Protecting Farmland Pollinators

National Biodiversity Data Centre
A Heritage Council Programme

Farmer Moth Monitoring EIP Project Report

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An Roinn Talmhaíochta, Bia agus Mara
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All-Ireland Pollinator Plan
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Summary of key achievements

- For the first time farmers in Ireland have led a pollinator monitoring scheme.
- Twenty farmers from Kildare and neighbouring counties Laois and Wicklow were able to independently operate moth traps and successfully monitor moths on their farms.
- Collectively, the moth traps were operated on 180 occasions by the farmers between the end of June and mid-October 2022.
- A total of 112 moth species was recorded across the 20 farms. This total includes macro-species and larger, more distinctive micro-species.
- Almost all the farmers' sites represent new locations for each of the 112 species recorded.
- The success of this project demonstrates the value of a nationwide and longer-term monitoring scheme whereby the distributions and populational trends of moths on Irish farmland can be accurately monitored.
- This project has shown the general interest and willingness of farmers in Ireland to engage in and contribute to citizen science.

Background

Moths are a magnificent group of organisms and are often overlooked. There are over 1,500 species of moth in Ireland, and they can be found in a range of habitats. Some species are widely distributed, while others are limited in their distribution. There is a myriad of reasons why a species of moth occurs in one place and not another, but often it is related to the caterpillar's food plant(s). Some caterpillars are restricted to specific types of plant which only grow in certain conditions. The timing of a moth's lifecycle is linked to the phenology of their food plant(s).

Forty-three of the 578 species of Irish macro-moths are threatened with extinction, whilst the conservation status of Ireland's micro-moths is unknown. Evidence from elsewhere however suggests that many species are in decline. Habitat destruction and degradation, driven by land-use change and chemical pollution is one of the leading causes of this decline.

MothsIreland manages a very large database of sightings of all moth species that occur in Ireland. This provides very detailed information on what species occur in Ireland and how they are distributed. The intention of this project was to test the feasibility of farmers helping to monitor moths that occur on their farms, to complement the huge amount of moth trapping being done by the MothsIreland network.

Some moths fly at night and some fly during the day. Both day and night flying moths are important pollinators and complement the work of other pollinator groups. They help keep plant populations diverse and abundant, which in turn supports crop yields. Irelands has five main pollinator groups: bees, hoverflies, other flies, moths, and wasps. Pollinators are important to farmers who grow pollinator dependent crops, to those who want to grow their own fruits and vegetables and for the health of our environment. Irish farmland has experienced wide-scale loss of pollinators over the last fifty years and the National Biodiversity Data Centre's All-Ireland Bumblebee Monitoring Scheme has demonstrated that these declines are ongoing. Considering evidence-based studies from elsewhere in Europe, we know that simple measures, such as communicating widely and clearly to interested farmers the importance of pollinators, can help farms to become more pollinator friendly. This can be achieved by providing farmer training and facilitating a farmer led monitoring scheme (e.g., the BIMAG (Boeren Insecten Monitoring Agrarische Gebieden) project in the Netherlands).

Long-running data on insect populations are scarce globally. Attempts to assess how these extremely diverse and ecologically vital creatures are doing in the current biodiversity crisis have been successfully rolled out by the National Biodiversity Data Centre (e.g., the All-Ireland Bumblebee Monitoring Scheme and the Irish Butterfly Monitoring Scheme). To date these schemes have not been focussed on Irish farmland. Farmland in Ireland comprises nearly two thirds of the total land surface. Farmers and their wider communities are at the heart of the solution to protecting our pollinators.

This project has for the first time tested the useability of a farmer led pollinator monitoring technique in the Irish context and has developed a simple farm moth monitoring system that is suitable for a national roll out. The project has also provided information on whether the number of moth species vary according to farm type (beef, dairy, mixed and tillage) and land use within the farm.

A national pollinator monitoring scheme in Ireland was called for in the All-Ireland Pollinator Plan 2021-2025, and a pilot scheme has been rolled out in 2022 by the National Biodiversity Data Centre (funded by the National Parks and Wildlife Services and the Department of Agriculture Food and the Marine). The pilot follows the EU Pollinator Monitoring Scheme recommendations published in 2020 and is focussed on wild bees and hoverflies. The EU recommendations suggest that where possible, an additional module on moths is included. This project tests and confirms the methodology for potential roll out of this additional moth module in Ireland.

Objectives

The project has four key aims:

1. To test the useability of a non-lethal moth (pollinator) monitoring technique across farmland of different types in the Irish context.
2. To test the time allocation, cost effectiveness and farmer buy in of this technique.
3. Based on the outcome, to develop a simple farm moth monitoring system that is suitable for wide roll out, and that could be included in the national pollinator monitoring scheme in line with EU recommendations.
4. To test whether the number of specimens vary according to farm type (beef, dairy, mixed and tillage) and land use within the farm (land managed for production where no intervention for the benefit of biodiversity has occurred versus land where intervention for the benefit of biodiversity has occurred).

Using the information on the useability of the farmer moth monitoring scheme will enable farmers to be able to monitor their farms for pollinators in a measurable way that does not impact on productivity.

Project Team

The Farmer Moth Monitoring Project was developed from the existing Protecting Farmland Pollinators EIP Project. Protecting Farmland Pollinators is a five-year EIP that has identified small actions that farmers can take that allow biodiversity to coexist within a productive farming system. By working closely with a group of 40 farmers, management practices that benefit bees on Irish farmland were identified, and a whole farm pollinator scorecard was developed. Farmer engagement with the project has been very positive. The participant farmers have been a great team to work with and an invaluable resource in terms of providing vital information on what biodiversity friendly management practices are possible on the farm. These farmers provided some of the inspiration that has led to the Farmer Moth Monitoring EIP. Twenty of the forty farmers participating in the Pollinators EIP are actively participating in the Farmer Moth Monitoring EIP as well.

The Farmer Moth Monitoring Project is coordinated by the National Biodiversity Data Centre. Owen Beckett, the Project Manager manages the day-to-day running of the project, overseen by Dr Saorla Kavanagh, the Project Co-Ordinator. Both are employed by the National Biodiversity Data Centre. Financial Management for the project was provided by Paulina Furmaniak and Cathy Walsh, both are employed by Compass Informatics. The 20 participant farmers contribute ideas and offer feedback whenever required. Figure 1 shows the key personnel involved in the project and their roles.

Figure 1 Farmer Moth Monitoring EIP Project Staff.

The Operational Group consists of representatives from, the National Biodiversity Data Centre, Bord Bia, Glanbia, Teagasc, Macra na Feirme and Trinity College Dublin and five Champion Farmers, (Table 1). The group is locally led by the five Champion Farmers across types (beef, dairy, mixed and tillage). It has been put together to ensure scientific expertise in pollinator requirements, project design and data analyses (National Biodiversity Data Centre, Trinity College Dublin); farmer engagement and knowledge transfer (Teagasc, Macra na Feirme); and to advise on future practical recommendations with respect to agri-environment (Teagasc) and biodiversity sustainability schemes from a commercial perspective (Bord Bia, Glanbia and Heineken Ireland).

Table 1 The Farmer Moth Monitoring EIP Project operational group members and their affiliations.

Name	Affiliation
Owen Beckett	Project Manager, Farmer Moth Monitoring EIP Project, National Biodiversity Data Centre
Saorla Kavanagh	Project Co-ordinator, Farmer Moth Monitoring EIP Project, National Biodiversity Data Centre
Úna FitzPatrick	Senior Ecologist, National Biodiversity Data Centre; Chair All-Ireland Pollinator Plan
Liam Lysaght	Centre Director, National Biodiversity Data Centre
Kim & Mireille McCall	Suckler Farmers, Co. Kildare
Andrew Bergin	Tillage Farmer, Co. Kildare
John McHugh	Dairy Farmer, Co. Kildare
Trevor Harris	Organic Farmer, Co. Kildare
John Keane	President, Macra na Feirme
Jane Stout	Senior lecturer, Trinity College Dublin; Deputy Chair All-Ireland Pollinator Plan
Sadhbh McCarrick	Origin Green, Bord Bia
Michael Hassett	Sustainability Development Advisor, Glanbia Ireland
Catherine Keena	Countryside Management Specialist Teagasc
Barbra-Anne Richardson	Communications and Sustainability Manager, HEINEKIN

Summary of Farmer Led Monitoring

Farmer recruitment

The farmer recruitment phase commenced early in 2022. Twenty farmers in total were recruited by the Project Co-ordinator from a larger group of farmers who are participating in the Protecting Farmland Pollinators EIP Project. Farms were selected to cover a wide range of farm types (five dairy, five beef, five mixed and five tillage) and intensities. Farms were also chosen to minimise the logistical cost of monitoring and were all based in Counties Kildare, Laois, and Wicklow. The participating farmers were given an outline of what the project would involve. Contracts outlining the fundamental details of the project were signed by both the farmer and the Project Manager.

Moth Trapping License

In early March, an application for a moth trapping license was submitted to the National Parks and Wildlife Service. The application outlined the key details of the project, such as the trapping period, locations, and administrative personnel, and in early April the license was granted.

Procuring the moth traps

Forty LedEmmer moth traps were ordered from the Dutch lepidopteran organisation De Vlinderstichting in February 2022. These traps were selected as they differ from the more traditional skinner or heath traps and offer several advantages:

- LedEmmer traps use an LED strip as a light source, which requires much less energy than a traditional bulb.
- They are battery-powered, meaning there is no need for a power cable, and they can be situated in a wider range of settings.
- The traps feature a light sensor, meaning there is no requirement to turn the light on and off either side of the trapping session as this will happen automatically.
- The traps are light in weight and relatively easy to assemble.

Figure 2 An image of the assembled LedEmmer trap with illuminated LED strip.

Trap delivery

The moth traps were delivered by the Project Manager to each of the participant farmers in late June. Each of the participants received two LedEmmer moth traps and an instruction booklet, which included background information on the project, guidance to trap operation and images of some of the common moths found on Irish farmland. A one-on-one demonstration of how the traps are set up and advice on where the traps should be situated were also given.

Description of monitoring activities by the farmer

The following actions were taken by the farmer:

1. Each farmer participated in a single hour training session.
2. Following the training, the farmer participated in a trial moth trapping night.
3. Farmers participated in ten moth trapping nights, two moth traps were set up on each farm, once every two weeks, shortening to weekly trapping session during October.
4. Farmers checked each trap first thing in the morning and sent photographs of each individual moth caught to the Project Manager for identification. Photographs were sent via email, SMS, or WhatsApp.
5. All farmers received feedback on the moth species identified on their farm.

Moth trapping procedure

Trap location

One trap was placed within a pasture or tillage field (area on the farm not managed for biodiversity) and the other was placed next to a hedgerow within the same filed (area managed for biodiversity). The first trap was placed in a field which was most representative of the farm. Ideally the trap was placed towards the centre of the field at a distance of at least 80 metres from the field boundary. A tramline was recommended as an ideal location for this trap. It was also recommended that the trap should not be placed in a field in which the crops are significantly taller than the trap. If the crops were taller than the trap, they could reduce trap effectiveness by limiting the amount of light emitted.

The second trap was placed along a margin the same field. It was recommended that field margins situated under mature overhanging trees should be avoided. Between trapping nights, the traps were to be stored in a dry, safe environment indoors between uses.

Figure 3 Assembled LedEmmer moth traps situated beside a field margin (*left*) and in the centre of a field in Kildare (*right*). Photos: Rachel Creighton.

Trap schedule and timing

Each trap was placed in situ for a single night at two-week intervals. When possible, the traps were placed in the same location in the same field for each trapping night.
Moth traps were set up by the farmers before 9pm (or before dusk) each night. Once the traps were set up and switched on, the LED would illuminate automatically when the light levels were low enough, and the light automatically turned off the following morning.

Trapping was only conducted if the weather was suitable and there was little to no wind or rain. A light breeze or passing shower was acceptable, but if there was persistent rain or if there was difficulty getting the trap to stay in place without blowing over, then the trapping was postponed.
To mitigate against the challenges associated with moth trapping in unreliable weather conditions, trapping two or three days either side of the proposed dates was permitted.

Between trapping sessions, the power source was charged overnight or for approximately 6-12 hours, depending on the level of charge left. It was recommended that the power source should have all four bars illuminated before use. This ensured the traps would remain illuminated for the entire night and ensured consistency for all traps on each of the farms.

Checking the traps

The traps were checked between 6:30 am and 9:00 am the following morning, depending on the farmers' routines and the time of year. The lid of the trap was removed with caution and the egg boxes were removed slowly. Any macro moths and larger micro moths present (those which are larger than 1cm in length) were photographed. Once the moths were photographed, they were released. It was recommended that the moths were released in an area of long grass or dense vegetation where the risk of predation by birds is reduced.

Results

Moths found on the farms

Traps were operated 180 times collectively by the 20 farmers between the 30th of June and the 24th of October 2022. Over the course of the trapping period, 874 moths were identified. A total of 112 moth species were recorded, of which 28 were micro moths and the remaining 84 were macro moths. These figures include macro moth species and some of the larger micro moths. As such, the true species total would be appreciably higher if all micro moth species were included in the count. It was decided that the smaller, more inconspicuous micro-species would not be included in the monitoring project as identification can be rather difficult and, in some cases, impossible from photographs. Their small size means that they are difficult to photograph accurately without special equipment. The complete species list can be viewed in Appendix 1.

What farm type recorded the most species?

A variety of moth species were recorded across each farm type. A beef farm had the highest diversity of moths overall recording 48 species in total. The second highest was a mixed farm with 45 species. This was closely followed by a beef farm and a mixed farm where both recorded 44 species.

Across the four farm types, mixed farms recorded the highest species total, with 88 moth species recorded. Beef and dairy farms recorded similar moth species totals, with 74 and 71 species respectively, whilst tillage farms collectively recorded 54 species (Table 2 and Figure 4).

The variability in the total number of species recorded and the lower number of species recorded on tillage farms, could be a result of the number of moth trapping sessions completed (i.e., the number of times that the moth traps were operated on a farm) on each farm type (Table 2). However, the average number of moth species across each of the farm types was higher in the beef and mixed farms compared to the dairy and tillage farms (Figure 5). Beef farms had the highest average number of species, despite having the second highest overall species total and second highest number of moth trapping sessions (Figures 4 and 5). It is important to note that these results are from a small sample size of forty sites (20 farms).

Table 2 Total number of moth trapping sessions, the total number of species recorded, and the average number of moth species recorded for each farm type (beef, dairy, mixed and tillage).

Farm type	Sum of moth trapping sessions	Total number of moth species	Average number of moth species
Beef	42	74	18
Dairy	40	71	14
Mixed	64	88	17
Tillage	30	54	13

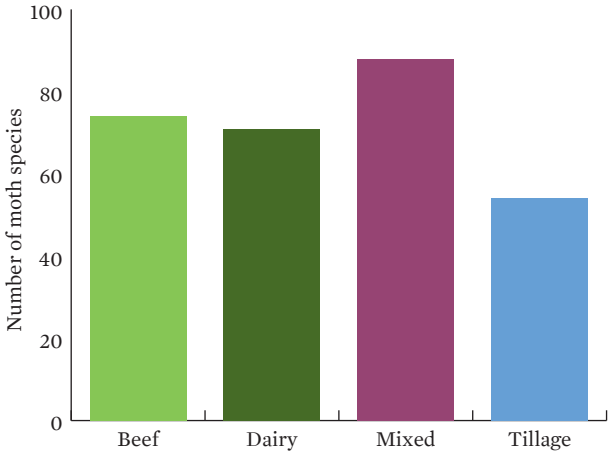

Figure 4: The total number of moth species found on each farm type.

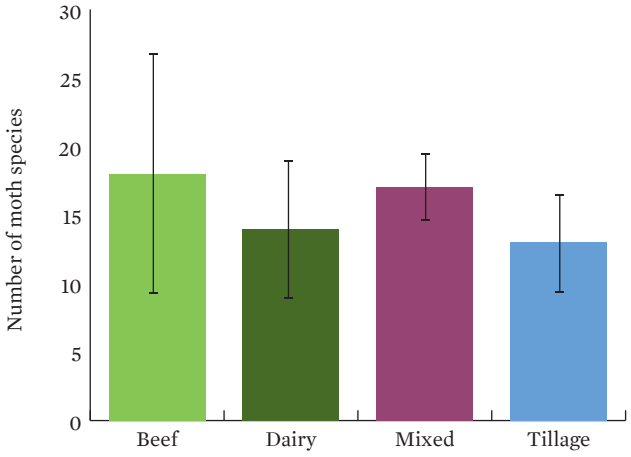

Figure 5: The average number of moth species per farm type (Beef= 4 farms, SD= 17.06; Dairy= 5 farms, SD= 11.01; Mixed= 5 farms, SD= 5.29; and Tillage= 4 farms, SD= 6.99).

Did trap location have an impact?

When comparing the two trapping location types, traps situated along the hedgerow or field margin exhibited a greater variety and frequency of moth species, (Figure 6 and 7). This is not surprising, as hedgerows often contain caterpillar foodplants as well as nectar sources for adult moths.

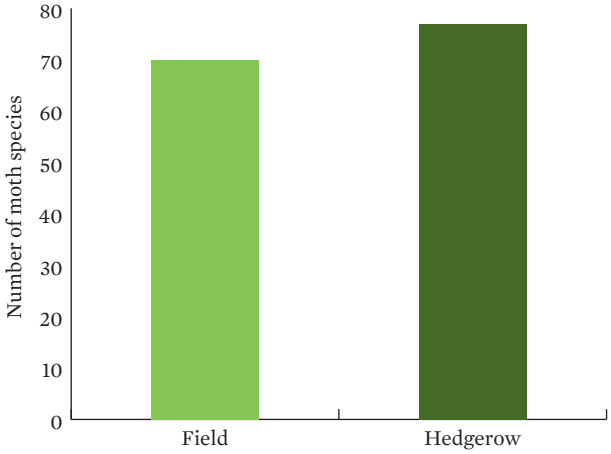

Figure 6 The total number of different species observed at each of the trapping locations (field and hedgerow).

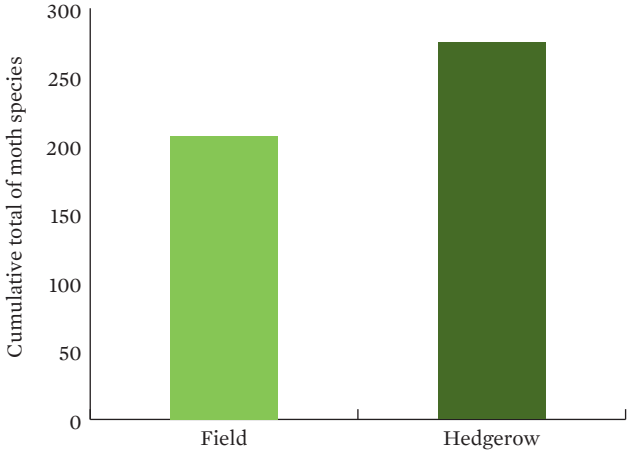

Figure 7 The cumulative total of the 112 moth species observed in the field traps compared to the hedgerow/field margin traps. The 'Cumulative total of moth species' refers to the total number of times different species were observed.

What moth species were recorded in the project?

The top ten species recorded on the 20 farms are listed in Table 3. The most frequently encountered species was the Large Yellow Underwing (*Noctua pronuba*), which is a common and often ubiquitous moth in Ireland and a frequent find in moth traps across the island, particularly between June and August. This was encountered 55 times throughout the trapping period and found on 17 farms. Other species which were encountered frequently include the Common Rustic agg. (*Mesapamea secalis agg.*), Setaceous Hebrew Character (*Xestia c-nigrum*), Heart-and-Dart (*Agrotis exclamationis*) and Lesser Broad-bordered Yellow Underwing (*Noctua janthe*) (Table 2).

Figure 8 Large Yellow Underwing (Gail Hampshire), Setaceous Hebrew Character (Colm Flynn), Heart & Dart (Mirielle McCall), and Common Rustic agg. (Gail Hampshire).

Table 3 A list of the top ten most frequently encountered moth species, showing the number of times each species was recorded as well as the number of farms in which each species was found.

Species	Count of species	Number of farms
Large Yellow Underwing	55	17
Common Rustic	40	17
Setaceous Hebrew Character	37	16
Heart and Dart	36	18
Lesser Broad-bordered Yellow Underwing	35	15
Rosy Rustic	25	16
Small Square-spot	25	17
The Uncertain	24	14
White Ermine	23	12
Dark Arches	23	14

None of the 112 species recorded were particularly rare or restricted species, although several localised species were recorded such as the Heath Rustic (*Xestia agathina*), a heathland specialist and Yellow-tail (*Euproctis similis*) which is restricted to the eastern counties.

Did time of year have an impact?

There was a notable change in species abundance as the trapping period progressed (Figure 9). As expected, the number of different moth species was at its highest in mid-July, followed by the end of July and the end of June respectively (Figure 9). There was a notable drop-off in species abundance at the end of August, which is a common trend observed when moth-trapping in Ireland. Ten traps returned zero moth species (5.6%). Most of the empty traps were observed towards the end of the trapping period as seven out of ten occurred during September and October. This was not unexpected, as the cooler and more unreliable weather at that time of year coupled with fewer species being in flight means that empty traps are not uncommon. Note that the smaller cumulative species totals situated between the higher totals in this figure represent trapping nights when a small number of farmers operated their traps instead of on the proposed date, due to poor weather conditions.

There was also a notable change in species composition as the trapping period progressed. Species such as The Uncertain (*Hoplodrina octogenaria*), Map-winged Swift (*Korscheltellus fusconebulosa*) and White Ermine (*Spilosoma lubricipeda*) were encountered regularly during June and July but were absent by mid-August. Other species such as the Setaceous Hebrew Character, Lesser Broad-bordered Yellow Underwing and Small Square-spot (*Diarsia rubi*) were absent or uncommon until August, by which stage they were often the most abundant and frequently encountered species. There was a significant drop-off in species abundance towards the end of August. However, several autumn specialist species were encountered during September and October, such as the Green-Brindled Crescent (*Allophyes oxyacanthae*), Frosted Orange (*Gortyna flavago*), Beaded Chestnut (*Agrochola lychnidis*) and Black Rustic (*Aporophyla nigra*).

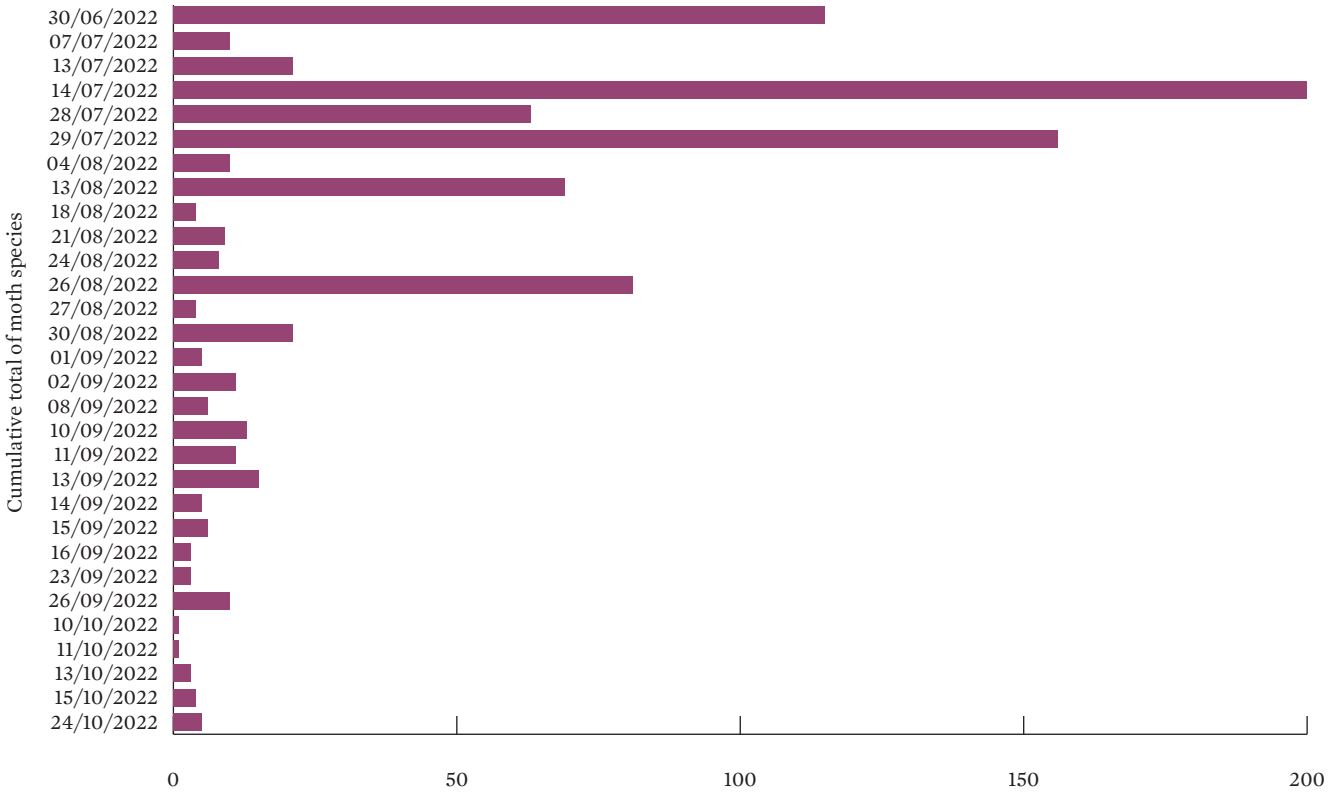

Figure 9 The cumulative total of the 112 different species counts across the 20 farms over the course of the monitoring period (June to October). The 'Cumulative total of moth species refers to the number of times each species was encountered. It is not a cumulative total of the number of specimens found of each species.

Development of resources to support farmers

The project saw the opportunity to publish several resources that would be beneficial for participants, the wider citizen science network, and the public. Using the data generated from this project a flyer on the six most common farmland moths is being designed. Moths that are easily identified will be included in the flyer. This flyer includes an image of each species and information on the distribution of the species and the key identification features. Additionally, an identification swatch is currently being designed on commonly encountered moths in Ireland. Both the swatch and the flyer will be made available on the National Biodiversity Data Centre's website.

Additional Information

Before the beginning of the trapping period, permission to be added to a WhatsApp group was granted by the participants. This WhatsApp group facilitated knowledge transfer between the participant farmers. It allowed for progress and ideas to be shared and other relevant discussion to take place. It was the decision of the Project Co-ordinator and Project Manager that the latter would oversee the group but would not be heavily involved to allow the participants to steer the discussion themselves. Over the course of the trapping period, several practical considerations were raised by the farmers and reported to the Project Manager. Subsequently solutions, or mitigation measures were devised by the Project Manager and the farmers. Some examples are listed below:

1. Despite checking the weather forecast for the proposed night of trapping, unexpected gusts showed that the trap could be tipped over, which would render it nearly useless for trapping. A solution for this was to increase the weight of the trap by placing a small, weighted object inside the bucket. This object should not be overly large or heavy to avoid breaking or cracking the bucket. Several participants recommended a small stone or brick.
2. Two of the light sensors were reported to be faulty and less sensitive, consequently the LED strips did not switch on or off automatically as intended. One solution which was proven to be effective was to wrap a piece of fabric (a sock) over the sensor to simulate night-time. This allowed the LED strip to illuminate. When the fabric was removed the following morning, the LED strip then switched off.
3. To correctly set up the trap, the cable which connects the power source to the LED strip via the light sensor must be fed through a small pre-cut hole in the side of the bucket. On more than one occasion it was reported that the pre-cut slit in the bucket was quite sharp and was able to slice through the rubber casing of the cable. To mitigate this, the cable should be fed through the gap slowly and with care. Other challenges became apparent during the trapping period. If the scheme were to be rolled out on a larger scale in the future, then these additional points of consideration may need to be addressed:
4. Photo quality: In most cases the moths were photographed clearly enough to be identified, but occasionally photos which could not be used for identification were received. The most common problem was that the photos were either too blurry/not focussed or they were taken at too great a distance to see the key identification features. This is easily rectified with more specific guidance regarding photographing technique.
5. Participant commitment to trapping nights: Moth trapping nights may be missed by other commitments. One example is summer holidays. To mitigate against a missed trapping night for personal commitments, farmers could complete a catch-up trapping night at their earliest convenience.
6. Force majeure: One participant unfortunately broke their leg during the programme and was unable to trap for 8 nights. To mitigate against missed trapping nights in a circumstance like this one, participants could nominate a friend or family member to cover the trapping nights in their place.

Farmer engagement

This is the first time a monitoring project of this scale and scope has been successfully undertaken by farmers in Ireland.

Nineteen of the 20 participant farmers were engaged in the WhatsApp group and many actively contributed to group discussions. Several challenges regarding the trapping (outlined above) were raised in the group and many of the participants offered suggestions and solutions. The group was also beneficial for planning alternative trapping dates due to unfavourable weather and for the farmers to update one another with their respective moth catches.

Figure 10 Buff Arches and The Herald (Mireille McCall).

Several farmers expressed their interest in moth trapping outside of the project and took a great interest in the moth species which were previously unknown on their land. Several were keen to operate the traps independently of the proposed trapping schedule in alternative locations to those which had been selected. Others also mentioned their desire to keep the traps for use in the future. Several farmers expressed their interest in further involvement should the project continue beyond the current proposal.

Recommendations for future work

The practical nature of the trapping procedure and trap design have resulted in a highly cost-effective monitoring programme. The traps are simple to assemble, easily manoeuvrable and straightforward to operate, as well as being available at a relatively low unit cost (€135 including VAT and delivery) in comparison with more traditional moth traps. These practical considerations are key to farmers successfully monitoring their farms independently. The absence of any requirement for entomological experts to actively trap the moths onsite themselves gives this project a very broad scope and offers huge potential, as well as reducing the administrative burden. The trapping schedule will provide enough data for long-term monitoring whilst simultaneously not overexerting the participating farmers. Another benefit of the practicality of the traps, is the automatic light sensor which reduces the required time input. Farmers dedicated approximately one hour to this project every two weeks.

During the recruitment phase, there was little difficulty in meeting the requirement of 20 farmers for the project to commence. This signifies an interest among Irish farmers in biodiversity and actively contributing to citizen science. With such a successful farmer buy-in during the pilot, it is feasible that a similar level of uptake would be experienced throughout Ireland. Additionally, once farmers from outside of the project found out about the monitoring programme, emails started to come in with requests to join up.

We have developed a robust and scientifically rigorous farmer led moth monitoring scheme that is suitable for a national roll out and that has the potential to assesses how pollinator-friendly (moths) a farm is regardless of type, or intensity level. This is a new and innovative approach to nature conservation on farmland.

This scheme has helped farmers gain a better understanding of biodiversity and has allowed them to engage with nature on their land in a very positive way. There is a clear body of Irish evidence for the consideration of a National Farmer Led Moth Monitoring Scheme.

The National Biodiversity Data Centre is ideally placed to run an Island wide or National Farmer Moth Monitoring Scheme. The Centre has experience of citizen science, collecting data on country wide biodiversity and monitoring biodiversity. A proposal for the roll out of a national scheme will be written which will include the costings of such a scheme. The hope is that the scheme will be rolled out on a phased basis over a 5-year period (funding dependant) with an increasing number of participant farms joining the project each year.

Appendix 1: Complete moth species list

Common Name	Latin Name
Common Swift	*(Korscheltellus lupulina)*
Map-winged Swift	*(Korscheltellus fusconebulosa)*
Ghost Moth	*(Hepialus humuli)*
Elderberry Pearl	*(Anania coronata)*
Mother-of-Pearl	*(Pleuroptya ruralis)*
Brown China Mark	*(Elophila nymphaeata)*
Beautiful China Mark	*(Nymphula nitidulata)*
Chinese Character	*(Cilix glaucata)*
Peach Blossom	*(Thyatira batis)*
Buff Arches	*(Habrosyne pyritoides)*
Poplar Hawkmoth	*(Laothoe populi)*
Elephant hawkmoth	*(Deilephila elpenor)*
Single-dotted Wave	*(Idaea dimidiata)*
Small Fan-footed Wave	*(Idaea biselata)*
Riband Wave	*(Idaea aversata)*
Shaded Broad-bar	*(Scotopteryx chenopodiata)*
Garden Carpet	*(Xanthorhoe fluctuata)*
Dark-barred Twin-spot Carpet	*(Xanthorhoe ferrugata)*
Flame Carpet	*(Xanthorhoe designata)*
Common Carpet	*(Epirrhoe alternata)*
Sharp-angled Carpet	*(Euphyia unangulata)*
Dark Spinach	*(Pelurga comitata)*
July Highflyer	*(Hydriomena furcata)*
Barred Yellow	*(Cidaria fulvata)*
Purple Bar	*(Cosmorhoe ocellata)*
The Chevron	*(Eulithis testata)*
Barred Straw	*(Gandaritis pyraliata)*
Small Phoenix	*(Ecliptopera silaceata)*
Common Marbled Carpet	*(Dysstroma truncata)*
Green Carpet	*(Colostygia pectinataria)*
November Moth	*(Epirrita dilutata)*
Double-striped Pug	*(Gymnoscelis rufifasciata)*
Green Pug	*(Pasiphila rectangulata)*
The Magpie	*(Abraxas grossulariata)*

Common Name	Latin Name
Clouded Border	*(Lomaspilis marginata)*
Brimstone Moth	*(Opisthograptis luteolata)*
Latticed Heath	*(Chiasmia clathrata)*
Bordered Beauty	*(Epione repandaria)*
August Thorn	*(Ennomos quercinaria)*
Canary-shouldered Thorn	*(Ennomos alniaria)*
Early Thorn	*(Selenia dentaria)*
Scalloped Oak	*(Crocallis elinguaria)*
Peppered Moth	*(Biston betularia)*
Willow Beauty	*(Peribatodes rhomboidaria)*
Mottled Beauty	*(Alcis repandata)*
Light Emerald	*(Campaea margaritaria)*
Brussels Lace	*(Cleorodes lichenaria)*
Large Emerald	*(Geometra papilionaria)*
Pebble Prominent	*(Notodonta ziczac)*
Coxcomb Prominent	*(Ptilodon capucina)*
Buff-tip	*(Phalera bucephala)*
The Herald	*(Scoliopteryx libatrix)*
The Snout	*(Hypena proboscidalis)*
Yellow-tail	*(Euproctis similis)*
Buff Ermine	*(Spilosoma lutea)*
White Ermine	*(Spilosoma lubricipeda)*
Muslin Moth	*(Diaphora mendica)*
Garden Tiger	*(Arctia caja)*
The Cinnabar	*(Tyria jacobaeae)*
Muslin Footman	*(Nudaria mundana)*
Round-winged Muslin	*(Thumatha senex)*
Buff Footman	*(Eilema depressa)*
Common Footman	*(Eilema lurideola)*
The Fan-foot	*(Herminia tarsipennalis)*
The Spectacle	*(Abrostola tripartita)*
Burnished Brass	*(Diachrysia chrysitis)*
Gold Spot	*(Plusia festucae)*
Grey Dagger	*(Acronicta psi)*
The Shark	*(Cucullia umbratica)*
Copper Underwing	*(Amphipyra pyramidea)*
Mouse Moth	*(Amphipyra tragopoginis)*
Green-brindled Crescent	*(Allophyes oxyacanthae)*
Mottled Rustic	*(Caradrina morpheus)*
The Uncertain	*(Hoplodrina octogenaria)*

Common Name	Latin Name
The Rustic	*(Hoplodrina blanda)*
Angle Shades	*(Phlogophora meticulosa)*
The Crescent	*(Helotropha leucostigma)*
Frosted Orange	*(Gortyna flavago)*
Rosy Rustic	*(Hydraecia micacea)*
Flounced Rustic	*(Luperina testacea)*
Small Wainscot	*(Denticucullus pygmina)*
Dusky Brocade	*(Apamea remissa)*
Dark Arches	*(Apamea monoglypha)*
Common Rustic	*(Mesapamea secalis)*
The Sallow	*(Cirrhia icteritia)*
Beaded Chestnut	*(Agrochola lychnidis)*
The Chestnut	*(Conistra vaccinii)*
Pale Pinion	*(Lithophane socia)*
Centre-barred Sallow	*(Atethmia centrago)*
Black Rustic	*(Aporophyla nigra)*
Hebrew Character	*(Orthosia gothica)*
Hedge Rustic	*(Tholera cespitis)*
Antler Moth	*(Cerapteryx graminis)*
Bright-line Brown-eye	*(Lacanobia oleracea)*
Dot Moth	*(Melanchra persicariae)*
Common Wainscot	*(Mythimna pallens)*
Smoky Wainscot	*(Mythimna impura)*
The Clay	*(Mythimna ferrago)*
Heart & Dart	*(Agrotis exclamationis)*
The Flame	*(Axylia putris)*
Flame Shoulder	*(Ochropleura plecta)*
Ingrailed Clay	*(Diarsia mendica)*
Small Square-spot	*(Diarsia rubi)*
True Lover's Knot	*(Lycophotia porphyrea)*
Large Yellow Underwing	*(Noctua pronuba)*
Lesser Yellow Underwing	*(Noctua comes)*
Lesser Broad-bordered Yellow Underwing	*(Noctua janthe)*
Dotted Clay	*(Xestia baja)*
Heath Rustic	*(Xestia agathina)*
Setaceous Hebrew Character	*(Xestia c-nigrum)*
Double Square-spot	*(Xestia triangulum)*

National Biodiversity Data Centre
A Heritage Council Programme

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Contact Details

Owen Beckett, Project Manager
obeckett@biodiversityireland.ie

Saorla Kavanagh, Project Co-ordinator
+353 (0) 51 306 240

eip@biodiversityireland.ie
@BioDataCentre
Biodiversity Data Centre
www.biodiversiryireland.ie/farmland/moths/

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