The Hoverflies of Great Ardee Bog: an assessment of hoverfly diversity on a community-led bog restoration site

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1. Introduction

Hoverflies are true flies (Diptera) in the family Syrphidae and are vital pollinators in both natural and agricultural landscapes (Gilbert, 1981). The majority of adult hoverflies depend on flowering plants (angiosperms) as a food source, namely, nectar for carbohydrates and pollen protein for gametogenesis (development of adult sex organs). Larval biology is characteristically diverse in ecology. Hoverfly larvae in the sub-families Syrphinae and Pipizinae are aphidophagous (consuming aphids) and are therefore important biocontrol agents against agricultural pests. Hoverfly larvae in the sub-family Eristalinae are mostly saprophagous (consuming dead organic matter) and phytophagous (consuming living plant material) and inhabit essential ecological roles in nutrient cycling. Additionally, hoverfly larvae are important sources of food for predators in higher trophic positions such as dragonfly larvae, amphibians and birds (Hlaváček *et al*., 2025).

Hoverflies are an under-appreciated group of insect pollinators despite visiting up to 70% of animal-pollinated angiosperm species in Europe (Rotheray & Gilbert, 2011). Certain hoverflies undergo significant migratory journeys in the summer, illustrating their importance to pollination services across expansive areas (Wotton *et al*., 2019). Hoverflies are also effective bioindicators of habitat type, botanical assemblages and environmental health. Wetland habitats are perhaps the most productive environments for hoverfly diversity. To-date, there are 180 hoverfly species in Ireland, however, only a sub-set are associated with acidic peatlands. Hoverflies in Ireland such as *Eristalis tenax* (pictured on the cover page) and *Episyrphus balteatus* are the most common species and are seen throughout the year, even on mild winter days. Other species are much less common due to a combination of factors such as genuine rarity, under-recording or being restricted to specific habitats such as montane heathland and salt marsh.

Despite the clear importance of hoverflies to ecosystem services and agricultural systems, they remain an under-recorded group in comparison to other insect pollinators such as bees and butterflies. This is exemplified in Ardee Bog, which has an incredible lack of hoverfly records (exclusive of this study), despite having important habitats for hoverfly biodiversity. Therefore, it is this apparent knowledge gap that justified this project. The main objectives are laid out as follows:

- Better understand the spatio-temporal distribution of hoverflies on Ardee Bog; which species are inhabiting sections of the bog complex, which habitats are they utilising and when are they observed (phenology).
- Establish a baseline hoverfly species inventory from which future research can avail of.

2. Methodology

2.1. *Survey area*

Ardee Bog is a lowland cut-over raised bog complex to the west of Ardee town situated in both counties Louth and Meath. Other wetlands such as lakes and poor-fen are present within the broader region. This survey was conducted entirely within Stormanstown Bog which is mostly in County Louth. Overall habitat type was identified in order to capture the greatest hoverfly diversity potential. The site is characterised by open cut-over bog with remnants of the original bog dome in the centre of the site. Parts of the bog were in good condition with a high water table, presence of bog pools and high botanical diversity. Open bog pools and surrounding *Sphagnum* beds supported plants *Vaccinium oxycoccos, Narthecium ossifragum*, *Erica tetralix* and *Drosera anglica*. However, other sections were desiccated and undergoing active peat erosion. Stormanstown Bog is bound by bog woodland dominated by *Betula pubescens* and *Salix* spp., with more open areas along lanes supporting other non-peatland wildflower species such as *Heracleum sphondylium*, *Stachys sylvatica* and *Ranunculus repens*.

2.2. *Site stewardship*

Sections of the greater Ardee Bog complex are under active stewardship of Friends of Ardee Bog (FAB), a community-organised voluntary group founded in 2019 who focus on the protection of the bog complex through community engagement. FAB work with private landowners on the bog as much as possible to ensure the future of Ardee Bog is one of nature restoration, biodiversity enrichment and social cohesion. FAB are an invaluable community group for continued research and interest in the natural and human heritage of Ardee Bog.

2.3. *Survey methodology*

Walk-over surveys were conducted across the site and an insect net was used to capture hoverflies seen on the bog and woodland. Species were identified in the field with a 20x hand lens when possible and a voucher specimen was taken for collection purposes. Species not identifiable in the field were also collected. Generally, only one specimen of each species was collected. Specimen identifications were confirmed *ex-situ* under a stereo-microscope using the keys from Bot & Van de Meutter (2023), from which this current study's taxonomy nomenclature is based on.

Stormanstown Bog was visited a total of six times from June to August 2025. The visit on 02/08/2025 was organised as a hoverfly identification session, wherein, people had the opportunity to use nets and ID guides to better understand hoverfly morphology and ecology. This session focused on both open bog and bog woodland habitat.

3. Results

Overall, twenty-six species of hoverfly were found on Stormanstown Bog and associated bog woodland in the Summer of 2025. (**Table 1**). This represents 14% of hoverfly diversity in Ireland. The total hoverfly diversity of Stormanstown Bog increased by almost seven times from previous available data. Twelve species were observed in bog woodland only, eight in open bog only and nine in both habitats (**Fig. 1**). Twenty species were in the sub-family Syrphinae, eight in Eristalinae and one in Pipizinae.

Of particular interest were hoverflies *Paragus haemorrhous*, *Pipizella viduata* and *Sphaerophoria fatarum* which are under-recorded species in Ireland due to their size and identification difficulties. Three species were identified as new to County Louth (VC H31): *Epistrophe grossulariae, Pipizella viduata* and *Sphaerophoria fatarum.*

Table 1. Inventory of hoverfly species from Stormanstown Bog; * represents species recorded independent of this study.

Species	Date	Habitat	Sub-family
Baccha elongata	29/06/2025	Bog Woodland	Syrphinae
Chrysogaster solstitalis	12/07/2025	Bog Woodland	Eristalinae
Dasysyrphus albostriatus	02/08/2025	Open Bog	Syrphinae
Epistrophe grossulariae	29/06/2025	Bog Woodland	Syrphinae
Episyrphus balteatus	13/06/2025	Open Bog/Bog Woodland	Syrphinae
Eristalis pertinax*	19/06/2024	Bog Woodland	Eristalinae
Eristalis tenax	21/06/2025	Open Bog/Bog Woodland	Eristalinae
Eupeodes corollae	29/06/2025	Open Bog	Syrphinae
Helophilus hybridus	21/06/2025	Open Bog/Bog Woodland	Eristalinae
Helophilus pendulus	13/06/2025	Open Bog/Bog Woodland	Eristalinae
Leucozona glaucia	12/07/2025	Bog Woodland	Syrphinae
Leucozona laternaria	12/07/2025	Bog Woodland	Syrphinae
Melanostoma mellinum	29/06/2025	Open Bog/Bog Woodland	Syrphinae
Meliscaeva auricollis	13/06/2025	Open Bog/Bog Woodland	Syrphinae
Paragus haemorrhous	13/06/2025	Open Bog	Syrphinae
Pipizella viduata	13/06/2025	Open Bog	Pipizinae
Platycheirus albimanus	21/06/2025	Open Bog/Bog Woodland	Syrphinae
Platycheirus clypeatus	29/06/2025	Bog Woodland	Syrphinae
Platycheirus scutatus	13/06/2025	Bog Woodland	Syrphinae
Pyrophaena granditarus	21/06/2025	Bog Woodland	Syrphinae
Scaeva pyrastri*	07/07/2025	Open Bog	Syrphinae
Sericomyia silentis	13/06/2025	Open Bog/Bog Woodland	Syrphinae
Sphaerophoria fatarum	02/08/2025	Open Bog	Syrphinae
Syritta pipiens	02/08/2025	Open Bog	Eristalinae
Syrphus ribesii	13/06/2025	Open Bog/Bog Woodland	Syrphinae
Syrphus torvus	13/06/2025	Open Bog	Syrphinae
Volucella pelluscens	21/06/2025	Bog Woodland	Syrphinae
Xylota segnis	12/07/2025	Bog Woodland	Eristalinae
Xylota sylvarum*	19/06/2024	Bog Woodland	Eristalinae

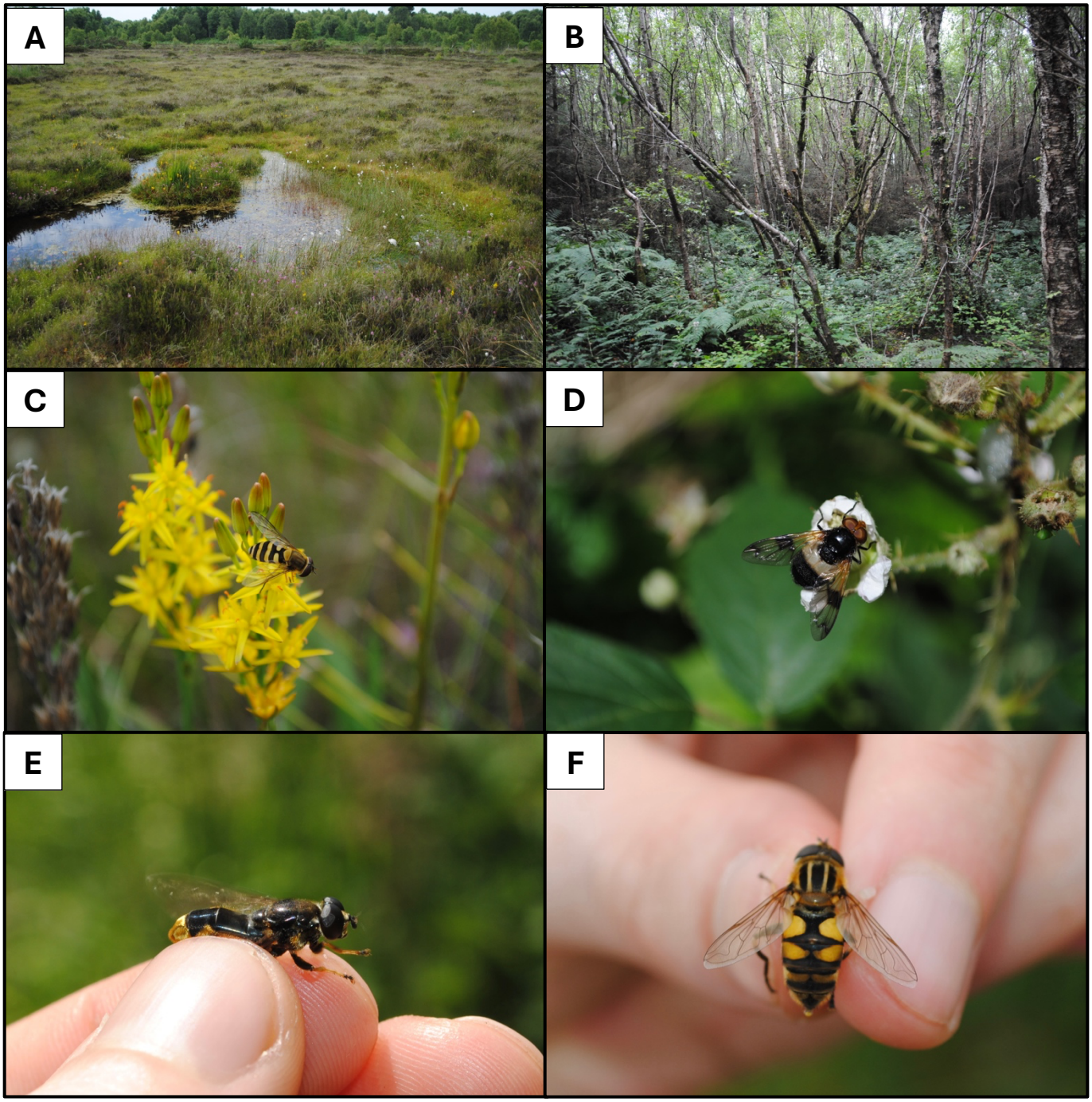

Figure 1. An illustration of the main habitat types (A = open raised bog; B = bog woodland) and a selection of hoverfly species found in Stormanstown Bog (C = *Syrphus* sp., D = *Volucella pelluscens*, E = *Xylota sylvarum*, F = *Helophilus hybridus*).

4. Discussion

4.1. *Habitat diversity on Stormanstown Bog*

Stormanstown Bog, and the larger Ardee Bog complex by extension, is evidently an important habitat for hoverflies. This is due, in large part, to the relatively undisturbed peatland habitat. The extensive areas of bog pools supports a diverse array of peatland plant assemblages, which in turn offer vital food sources for many invertebrates. Additionally, habitat diversity on and near Stormanstown Bog is an essential component in maintaining hoverfly diversity. The extensive acidic bog of Stormanstown also provides invaluable habitat for both habitat-specific and generalist species alike. However, bog specialist species were not often encountered with only *Seryicomia silentis* and *Sphaerophoria fatarum* having any significant association with peatland. The edges of the bog which are markedly less acidic, especially along gullies, support plants more typical of poor-fen and wet meadows such as *Filipendula ulmaria*, *Comarum palustre* and *Valeriana officinalis.* Many hoverflies are closely linked to these habitats like *Parhelophilus consimilis* and *Eurimyia lineata* and this should be taken into account in future surveying.

The bog woodland in which willow composes a significant component of, also offers an important early season food source for hoverflies. Ground flora of bog woodlands such as *Rubus fruticosus* agg., *Geranium robertanium* and *Circaea lutetiana* are frequented by species *Rhingia campestris*, *Melanostoma* spp., and more scarce species like *Matsumyia berberina*. These species are likely to be found on Ardee Bog. The discovery of *Xylota sylvarum* in 2024 by the author, a relatively scarce species associated with old-growth woodlands where there is sufficient dead wood for their larvae, is suggestive of suitable site conditions for saprophytic invertebrates. The much commoner *X. segnis* which was found during this study also supports this observation. Therefore, it is important that bog woodland is conserved.

Moreover, several species such as *Platycheirus albimanus* and *Syrphus* spp. were common in both open bog and bog woodland, highlighting how important habitat diversity is for hoverflies, since it is possible that certain species, especially those in the Eristalinae sub-family, are ovipositing in shallow bog pools and peaty gullies, and then feeding on a diverse array of flowers as adults. Interestingly, no *Cheilosia* species were observed, despite being the most specious genus of hoverflies in Ireland. Hoverfly records from outside this study site such as the bog species *Tropidia scita* and *Neoascia* spp., are likely to be found on Stormanstown Bog in future surveying.

4.2. *Surveying considerations and future research*

Survey effort is one of the major considerations for any ecological survey since factors such as the amount of visits, the amount of surveyors, the expertise of the surveyor(s) and the weather conditions, significantly affect the potential biodiversity outcome. This survey was the sole endeavour of the author. Additionally, the weather was varied throughout the course of the surveying; high temperatures on the Summer Solstice (21st June) were not

ideal surveying conditions and returned few species from the exposed open bog. Overcast and windy days were also encountered and were not conducive to pollinator surveying. However, fine days with mild temperatures and little to no wind were ideal.

It is worth noting that this survey and associated species inventory list is essentially a baseline for known hoverfly diversity on Ardee Bog, which up until now has been severely overlooked. Future biological recording and surveying on the bog will reveal greater diversity. FAB is a fundamental organisation for the future recording of hoverfly diversity on the bog. Furthermore, since this survey commenced in June, early season species were missed. Spring willow blossom welcomes a vast array of insect pollinators, and this should be investigated in the future.

5. Conclusion

Stormanstown Bog is undeniably an important lowland bog for hoverfly ecology, and this is supported by the data presented in this current study. This project also successfully improved the known hoverfly diversity on the bog, significantly increasing the overall species inventory. The importance of habitat diversity on Stormanstown Bog was also evident and it is advised here that future ecological restoration on the bog should also take into account the bog woodland as an essential habitat in maintaining hoverfly and overall biodiversity. Additionally, based on the expertise of the author, there remains a large gap in the inventory regarding common species such as those in the *Cheilosia* genus, which will be the next stage in future biological recording. It is hoped that with this inventory acting as a baseline, the endeavours of FAB in bog restoration in the future, will provide invaluable biological data for continued biodiversity monitoring. FAB are identified as a key component in biodiversity enrichment on Ardee Bog and with their support, other ecologists and entomologists will be supported and encouraged to dedicate their time and efforts to the Great Bog of Ardee.

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