Environmental Impact Assessment Report

NISA

North Irish Sea Array

Volume 11: Appendices (Wider Scheme)

Appendix 35.2 Rockabill Island and Headland Offshore Bat Monitoring 2023

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Rockabill Island and Headland Offshore Bat Monitoring 2023

Results Report

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APEM Group

Contents

STATEMENT OF AUTHORITY

Oisín O Sullivan - Ecologist; Technical Lead on bat surveys

Oisín O Sullivan is an Ecologist with Woodrow. Oisín has completed a BSc in Ecology and Environmental Biology at University College Cork. His final year thesis involved bat activity surveys of urban habitats in Cork City. His work 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 current work has involved the coordinating, surveying, analysing data, and writing technical bat activity reports for all onshore wind developments that Woodrow has worked on in the 2021, 2022, and 2023 survey seasons. This also involves the use of R to provide data on bat activity relative to weather conditions with the goal of informing curtailment as a mitigation measure. During 2022 Woodrow began undertaking offshore bat surveys including Oisín as a technical lead on these projects. These surveys involve the long-term recording of activity on islands and headlands to record migration events. Oisín is a Qualifying member of CIEEM and holds a license to survey bat roosts from the Department of Culture Heritage and the Gaeltacht.

Kevin O'Reilly – Graduate Ecologist

Kevin obtained First Class Honours in Business and Law at University College Dublin before training and qualifying as a Solicitor with the Law Society of Ireland. He is currently completing a Masters in Environmental Management and GIS with Ulster University. He has also undertaken a number of 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 taken part in a number of bat surveys including static detector deployment and roost surveys.

Patrick Power – Assistant Ecologist

Patrick Power is an Assistant 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.

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 habitat surveying skills. Patrick is a student member of CIEEM and currently has a training licence to survey bat roosts from the Department of Culture Heritage and the Gaeltacht.

1 Introduction

Offshore bat surveys have been carried out to inform the impact assessment of bats from offshore wind infrastructure as part of the proposed North Irish Sea Array (NISA) project. The information contained within this report is intended to summarise the results of bat monitoring from Spring to Autumn of 2023, consisting of two main survey components including monitoring at Rockabill Island and monitoring on headlands. The 2023 surveys are a continuation of the monitoring conducted in 2022 as recommended by those results.

The bat survey methodology was designed by Chloe Delgery (Arup) in collaboration with Woodrow Environmental Consultants. Deployments and maintenance were carried out by Oisín O Sullivan and Patrick Power. The report was compiled by Oisín O Sullivan and Kevin O'Reilly.

2 Methodology

2.1 Deployment

2.1.1 Rockabill Island

Following consultation with Commissioners of Irish Lights (CIL), BirdWatch Ireland and NPWS, permission was received to access Rockabill Island for the purpose of monitoring bat activity. Rockabill Island and surrounding waters form part of Rockabill SPA (004014) and Rockabill to Dalkey Island SAC (003000). The qualifying interests (QI) for the SPA are roseate, common and arctic terns and purple sandpiper. The QI for the SAC are reefs and harbour porpoise.

Static detector surveys were undertaken using Wildlife Acoustics Song Meter 4s (SM4s). Detectors were deployed on Rockabill Island, *c.* 6km offshore of Skerries, Co. Dublin. The detectors were powered by external Lithium-ion batteries. The detectors were housed in modified weatherproof peli-cases to allow for power and microphone cables, and to prevent excessive fouling from seabirds directly onto detectors. Two static detectors were deployed continuously from 04-Apr-2023 to 08-Nov-2023. One detector was positioned on the eastern side of the island at [53.597212, -6.00454] while the other was placed on the western side [53.597285, -6.004187], as presented in **Figure 1** below**.** These are the same locations where detectors were deployed in 2022. The detectors were fitted with two 512 GB or 256 GB memory cards each, in anticipation of high levels of noise being recorded as a result of the island's breeding tern colony. The detectors were set with 16kHz as the minimum frequency trigger for recording, differing from standard Irish bat survey methodology for which a minimum trigger of 12 kHz is used. This was done in order the reduce the amount of interfering noise files produced by the tern colony on the island, while still recording within the normal echolocation frequencies of relevant bat species. The sample rate was lowered from 384 kHz in 2022 to 128 kHz in 2023 to save both memory space on the cards and reduce battery consumption. Detector units and batteries were placed on the ground, while microphones were mounted at approximately 2m above the ground. The east side detector was placed on a metal strut on the side of a storage shed adjacent to a wall, while the west side detector was affixed to a post, positioned in the corner of a walled area in front of the main building on the island. Respective pictures of each deployment location are shown in **Appendix: Detector Locations.**

Figure 1 - Detector deployment locations

2.1.2 Headland Monitoring

Two detectors were also deployed along the coast to assess if bat activity events on Rockabill Island coincided with activity changes on the mainland. In line with the surveys that took place in 2022, one detector was placed on a treeline north of Balbriggan at the landfall area of the proposed development, while a second was deployed on the RNLI lifeboat station in Skerries. The Balbriggan detector was deployed on 28-Apr-2023, however, due to a unit failure, recording began on 10-June-2023. Maintenance on the RNLI radio tower delayed deployment of the second detector until 16-June-2023. Both detectors were collected on 08-Nov-2023. Details on the detector run times are displayed in **Table 1**. A Wildlife Acoustics SM-mini was used at the Skerries location. At Balbriggan an SM4 was used (WSS024) which failed during its recording, on the following maintenance period a Batlogger C was deployed at Balbriggan (WSS087).

Table 1 - Headland deployment locations and times

Location	Detector	Latitude	Longitude	Recording Start	Recording End
Skerries	WSS042	53.624458	-6.189347	16-June-2023	08-Nov-2023
Balbriggan	WSS024/WSS087	53.585937	-6.105593	10-June-2023	08-Nov-2023

2.2 Calibration and testing of recording equipment

All detectors were tested and settings checked prior to deployment. The sensitivity of all microphones was tested prior to and after each deployment, and all microphone checks were logged in an excel spreadsheet. No microphone experienced complete failure, however, the build-up of bird droppings on microphones resulted in the partial loss of microphone sensitivity towards the end of the recording period for some deployments. Despite this, it is considered that data was captured effectively on both detectors located on Rockabill for the duration of the deployment, and provides an accurate representation of bat activity on Rockabill. There was no loss of data from technical malfunctions during the survey period. Aside from the recording failure in spring at the headland detector both headlands recorded effectively for the periods shown in **Table 1**.

2.3 Detector maintenance

Memory cards, microphones, and batteries were changed on a monthly basis or as close to a monthly basis as weather would allow. Maintenance period 4 was cancelled due to biosecurity concerns surrounding the outbreak of avian flu in the breeding seabird population on the island. During maintenance period 5 it was confirmed that the detectors recorded for the two months without failure. The maintenance schedule is shown in **Table 2.** Maintenance of headland detectors coincided with this table ± one day.

Table 2 - Maintenance periods for Rockabill detectors

Visit	Date	Detector E	Detector W
Deployment	04-Apr-2023	WSS058	WSS061
Maintenance period 1	05-May-2023	WSS058	WSS025
Maintenance period 2	07-Jun-2023	WSS058	WSS025
Maintenance period 3	03-Jul-2023	WSS058	WSS025
Maintenance period 4	NA	WSS058	WSS025
Maintenance period 5	04-Sep-2023	WSS058	WSS025
Maintenance period 6	02-Oct-2023	WSS058	WSS025
Collection	11-Nov-2023	WSS058	WSS025

2.4 Data Analysis

Sound files were analysed using Kaleidoscope and all files recorded on the Rockabill detectors were manually verified by a member of the Woodrow bat ecology team, with the aid of Russ 2012, Barataud 2015, and Middleton *et al.* 2022. 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, we 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 were recorded were split into separate bat passes per species. As a result of the length of deployment and the presence of resident bats surrounding the headland detectors a large quantity of data was generated. The headland data was processed through Kaleidoscope's automatic identification feature and identifications with match ratios >0.75 were accepted as bat calls. However, for migratory species considered to be at high risk from wind turbines, *Nyctalus leisleri* and *Pipistrellus nathusii*, manual verification was applied. A precautionary approach was taken with regard to manually verifying echolocation calls for *P. nathusii*. Calls with a FM-qCF structure resembling pipistrelle echolocation calls with a peak frequency below 41.5 kHz and a minimum frequency below 40.5 kHz were labelled as *P. nathusii* calls.

Weather data for Rockabill Island was gathered from the M2 weather buoy in the Irish Sea accessed via the Marine Institute website (Irish Weather Buoy Data). This buoy is located 40km south-east of Rockabill Island which is a limitation in that there may be localised differences to Rockabill unaccounted for, i.e., there may be higher wind and lower temperature effects from the mainland. However, it provides an insight into the weather conditions in a marine context for the Irish Sea rather than using a land-based weather station. The weather data for the headland sites was obtained from Dublin Airport weather station (Dublin Airport Weather Data) which provided land-based weather data. Dublin Airport is located approximately 20km south-west of the headland sites.

3 Results

3.1 Rockabill Island

Four species were recorded during the survey period; *Nyctalus leisleri*, *Pipistrellus nathusii*, *Pipistrellus pygmaeus*, and *Pipistrellus pipistrellus*. Total passes for each species are displayed in Figure 2. In a minority of cases some passes could not be identified to a species level. Those identified to the genus *Pipistrelle* were generally examples of social calls which were not accompanied by audible echolocation calls. The three passes identified as *Nyctalus* sp. consisted of a low number of pulses per recording which could not be identified to species level as they had acoustic characteristics shared by *N. leisleri* and *Nyctalus noctula.* Except for *P. nathusii*. All species were more active at the eastern detector. This contrasts the previous 2022 year's data in which the western detector recorded more passes for each species (Rockabill lighthouse, Boat-based & Headland Offshore Bat Monitoring Results Report, Woodrow 2022). Only two *P. nathusii* passes were recorded throughout the survey, on 05-Jun-2023 at 23:02 and 08-Aug-2023 at 00:40. No bats were recorded on either detector during the spring survey season (April – May).

The frequency of wind speeds and directions filtered for night time conditions are displayed graphically in **Figure 3** and numerically in **Table 3.** The prevailing nightly winds were southerly winds between 4 – 10 m/s consisting of 14% of the conditions during the survey. Overall, 21% of the recorded nightly wind conditions were southerly winds.

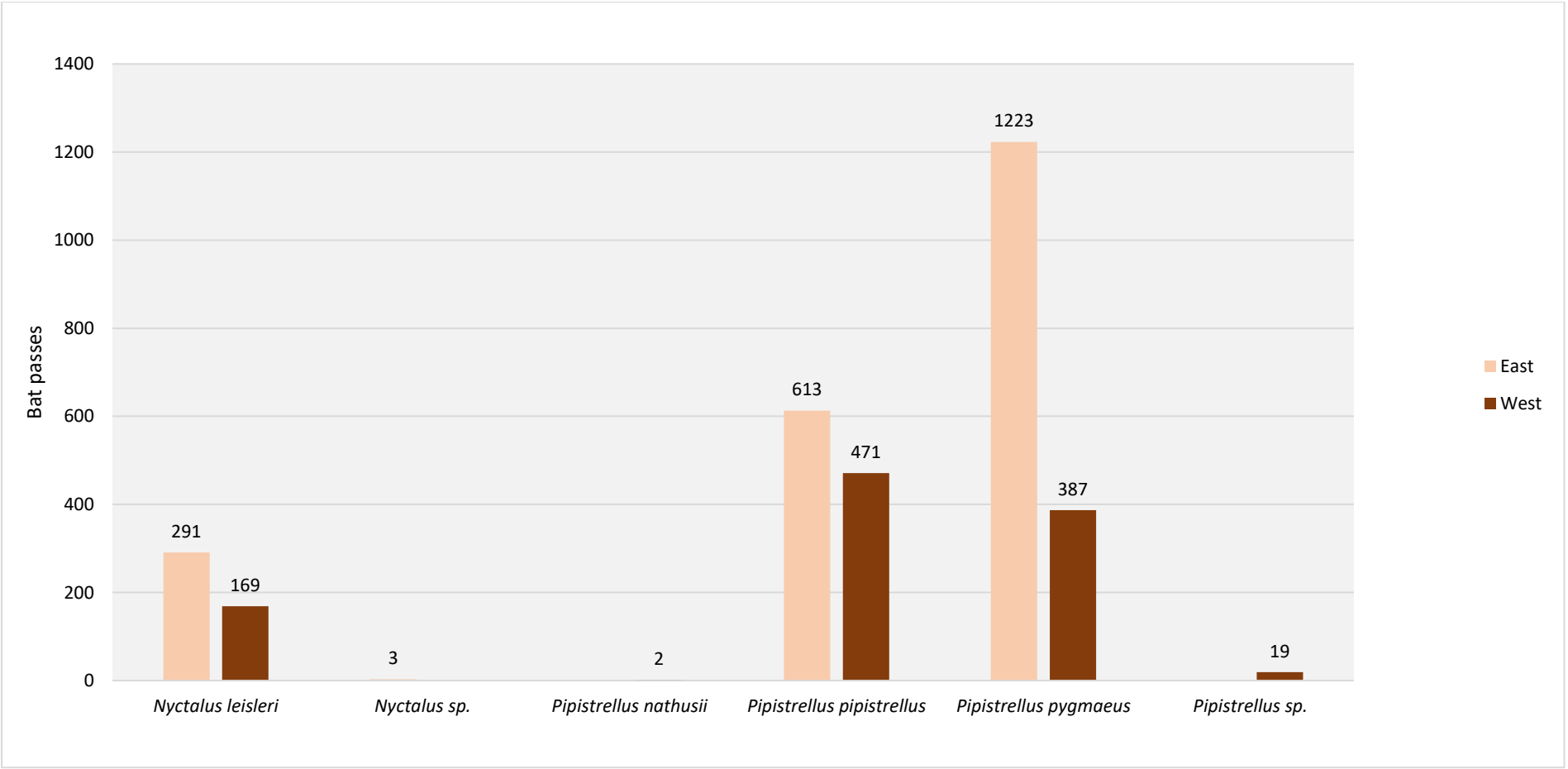

Figure 2 - Comparison of all species passes on the eastern vs western side of the island

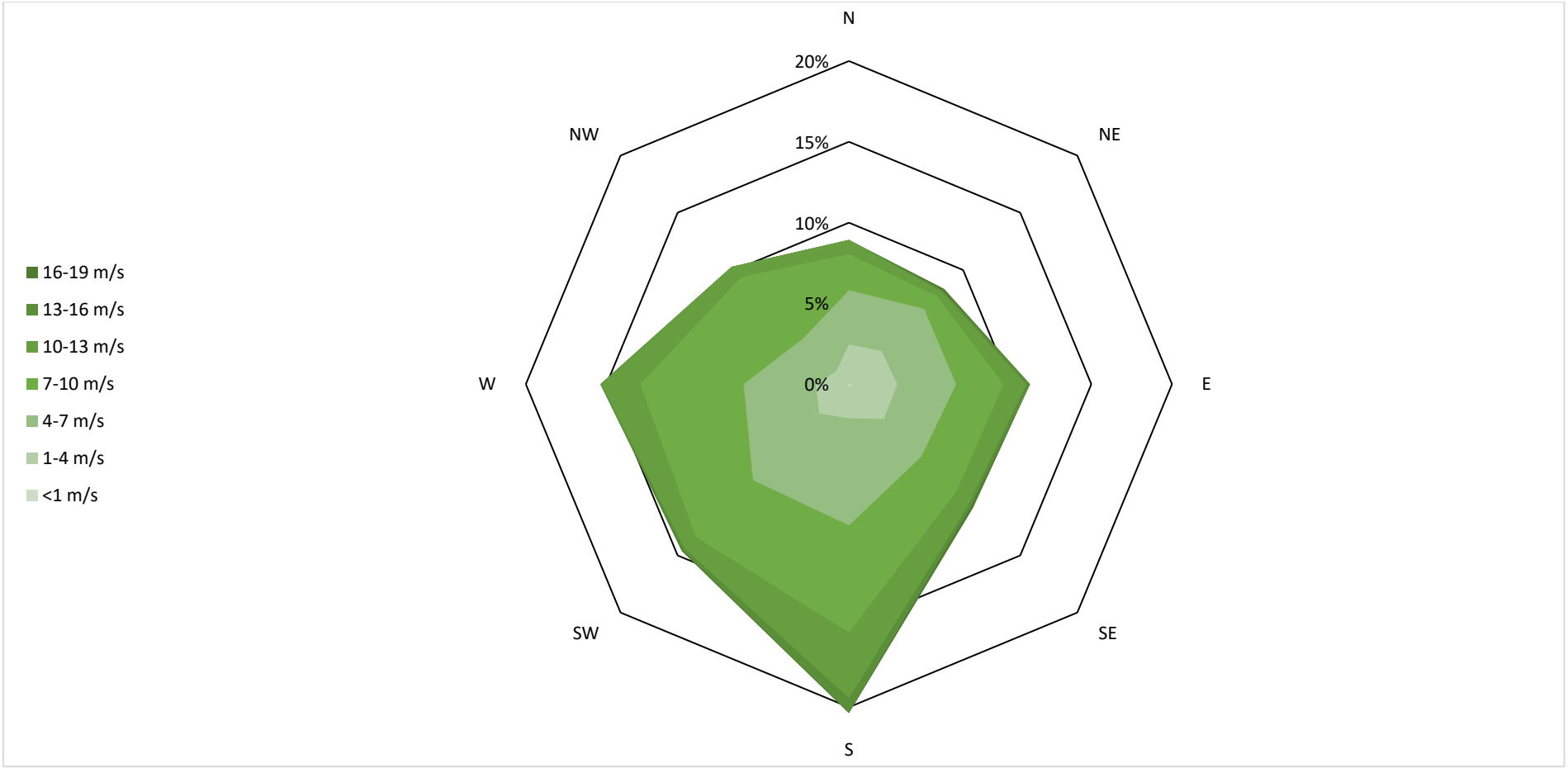

Figure 3 - Prevailing nightly wind conditions offshore during deployment period (M2 weather buoy)

Table 3 - Wind speed and direction frequencies as a percentage of nightly conditions throughout the deployment (M2 weather buoy)

Wind speed (m/s)	N	NE	E	SE	S	SW	W	NW	Total
<1	0%	0%	0%	0%	0%	0%	0%	0%	**1%**
1-4	2%	3%	3%	3%	2%	2%	2%	1%	**18%**
4-7	3%	4%	4%	3%	7%	6%	4%	3%	**34%**
7-10	2%	1%	3%	3%	7%	5%	6%	5%	**33%**
10-13	1%	0%	1%	1%	4%	1%	2%	1%	**12%**
13-16	0%	0%	0%	0%	1%	0%	0%	0%	**2%**
16-19	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Total	**9%**	**8%**	**11%**	**11%**	**20%**	**15%**	**15%**	**10%**	**100%**

3.1.1 *Nyctalus* activity

The three passes identified as *Nyctalus* sp. mentioned previously occurred on 12-Oct-2023 all within an 8-minute period between 04:52 and 05:00. There were no other bats recorded on this night.

The distribution of *N. leisleri* activity throughout the deployment is displayed in **Figure 4**. *N. leisleri* were recorded between 11-June-2023 and 11-Oct-2023. The peak in their activity occurred in September with 3 nights of the highest activity being 04-Sep-2023 (37 passes), 08-Sep-2023 (38 passes), and 09-Sep-2023 (35 passes). While there is a similar total level of *N. leisleri* activity to the 2022 survey. In 2022 the passes are distributed more evenly across August and September. In June, July, and October of 2023 there were less than 35 passes per month. Only two feeding buzzes were produced by *N. leisleri* on the 05-Sep-2023 and 06-Sep-2023. This is a large decrease in from 2022 which say an aggregate of 31 feeding buzzes recorded on two separate nights. The peak in activity within in each night varies across the entire deployment in 2023.

Wind conditions during which *N. leisleri* were active are shown graphically in **Figure 5** and numerically in **Table 4**. Showing a similar trend to the data gathered in 2022, *N. leisleri* activity coincided with predominantly easterly and southerly winds. These wind directions were present for 21% of passes, with 14% of passes being recorded in easterly wind speeds of 4-7 m/s. 17% of passes occurred while there were north-easterly winds. The remaining 48% is distributed across the remaining wind directions in lesser proportions. Examining **Figure 5**, it appears a disproportionate amount of *N. leisleri* activity occurred in easterly wind conditions relative to the standard nightly prevailing conditions shown in **Figure 3**.

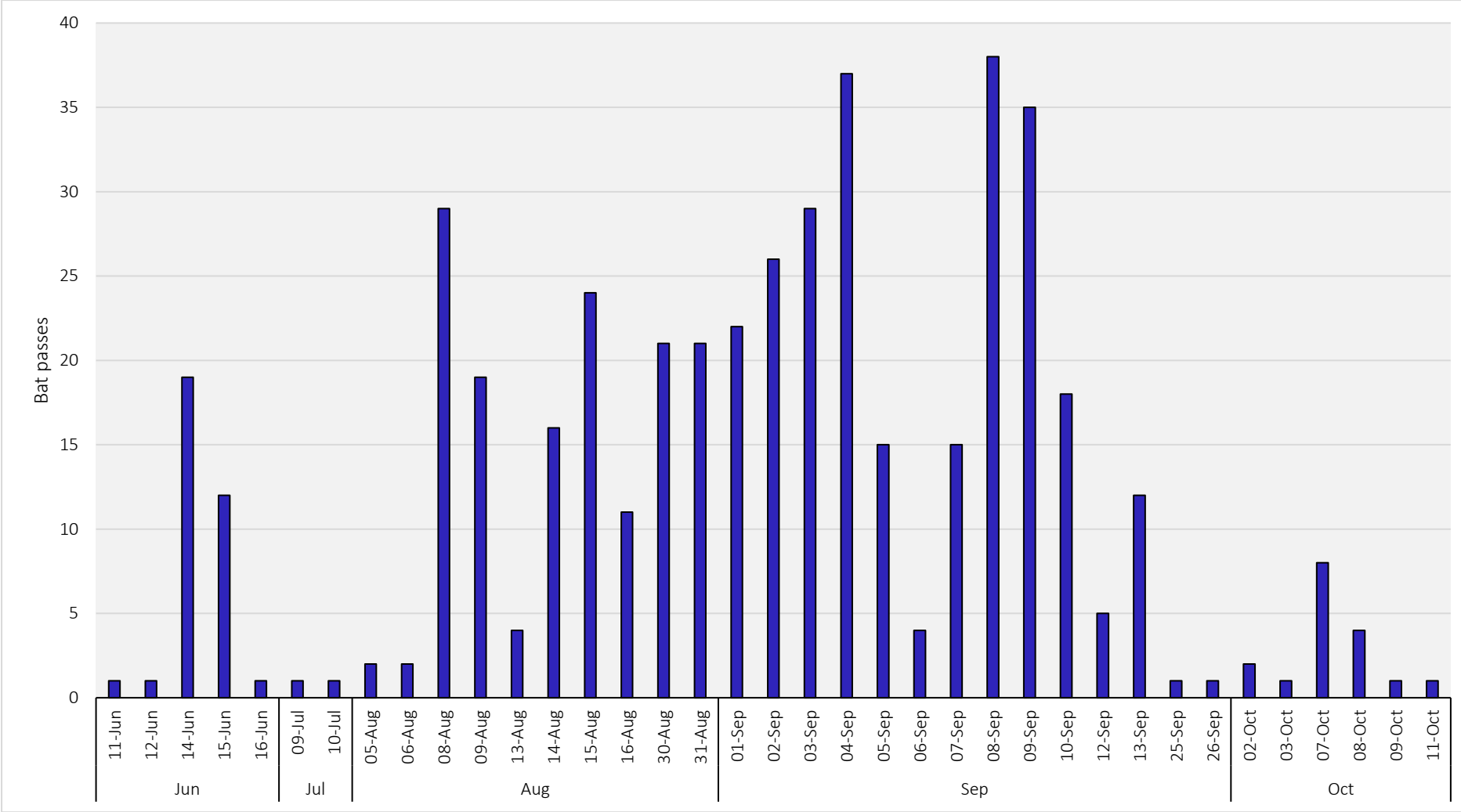

Figure 4 – Nyctalus leisleri passes distribution across the survey period

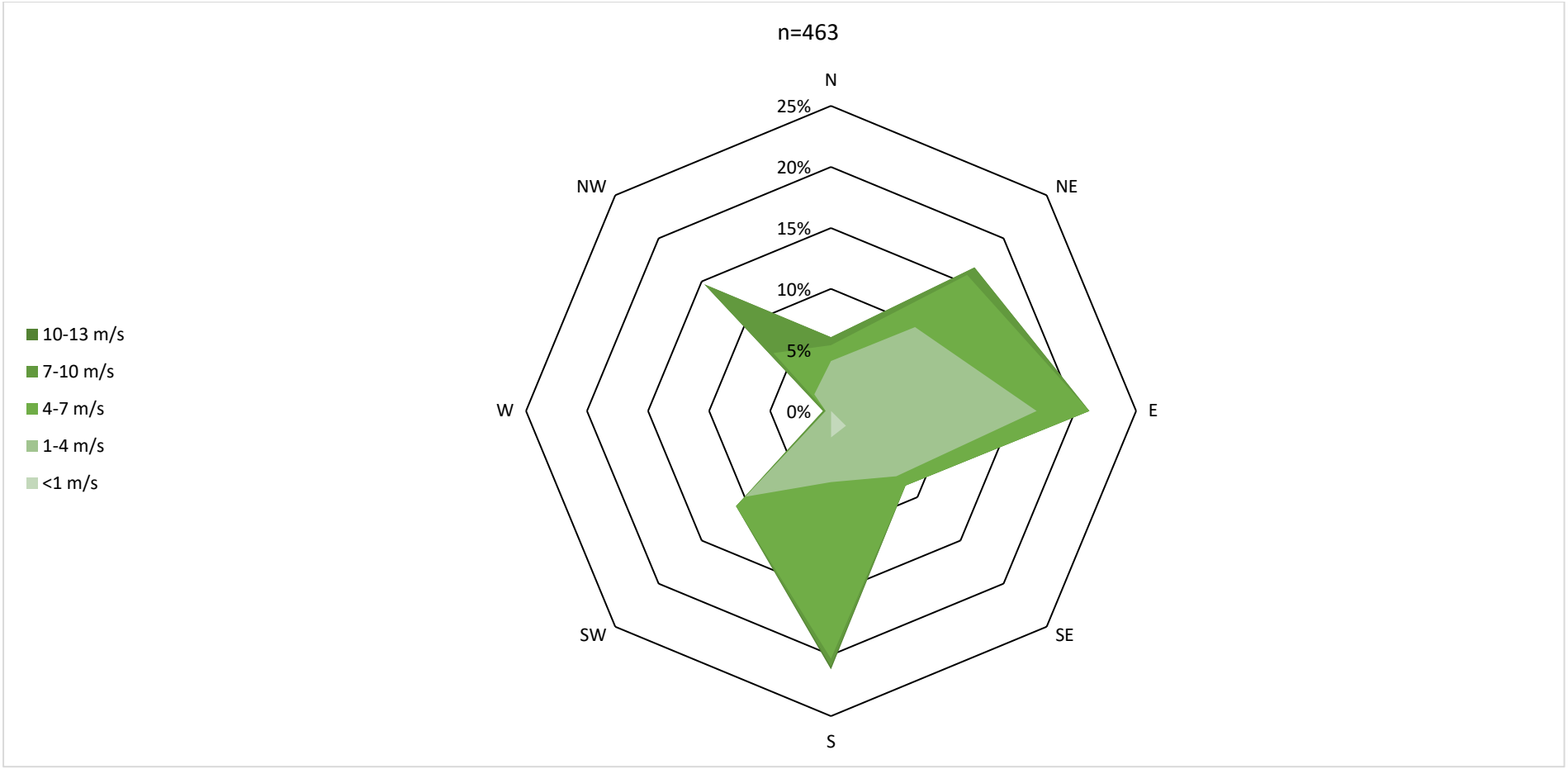

Figure 5 - Percentage of passes relative to wind conditions for Nyctalus leisleri and Nyctalus sp. on Rockabill

Table 4 - Wind conditions recorded during Nyctalus leisleri passes as a percentage for each possible wind direction and speed

Wind speed (m/s)	N	NE	SE	E	S	SW	W	NW	Total
<1	0%	0%	2%	0%	2%	0%	0%	0%	**4%**
1-4	4%	10%	6%	17%	4%	10%	0%	2%	**52%**
4-7	1%	6%	1%	4%	14%	1%	0%	5%	**33%**
7-10	1%	1%	0%	0%	1%	0%	0%	8%	**10%**
10-13	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Total	**6%**	**17%**	**9%**	**21%**	**21%**	**11%**	**1%**	**15%**	**100%**

3.1.2 Pipistrelle activity

3.1.2.1 Pipistrellus nathusii

The two *P. nathusii* passes recorded occurred on the 05-June-2023 and the 08-Aug-2023. Both occurred in wind speeds of approx. 2.5 m/s winds (north-easterly and north-westerly, respectively) and between 12°C and 14°C.

3.1.2.2 Pipistrellus pipistrellus & Pipistrellus pygmaeus

In 2022 of *P pipistrellus* and *P. pygmaeus* only two *P. pygmaeus* were recorded. This is contrasted heavily in 2023 with an aggregate of 2713 bat passes recorded for these species. Unlike *N. leisleri* the activity occurs within a much more focused window in time. There were two *P. pipistrellus* passes recorded in June 2023 (00:51 and 00:52), two *P. pygmaeus* passes recorded in July (23:41), an aggregate of 2699 passes for both in August, and one *P. pipistrelle* and ten *P. pygmaeus* recorded in September. The activity for these species during the deployment, as described here, can be seen in **Figure 6**.

There was a substantial level of behavioural calls recorded. Between the 08-Aug-2023 and 07-Sep-2023, 310 feeding buzzes were recorded. Between the 09-Aug-2023 and 22-Aug-2023, 384 social calls were recorded. The dates and spread of this behaviour across the deployment is shown in **Figure 7** (feeding buzzes) and **Figure 8** (social calls).

The wind conditions recorded for passes of these species are examined graphically in **Figure 9** and numerically in **Table 5**. These two species were primarily recorded while strong southerly winds were recorded in the Irish Sea. Of the passes recorded, 43% of them occurred in southerly winds between 10-13 m/s. Unlike *N. leisleri* the conditions most commonly present for *Pipistrellus* spp. activity is the same as the most common conditions in general which is a southerly wind. However, while these data are informed by a higher number of bat passes there is a much narrower window of time during which they were recorded and therefore is more heavily influenced by the conditions present for that shorter window of time.

Analysis of the *P. pipistrellus* and *P. pygmaeus* activity relative to sunset demonstrates that there is a high likelihood of a nearby roost (windows estimated using Identification Guide to Irish Bats, Bat Conservation Ireland (Roache & Torsney 2022)). This is shown in **Figure 10**. *Pipistrellus* spp. passes occurred in high density within the emergence window with the two earliest examples being passes approximately 5 minutes before sunset (pass 20:32, 22-Aug-2023 sunset at 20:38 and pass 20:31, 23-Aug-2023 sunset at 20:36, both were *Pipistrellus pipistrellus* passes).

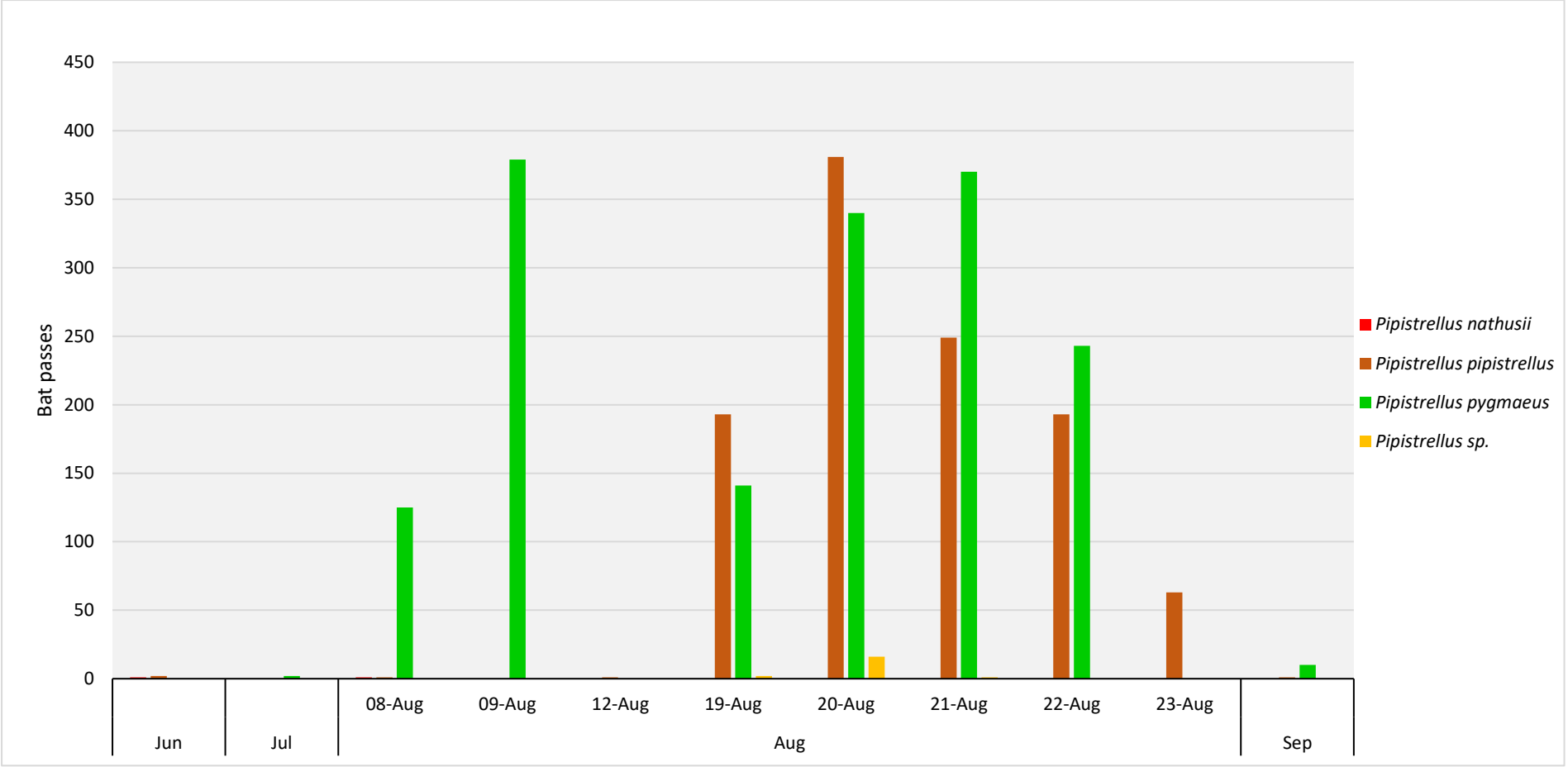

Figure 6 - Distribution of Pipistrelle spp. activity during survey period

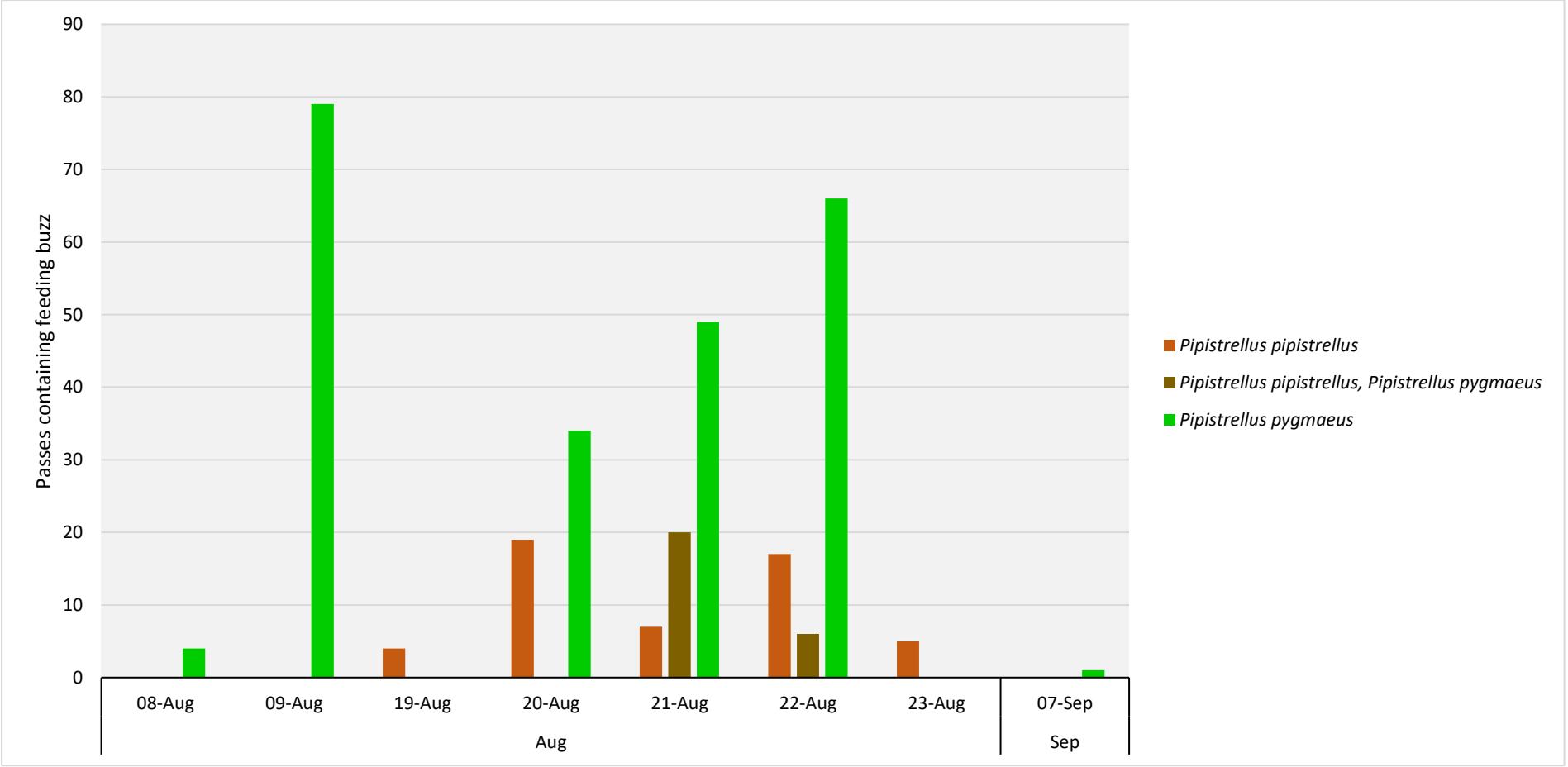

Figure 7 - Dates and numbers of passes containing pipistrelle feeding buzzes. Passes with social calls and both species' echolocation calls present are recorded under the heading of both as both could be emitting social calls

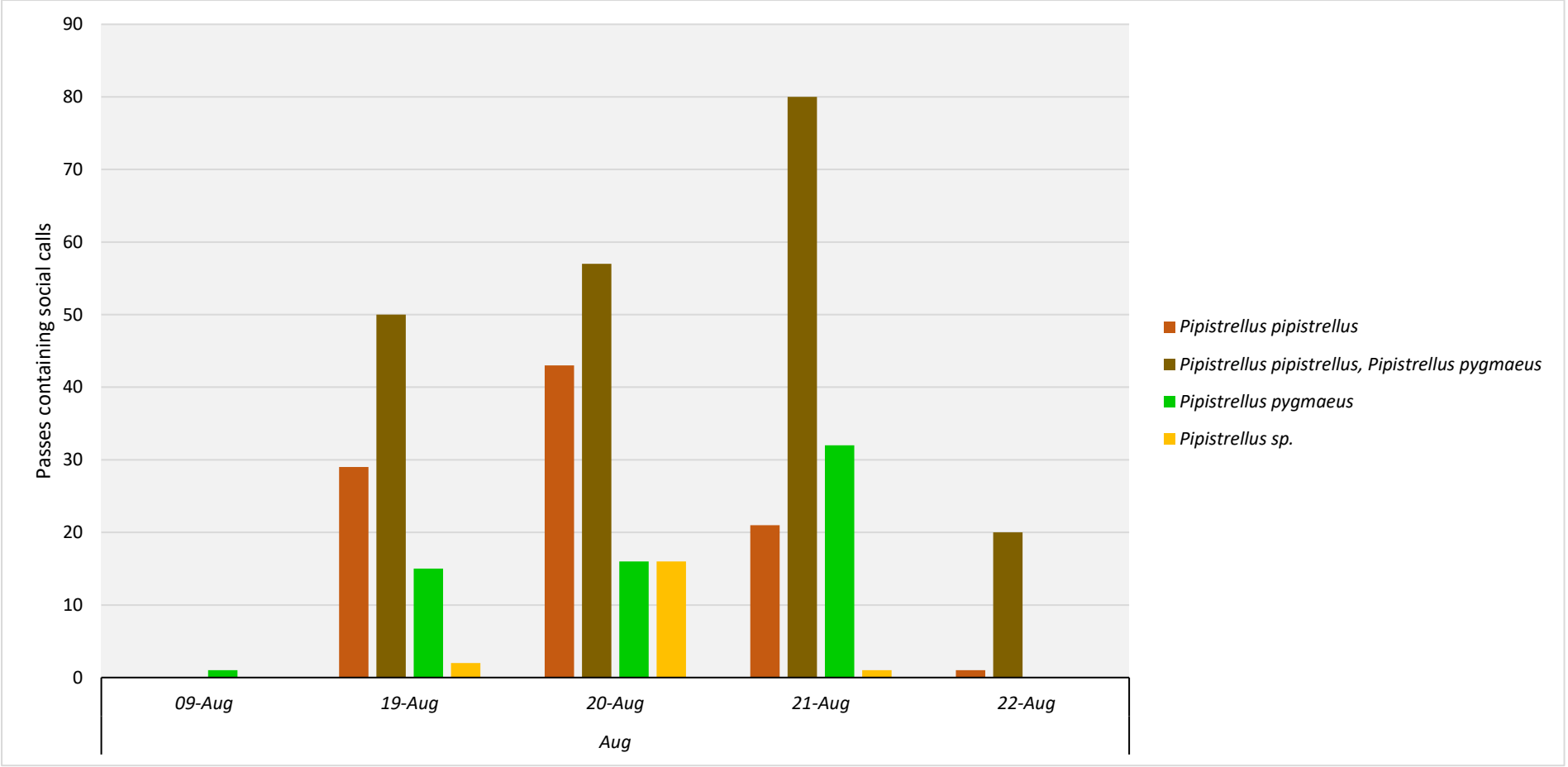

Figure 8 - Dates and numbers of passes containing pipistrelle social calls. Passes with social calls and both species' echolocation calls present are recorded under the heading of both, while the presence of pipistrelle social calls in the absence of any echolocation were recorded as Pipistrellus sp.

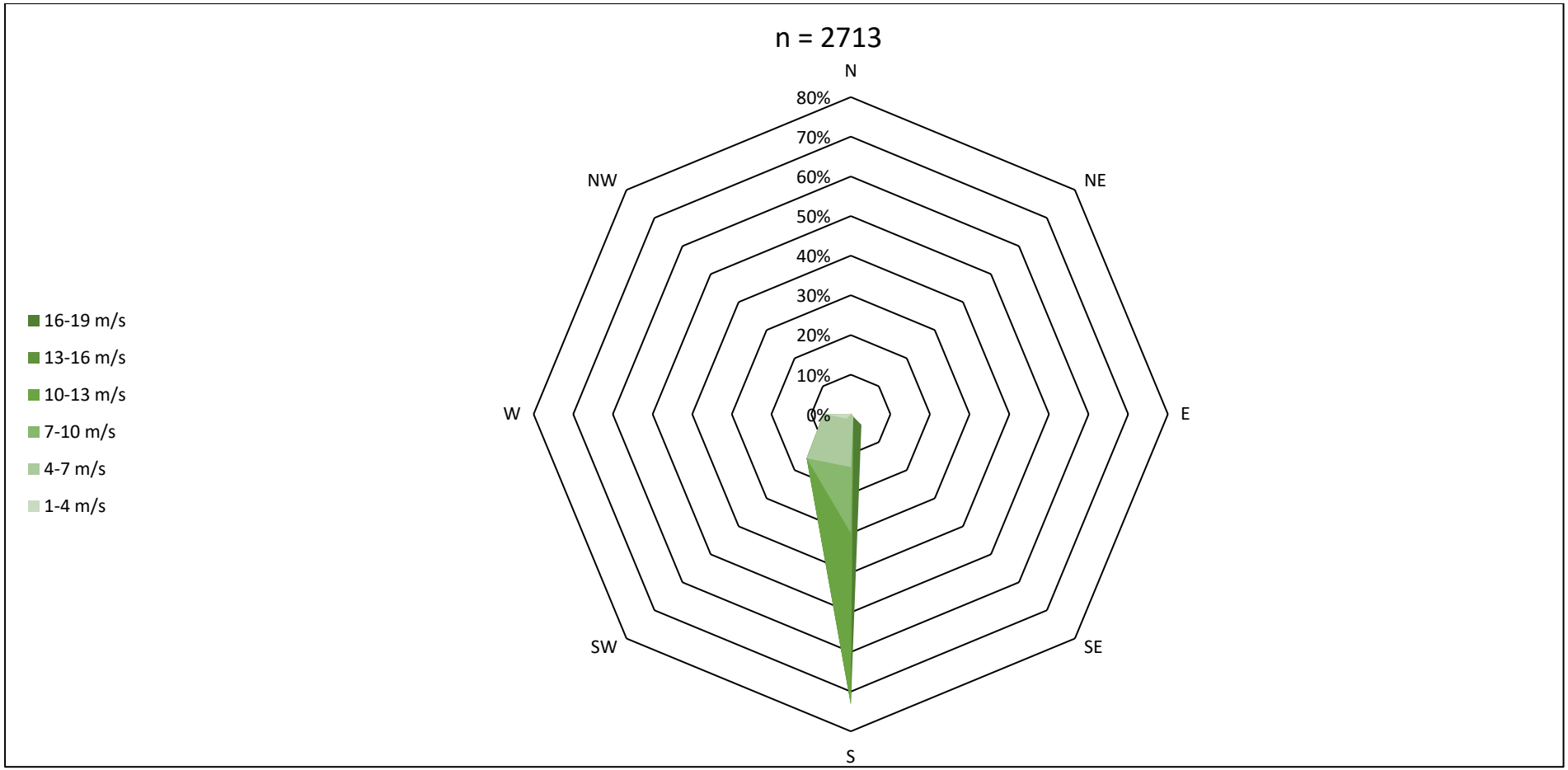

Figure 9 - Percentage of passes relative to wind conditions for pipistrelles (excluding P. nathusii) on Rockabill

Table 5 - Wind conditions recorded during Pipistrelle passes (excluding nathusii) as a percentage for each possible wind direction and speed.

Wind speed (m/s)	N	NE	E	SE	S	SW	W	NW	Total
1-4	0%	0%	0%	0%	0%	2%	6%	0%	**8%**
4-7	0%	0%	0%	1%	13%	14%	1%	0%	**29%**
7-10	0%	0%	0%	0%	17%	0%	0%	0%	**17%**
10-13	0%	0%	0%	0%	43%	0%	0%	0%	**43%**
13-16	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
16-19	0%	0%	0%	3%	0%	0%	0%	0%	**3%**
Total	**0%**	**0%**	**0%**	**4%**	**73%**	**16%**	**7%**	**0%**	**100%**

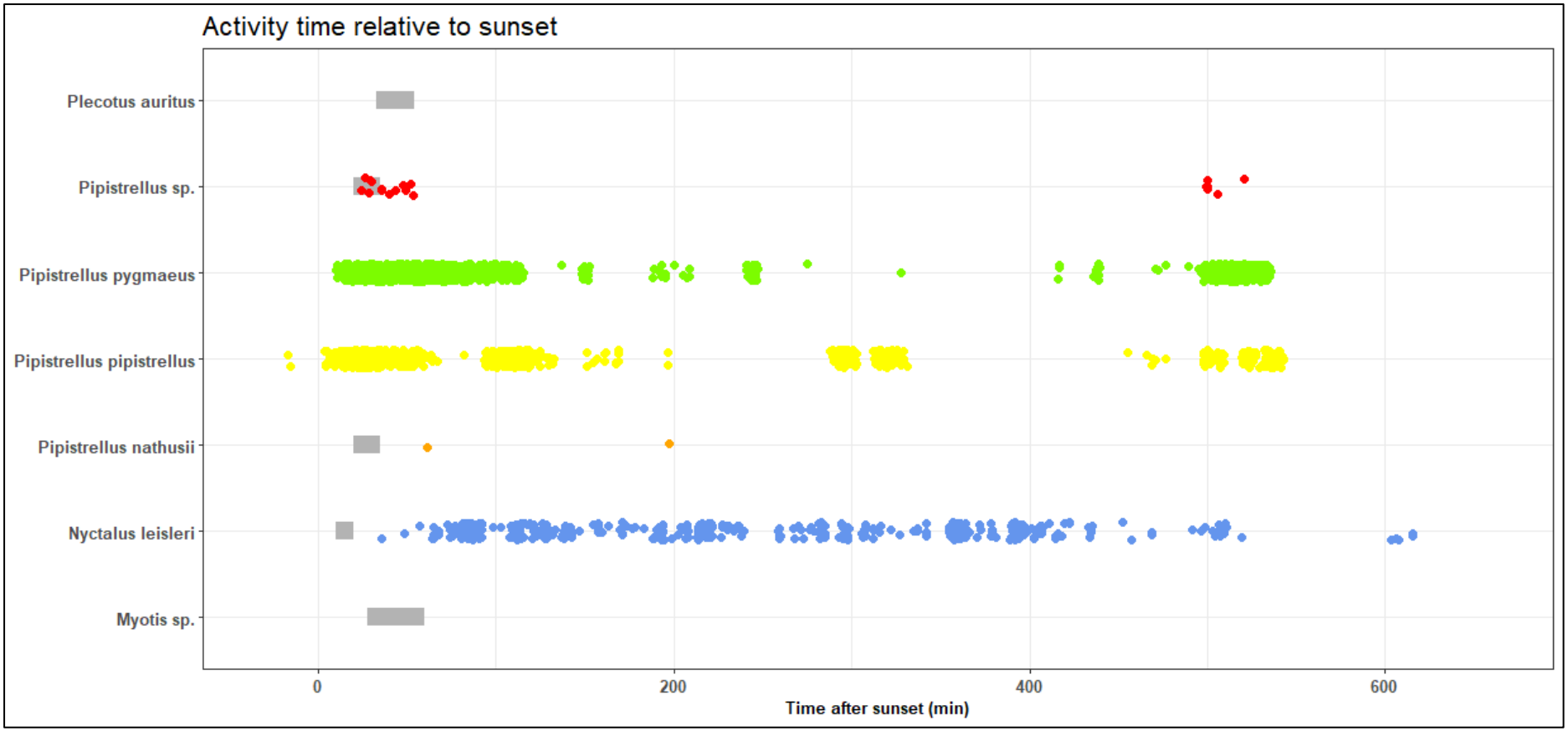

Figure 10 - Species activity relative to sunset, emergence windows denoted by the grey box

3.2 Headland Monitoring

The headland detector data was examined specifically for trends in *P. nathusii* and *N. leisleri* data on the basis of the results recorded at Rockabill Island. The detector at Skerries recorded the most passes for these two species specifically at 71% of the total aggregate bat passes, while the Balbriggan detector recorded 21% of the total aggregate bat passes. Activity percentages relative to wind speed are shown graphically in **Figure 12** and **Figure 14** and numerically in **Table 6** and **Table 7**.

3.2.1 Nyctalus leisleri activity

N. leisleri activity was recorded across both headland detectors (**Figure 11**). A peak of activity for this species occurred on 14-July-2023 with 688 passes recorded in one night at Skerries. This could be the result of a single feeding event of one or several bats in close proximity with the detector There was an absence of *N. leisleri* activity between 05-Sep-2023 and 02-Oct-2023 wherein no passes were recorded at either of the headland sites. This quiet period was then followed by an increase in activity which peaked on 09-Oct-2023 with 338 passes recorded in one night. *N. leisleri* echolocations were recorded at the headland sites as late as 2-Nov-2023. Overall, this species was active mostly in light to moderate south westerly winds (**Figure 12**).

3.2.2 Pipistrellus nathusii activity

The detector located at Skerries recorded only seven passes for *P. nathusii* while the detector at Balbriggan recorded considerably higher activity with 255 passes. The majority of the *P. nathusii* passes at Balbriggan were recorded in a peak of activity between 9-Oct-2023 and 16-Oct-2023. The activity levels in bat passes per night is shown in **Figure 12**. The data recorded shows that *P. nathusii* were most active during light northerly winds (29% of all passes) and light to moderate westerly winds (42% of all passes). The activity for *P. nathusii* in relation to wind direction and speed is shown in **Figure 14**. None of the periods of activity for *P. nathusii* recorded on the headlands correspond to the activity recorded on the island detectors.

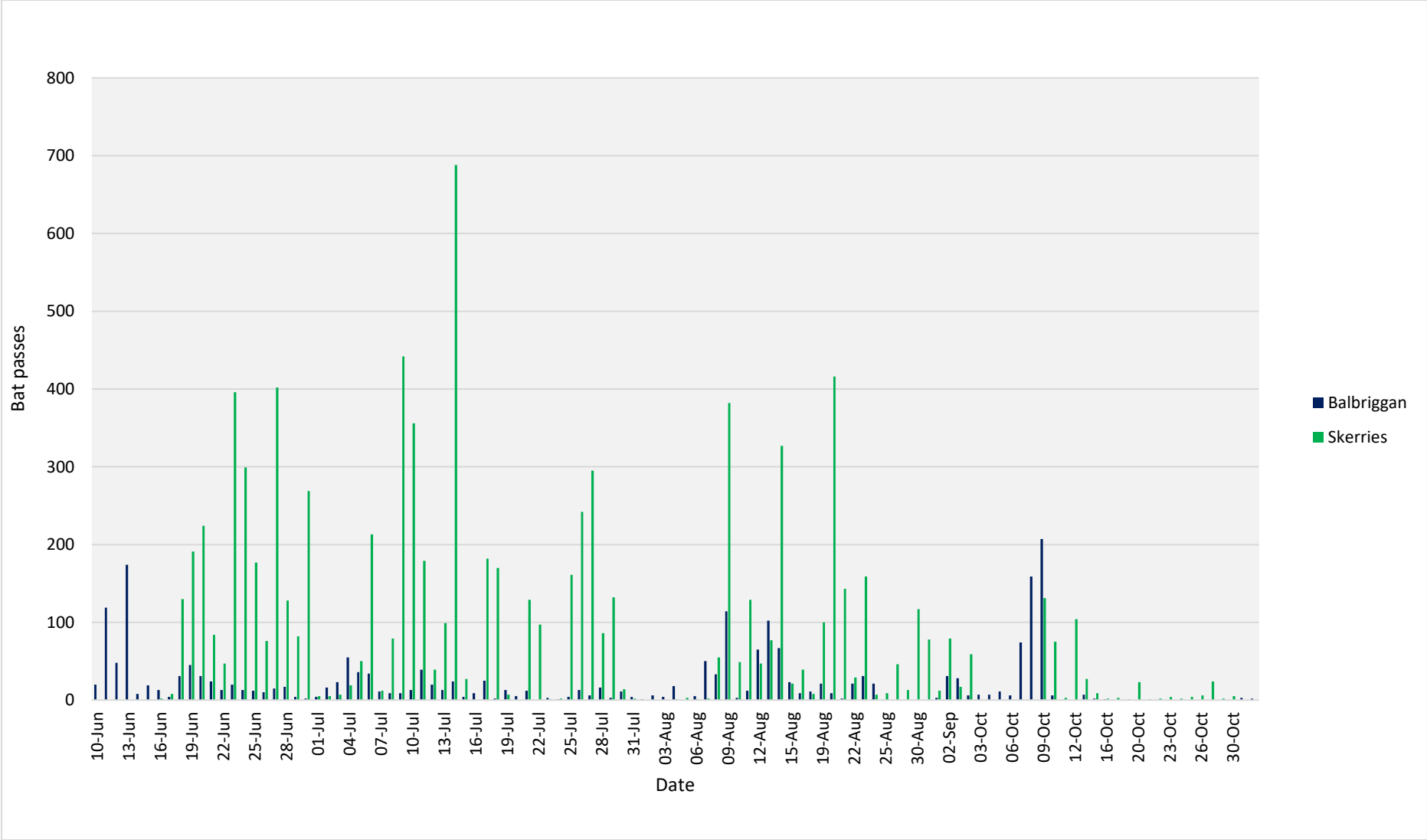

Figure 11 - Nyctalus leisleri activity on headlands during deployment

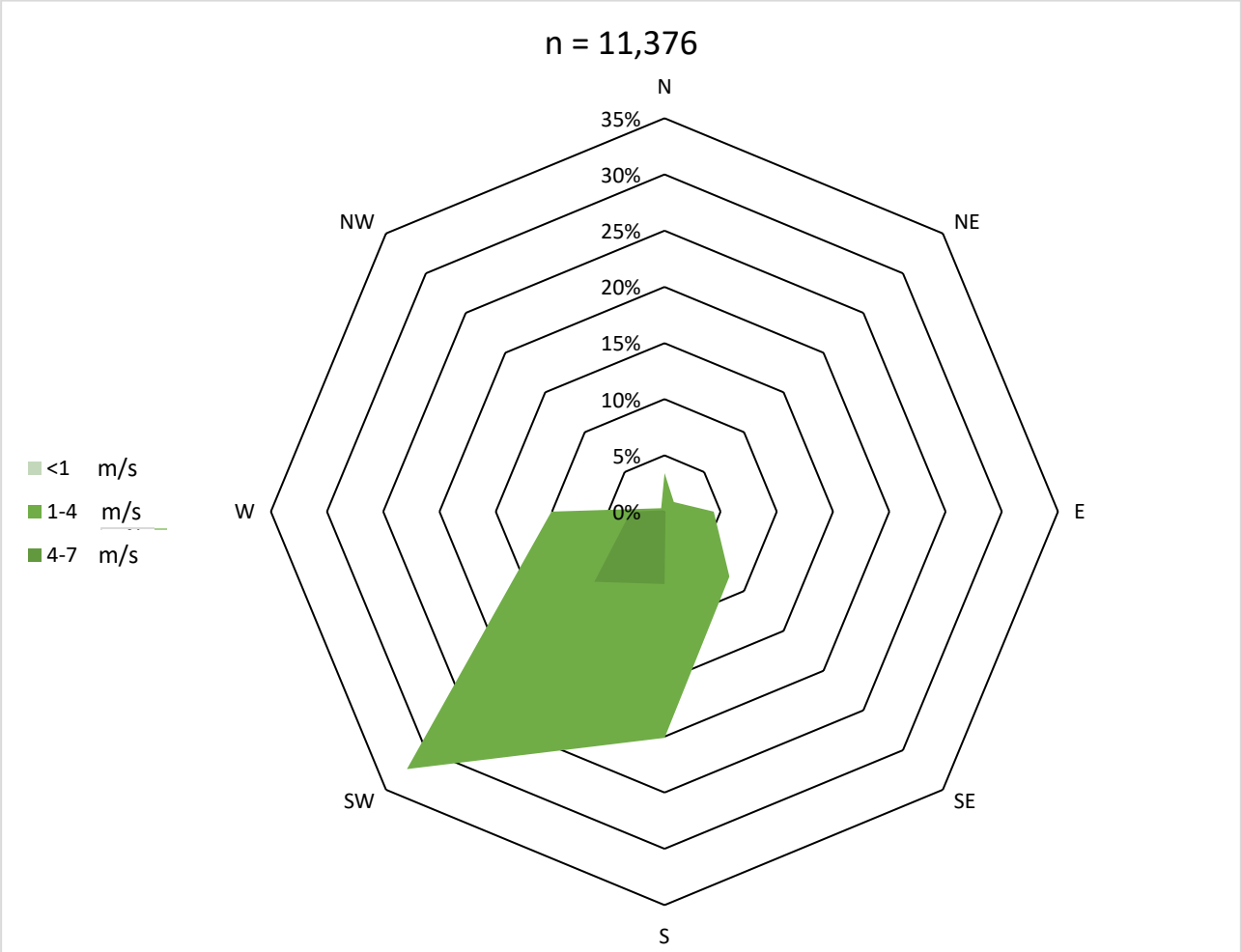

Figure 12 - Percentage of passes relative to wind conditions for Nyctalus leisleri on headlands

Table 6 - Wind conditions recorded during Nyctalus leisleri passes as a percentage for each possible wind direction and speed on headlands

Wind speed (m/s)	N	NE	E	SE	S	SW	W	NW	Total
<1	0%	0%	0%	0%	0%	0%	0%	1%	**1%**
1-4	4%	1%	4%	8%	20%	32%	10%	0%	**80%**
4-7	0%	0%	0%	0%	6%	9%	3%	0%	**19%**
Total	**4%**	**1%**	**5%**	**8%**	**27%**	**41%**	**13%**	**1%**	**100%**

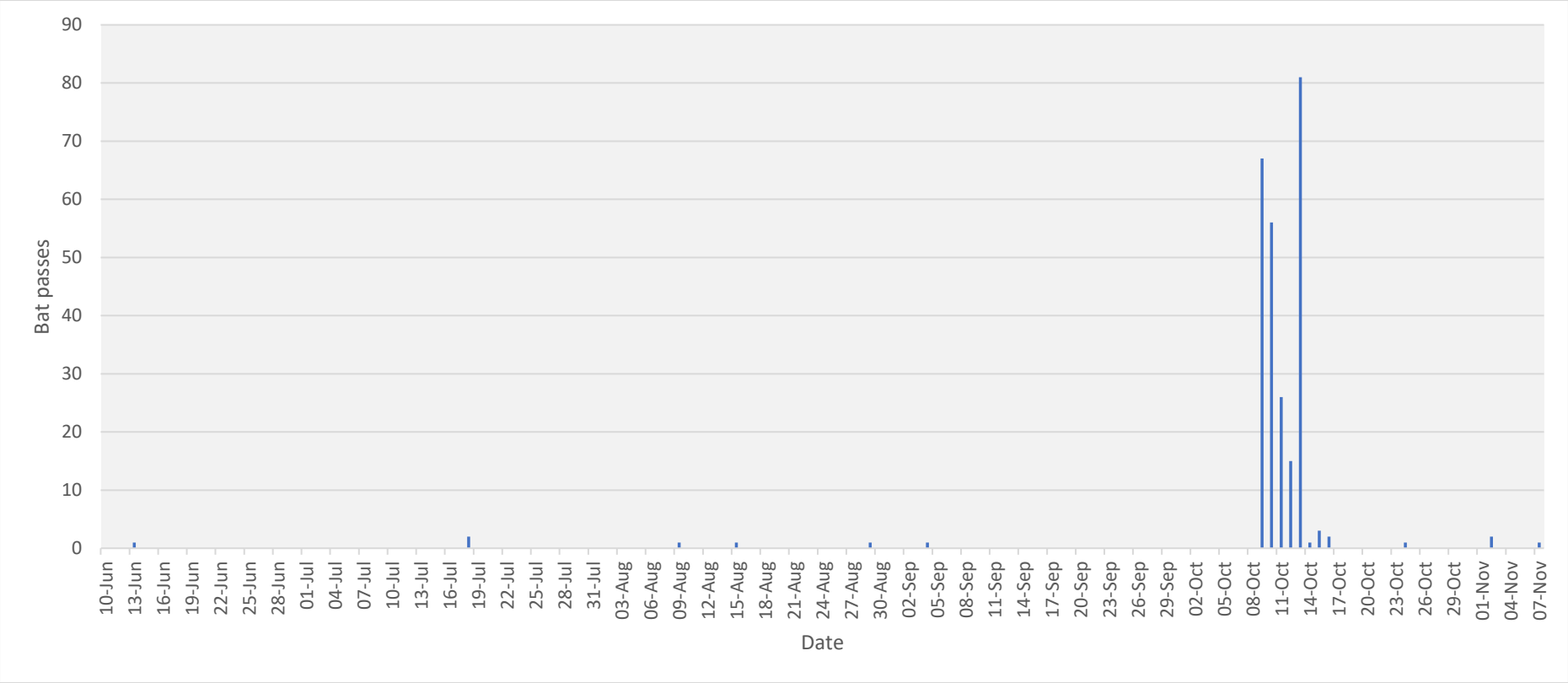

Figure 13 - Pipistrellus nathusii activity over time at both headland sites in bat passes per night

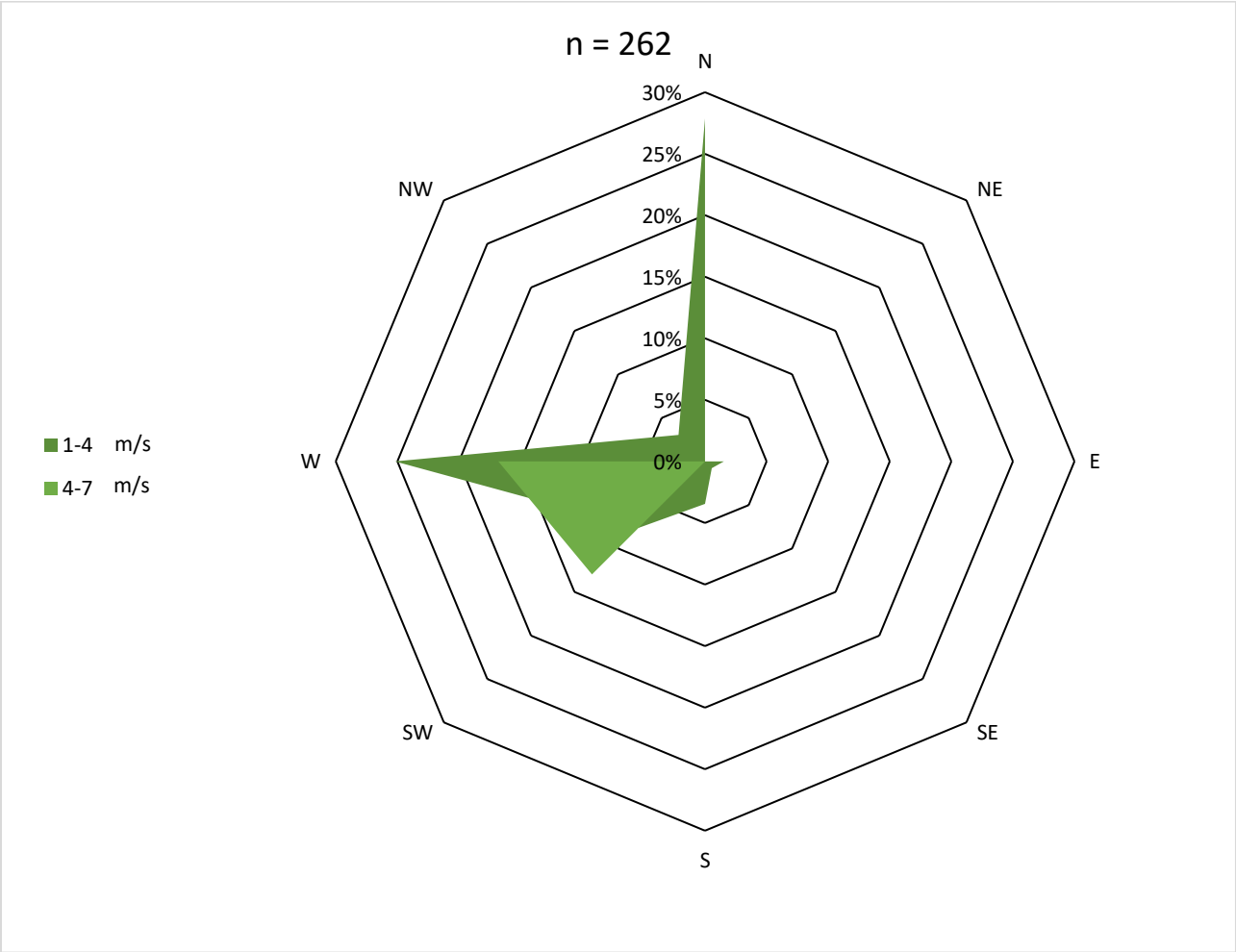

Figure 14 - Percentage of passes relative to wind conditions for Pipistrellus nathusii on headlands

Table 7 - Wind conditions recorded during Pipistrellus nathusii passes as a percentage for each possible wind direction and speed on headlands

Wind Speed m/s	N	NE	E	SE	S	SW	W	NW	Total
1-4	28%	0%	2%	1%	3%	8%	25%	3%	**69%**
4-7	1%	0%	0%	0%	0%	13%	17%	0%	**31%**
Total	**29%**	**0%**	**2%**	**1%**	**3%**	**21%**	**42%**	**3%**	**100%**

4 Results Summary & Discussion

4.1 Rockabill

- *Pipistrelle pipistrellus* and *Pipistrellus pygmaeus* were much more active in 2023 despite this activity being highly restricted to the month of August. High activity at this time of the year, coupled with the level of social calls recorded, is an indication that the island is potentially a swarming location for these two species. This differs greatly from results recorded in 2022 during which only two *P. pygmaeus* passes were recorded across the entire survey season.
- Given the level of activity for *P. pipistrellus* and *P. pygmaeus* within their respective emergence windows (**Figure 10**) along with the level of social activity recorded there is a high likelihood that features on the island are used as both a roost and swarming site.
- Only two *P. nathusii* passes were recorded on Rockabill, both of which were outside the migratory window.
- *Nyctalus leisleri* were present in late August, however, their activity peaked in September, coinciding with their known migration period. This matches the results recorded in 2022. Unlike the *Pipistrelle* spp., very little foraging behaviour, and no social behaviour was recorded at Rockabill.
- Given that *N. leisleri* were disproportionately active on Rockabill in easterly wind speeds relative to the prevailing nightly winds which were predominantly southerly (**Figure 3** & **Figure 5**), this may suggest migratory behaviour and the use of tailwinds. Leisler's bat are known to be a species capable of long distance migrations particularly on continental Europe (Shiel *et al.* 1999; Dondini *et al.* 2012; Ongoing data collection project, Charlotte Roemer/CESCO Lab 2021 – Present weblink 1). Literature has detailed the use of tailwinds by migrating bats (Dechmann *et al.* 2017; Lagerveld *et al.* 2021), however this has not been substantiated for *N. leisleri* to date but is a behaviour noted in both *P. nathusii* and *Nytalus noctula*.
- Three passes on 12-Oct-2023 could not be identified to species level as they share acoustic characteristics with *N. noctula*, which is native to Great Britain and mainland Europe but not recorded in Ireland. There is a possibility that in an offshore environment *N. leisleri* call at lower frequencies compared to what is recorded in standard terrestrial surveys. However, no *N. leisleri* were recorded during this particular night.

4.2 Headland Monitoring

- *N. leisleri* activity was lower or absent from headland recordings during the period of time that they were most active on Rockabill, which differs for the recording period of 2022.
- The peak in *N. leisleri* activity at the headlands corresponds with known *N. leisleri* migratory times.
- A greater number of *P. nathusii* passes were recorded at headland locations in 2023 compared to 2022. These were recorded predominantly at Balbriggan (250+ passes) and line up with the migratory window for the species. There were no recordings of *P. nathusii* during this time period at Rockabill.
- Activity relative to wind speed differs at the headlands compared to that recorded at Rockabill for both *N. leisleri* and *P. nathusii*. Predominantly species were active at lower wind speeds at the headlands, though this could be attributed to the difference in recordings between weather sources.
- However, *N. leisleri* were much less active in easterly wind conditions at the headlands relative to the recordings made on Rockabill.

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6 Weblinks

Weblink 1: https://bat-migration-europe.netlify.app/project/ (Accessed Dec 2023)

7 Appendix: Detector Locations

7.1 Rockabill

Plate 1 - Western detector, microphone circled in red, detector and battery circled in yellow

Plate 2 - Eastern detector, microphone circled in red, detector and battery circled in yellow.

7.2 Headland

Plate 3 - Skerries detector on the RLNI weather mast detector circled in yellow (integrated mic)

Plate 4 - Balbriggan detector on treeline adjacent to beach detector circled in yellow and mic in red