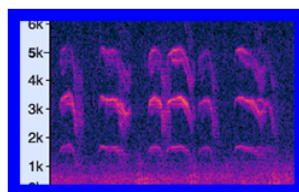
Water Rail\_17July24\_0600 (Call)



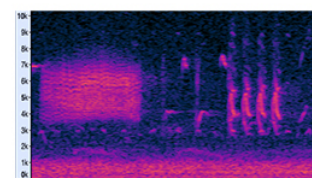
Raven\_12July24\_1200 (Call)



Woodcock\_12July24\_0300 ( Roding Call)



Common Tern\_23July24\_0000 (Nocmig)



Redpoll\_08July24\_0600 (Call)

Fig. 13. Birds songs and calls as seen on a spectrogram in Audacity. Site 1.



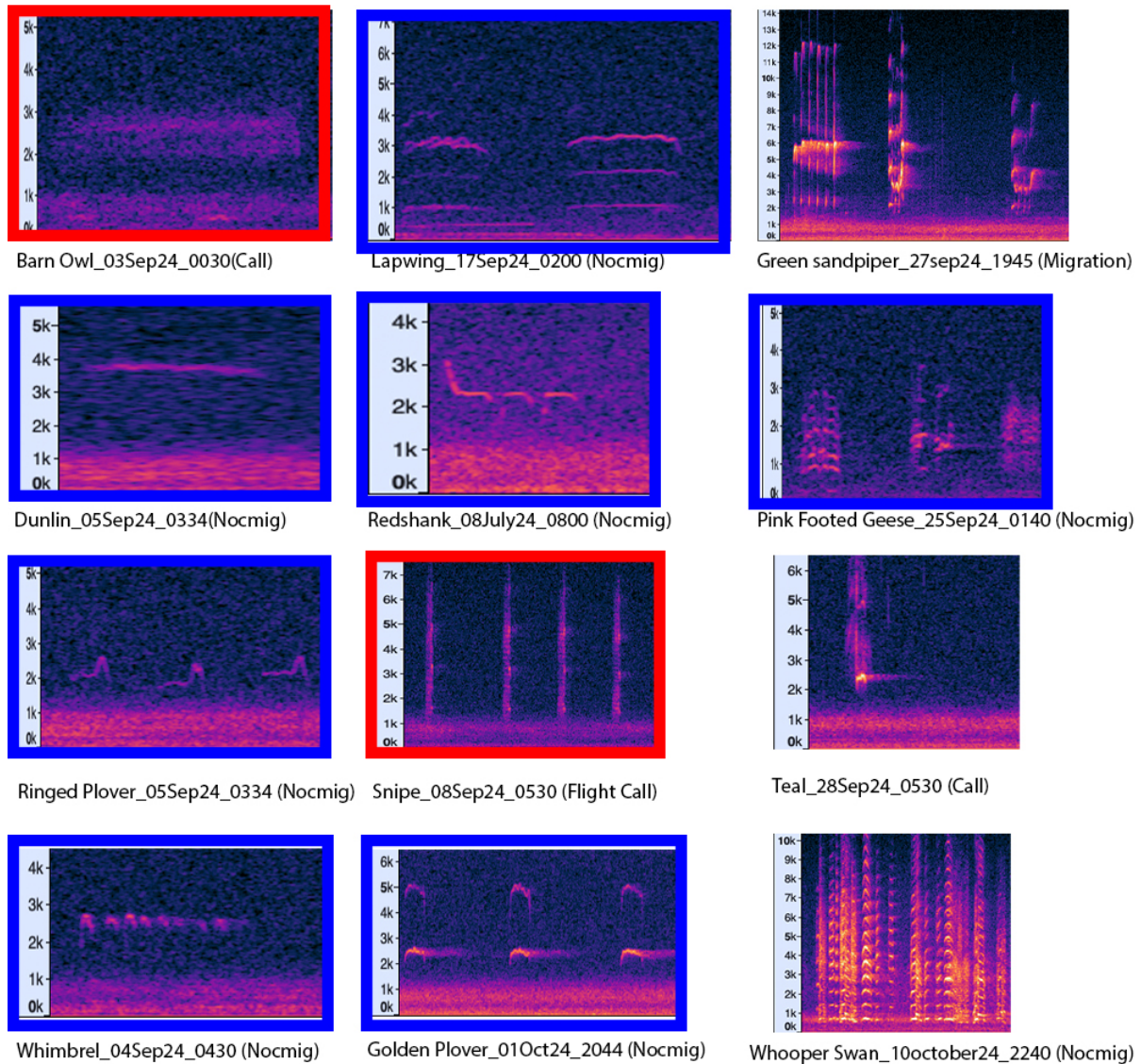


Fig. 14. Birds songs and calls as seen on a spectrogram in Audacity. Site 1.

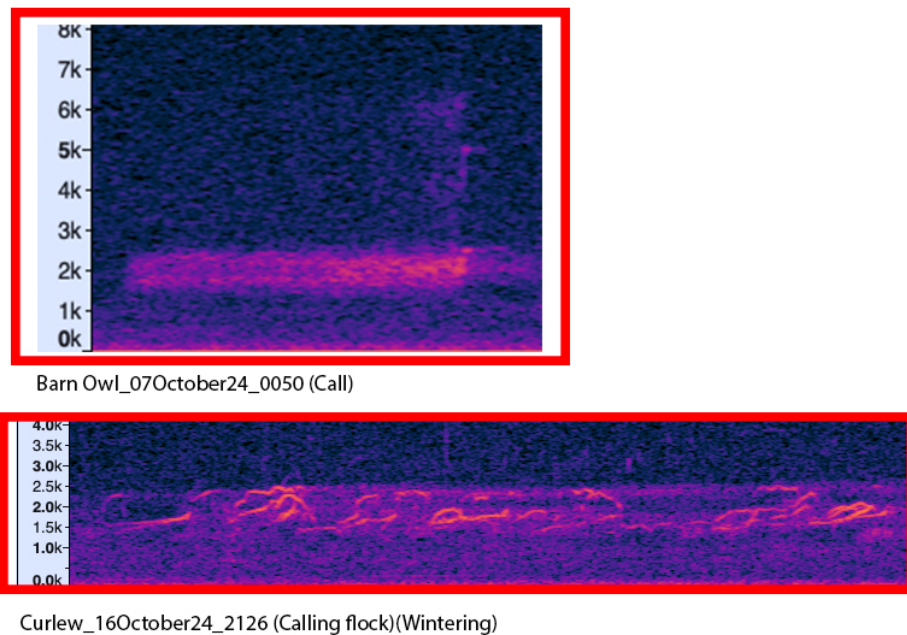


Fig. 15. Birds songs and calls as seen on a spectrogram in Audacity. Site 1.

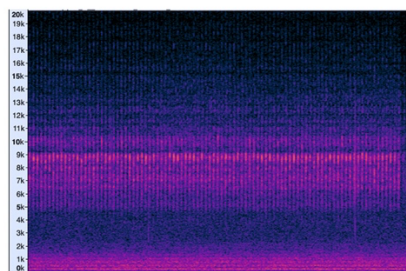
The song meter mini captured many interesting recordings at Site 1. A Jay was captured calling on multiple days which confirms their presence in the wooded areas around the bog. A Green Sandpiper, a scarce passage migrate, was recorded calling on two dates. It frequents freshwater wetlands like stormanstown bog when migrating through Ireland. Linnet songs and calls were recorded, this was a bird species we expected to inhabit the area but had yet to confirm sightings. Noddy curlew recorded in July. For the week of October 15<sup>th</sup> to October 28<sup>th</sup> wintering Curlew were recorded everyday calling from the bog. Historically Curlew have wintered in this area. There is a possibility that the Curlew may also be roosting somewhere in the area as calls were recorded throughout the night.

A couple of noddy Oystercatcher were recorded which is interesting as they are not typically noted this far inland, however not much noddy study has been done in Ireland to note their distribution when migrating at night. Siskins and redpolls were captured calling almost on a daily basis, it is likely that the birds are feeding and roosting in the nearby Birch trees. They may be potentially breeding in the wooded area as well but this is not confirmed. Nocturnal Moorhen and water rail "territorial" flight calls were recorded, the theory is that these calls are used to mark territory, however it should be noted that these birds can also use these calls when migrating. Calling Ravens were noted almost everyday, it is suspected that these birds breed in the area as they can be seen around the bog year round. A roding woodcock was noted on a single night in July, which is quite late for this breeding call (song). Woodcock Roding calls have been recorded in this area for three years in a row, a strong indication that they are breeding in the area. A large flock of migrating common tern were noted flying over and or circling the bog on the July. In September and October a calling barn owl was recorded. Lapwing calls were recorded at night on , possibly migrating through or feeding in the fields adjacent to the bog at night. Waders such as Dublin, Redshank, Ringed Plover, Golden Plover and Whimbrel were noted via noddy. Pink footed geese were picked up on the night of. Many Snipe flight calls were recorded , almost daily. This area appears to

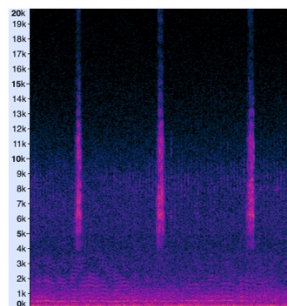
be very attractive for roosting wintering snipe as there are many grassy tussock areas. Close Teal and mallard calls noted when the bog was sufficiently flooded. Returning whooper wand noted on the. Historically whoopers winter in areas around the bog.

#### 2.4.2.2 Invertebrates

The only identifiable by sound invertebrates noted were the Common Green Grasshopper and the Common Field Grasshopper. There appears to be an abundance of the Common Green Grasshopper as there were many individuals recorded chirping on sufficiently hot and calm days. Many flying insects passed the microphone but they can not be identified by sound alone.



Common Green Grasshopper\_12July24\_1400

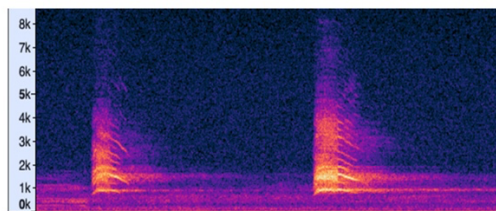


Common Field Grasshopper\_6Sep24\_1250

Fig. 15. Grasshopper stridulation as seen on a spectrogram in Audacity. Site 1

#### 2.4.2.3 Mammals

The only wild mammal recorded during this period were foxes calling.



Red Fox\_10Oct24\_2231

Fig. 15. Fox call as seen on a spectrogram in Audacity. Site 1



## 2.5 Site 2 Data

### 2.5.1 Trail Camera

The trail camera triggered twice during the entire recording period at site 2. A Hooded crow recorded on 07/08/24 at 17:19, and an immature/female type Kestrel recorded on 09/08/24 at 12:58 .



*Fig.16 .Hooded Crow. Site 2*



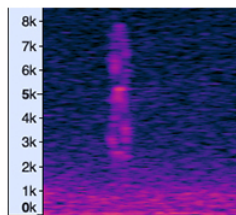
*Fig.17 & 18 . Kestrel bathing in bog pool. Site 2*



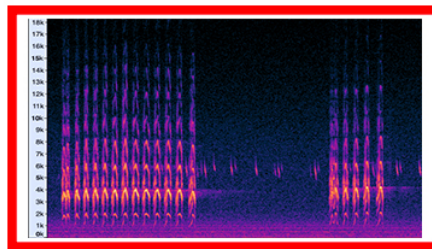
## 2.5.2 Song Meter Mini 2 Li-on

### 2.5.2.1 Birds

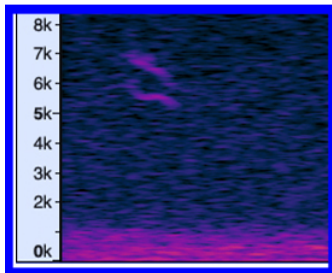
Attached below are spectrograms of bird songs/calls of interest recorded by the Song Meter in July and August at Site 2. Nocmig birds passing over the bog at night are highlighted by a blue box. Birds on the red list (wintering and breeding) and calling from the bog itself are highlighted by a red box



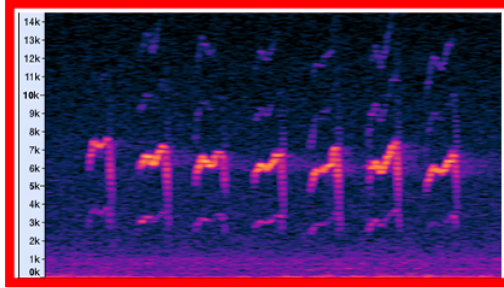
Great Spotted Woodpecker\_08Aug24\_1200( Call)



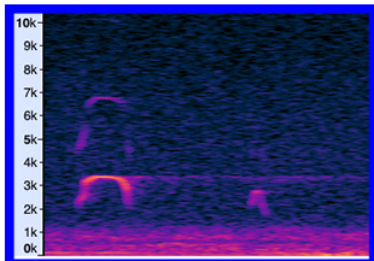
Kestrel\_27July24\_1559 (Call)



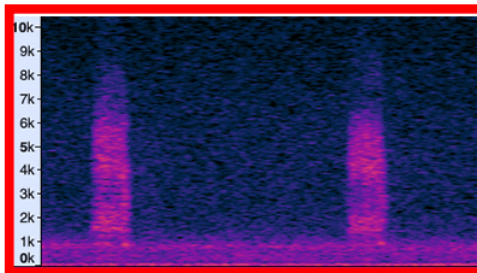
Spotted Flycatcher\_11Aug24\_0350 (Nocmig)



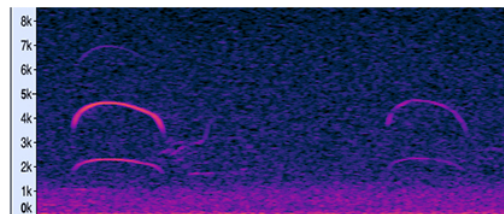
Meadow Pipit\_27July24\_1500 (Call)



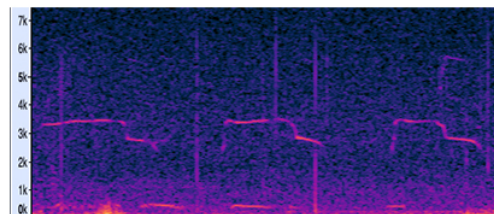
Oystercatcher\_27July24\_2300 (Nocmig)



Snipe\_27July24\_2200 (Flight Call)



Sparrowhawk\_08Aug24\_1900 (Juv Calling)



Buzzard\_05Aug24\_1700 (Juv Calling)

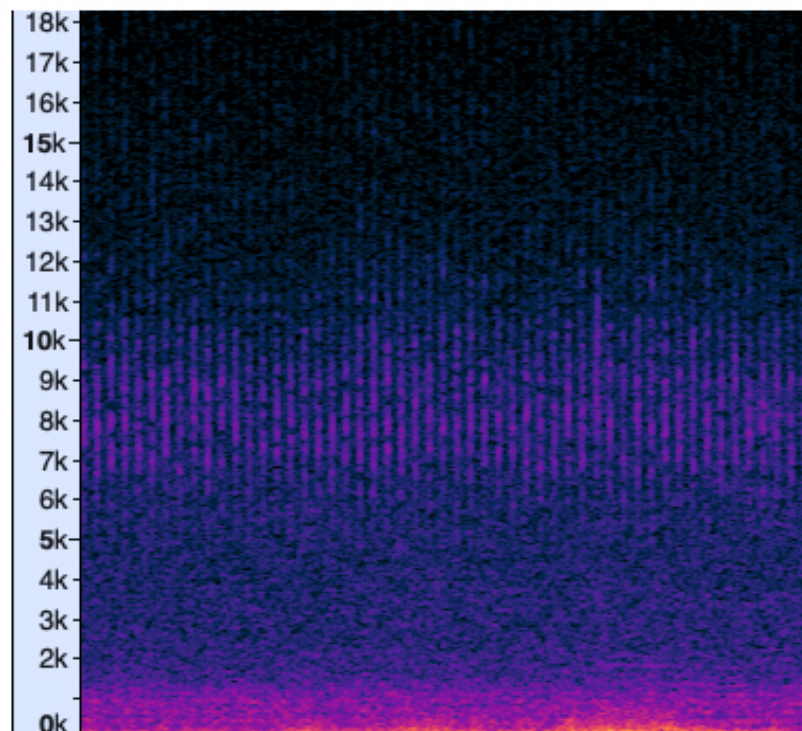
Fig. 19. Birds songs and calls as seen on a spectrogram in Audacity. Site 2.

A Great Spotted Woodpecker was recorded calling on the 08 August, this bird had not been observed or heard in the bog before this date. An excellent recording of a calling Kestrel was picked up on the 27<sup>th</sup> of July. Nocmig Oystercatcher and Spotted Flycatcher were recorded.

Meadow Pipit calls were recorded at this site daily, weeks previously many birds were seen displaying. Many Snipe flight calls were noted, like site 1, it is likely that many snipe roost here in the winter. Snipe have been recorded drumming in this area in spring so there are likely breeding here as well. Juvenile Sparrowhawk and a juvenile Buzzard begging calls were recorded.

#### 2.5.2.2 *Invertebrates*

Common Green Grasshopper was only recorded on a single day at Site 2. Site 2 does not have many tall grassy tussocks like Site 1, which is the preferred habitat of Grasshopper species.



Common Green Grasshopper\_28July24\_1500

Fig. 20. Birds songs and calls as seen on a spectrogram in Audacity. Site 2.

#### 2.5.2.3 *Mammals*

No vocalising wild mammals were recorded.

### 3 Findings Overview

The entire recording period for this project spanned between mid-July and the end of October.

Unfortunately, only one significant find was captured on the trail camera, that of a Kestrel bathing in a bog pool at Site 2. This was our first confirmation of the presence of Kestrels on the bog and an excellent audio recording of a kestrel calling was also captured on the audio recorder on a different date. The Grey Heron and Hooded Crow captured on the trail camera at Site 1 were also interesting, although these species are quite ubiquitous on the bog. It was hoped that more species would have been captured. Initially the trail camera was placed next to a well-used animal track at Site 1 but unfortunately movement of trees and heather in the wind kept falsely triggering the trail camera so we moved it to an open space on the flooded cutover bog area at Site 1. The potential for this area seemed good as it is also next to an emergent woodland where an owl species had been seen previously, there were also reports of deer species using this area at night. However neither species was noted on the trail camera. The song meter mini audio recorder captured some very close audio recordings, such as that of a calling Green Sandpiper, many Snipe also called very close to the recorders but the trail camera did not record anything. There may be a sensitivity aspect to the trail camera that we missed or perhaps the trail camera is best suited for larger and slower moving subjects, like the Grey Heron we captured. More experimentation is likely required with the trail camera as it appears extensive field surveying and a target species is required for optimal results. We hope to receive more training on proper deployment of a trail camera.

The Song Meter audio recorder was far more successful at monitoring vocalising fauna. This is because it was not reliant on subjects coming into its field of view and could capture sounds from 360 degrees due to its omnidirectional stereo microphones. Our audio recordist, Dean McDonnell, had experience audio recording bird species with his own personal passive acoustic recorders and therefore had the skillset required to identify birds captured on audio files. This resulted in the vast majority of noted records being that of bird species. The only invertebrates that we could identify by sound were that from the order Orthoptera, specifically Grasshoppers. Many humming hoverflies and buzzing dragonflies were recorded but as far as we are aware it is not possible to identify these species on sound, or on sound alone. We would like to further investigate the possibility of identifying additional invertebrates via sound monitoring in the future. The only mammal we recorded a fox, no other discernible mammal sounds were recorded.

The Song Meter identified 6 Red Listed birds as designed by BOCCI4 2020-2026. These birds include;

1. Barn Owl (Calling)
2. Curlew (Calling) (Wintering Birds)
3. Snipe (Flight Calls) (Wintering Birds)
4. Kestrel (Calling)
5. Meadow Pipit ( Calling)
6. Woodcock (Riding Call)

All the above birds are of high conservation concern. Stormanstown Bog likely provides either feeding, breeding or wintering habitat for these birds. We do know that there is an abundance of Snipe in Site 1 and Site 2 during the winter months. In previous surveys Snipe have been recorded displaying (Drumming) and calling at Site 2 during the breeding season, it is therefore a reasonable assumption that Stormantown bog holds breeding and wintering populations of Snipe. Woodcock roding calls have been recorded in the Stormanstown bog Bog area for the last three years, which includes this survey. It is likely that woodcock are breeding here. Meadow Pipits are very numerous at Site 2 during the breeding season and can be seen displaying. They are numerous during the winter. Barn Owl calls were recorded twice at Site 1, we are not aware of any breeding records of Barn Owls in the area but recordings reveal that they are at least present in the area. A Kestrel was audio recorded on a single day in July at Site 2, another kestrel was captured on the trail camera in August at Site 2. It is likely that Kestrels uses the open habitat of Stormanstown Bog to hunt. Lastly wintering Curlew use the pasture fields just south west of Site 1 to feed every year, we suspect that they may be roosting somewhere in the area as they have been calling consistently throughout the night this October. We have not definitely confirmed that Curlew roost on or near the bog.

Nocturnal flights calls of birds migrating over the bog or birds that stopped on the bog on passage are as follows.

1. Curlew (Nocmig)
2. Oystercatcher (Nocmig)
3. Common Tern (Nocmig)
4. Lapwing (Nocmig)
5. Redshank (Nocmig)
6. Ringed Plover (Nocmig)
7. Golden Plover (Nocmig)
8. Pink-Footed Geese (Nocmig)
9. Dunlin (Nocmig)
10. Spotted Flycatcher (Nocmig)
11. Whimbrel (Nocmig)
12. Green Sandpiper (Stopped in Site 1 on passage on two different dates)

Many of the above species are associated with the coastal locations in Ireland, Site 1 and Site 2 being 17Km inland so it is clear that these migratory species disperse over Ireland en-route to their wintering grounds. We hope to continue monitoring the nocturnal movements of birds at Site 1 and Site 2 in the future.

Probably the most exciting recording we captured was that of a Green Sandpiper on 27<sup>th</sup> of September at Site 1, which landed right beside the audio recorder and called. This was also the second recording of this species we captured, the first being the 15<sup>th</sup> of July. It is clear that the wet cutover bog at Site 1 attracts this bird on passage. Green Sandpipers are considered a scarce passage migrant in Ireland so it was interesting to have noted two different birds at Site 1.



## 4 Conclusion

This monitoring project proved valuable in identifying bird species in the bog as well bird species migrating over the bog. Unfortunately we missed the breeding season but will be deploying the listening station at Site 1 and 2 in Spring 2025. This year we aim to leave the audio visual monitoring station at Site 1 for the rest of the winter so we can monitor wintering birds like the Curlew as well as wildfowl. In February last year a large group of Russian White Fronted Geese and a single Barnacle Goose grazed on a field next to Site 1. Greylag Geese have also been seen in this area in previous winters.

Next year we hope to expand the scope of this project to include echolocating bats. We also hope to get training on how to deploy a trail camera in order to maximise the chances of recording mammals and other fauna.