

# MISE

2015



Mammals in  
a Sustainable  
Environment

**MISE**, fostering  
Community involvement  
in Mammal Conservation.

## FEATURED ARTICLES

Otters

Pine marten

Harvest mice

Education

Volunteer perspective

# Introduction

The Mammals in a Sustainable Environment project (MISE) fosters the involvement of communities in mammal conservation through public engagement in mammal survey work. The project aimed to develop and run a range of workshops and training courses to enhance public understanding of the mammals in Ireland and Wales, to heighten public awareness of mammals in the environment by involving volunteers in sample collection and to use DNA analysis to monitor key mammal species from non-invasively collected samples.

MISE is a collaboration between Waterford Institute of Technology (WIT) (lead partner), Waterford City and County Council and the National Biodiversity Data Centre in Ireland, and The Vincent Wildlife Trust, Natural Resources Wales and Snowdonia National Park Authority in Wales. The project is part-funded by the European Regional Development Fund (ERDF) through the Ireland Wales Programme (INTERREG 4A). Over the course of the project, two partners underwent organisational mergers, which saw the Countryside Council for Wales become part of Natural Resources Wales, and Waterford County Council merged with Waterford City Council to become Waterford City and County Council.

In this publication, you will read about some of the varied work that the MISE project has engaged in, including otter surveys, red squirrel conservation and grey squirrel control efforts, bat surveys and small mammal surveys. Throughout the project, we have engaged with thousands of people through local wildlife surveys, school visits and community events. The results from our events have been disseminated at community talks and national and international conferences, thus ensuring that scientific and local community members learn about our work and findings.

As this current project draws to a close, MISE will be leaving a number of legacies behind including the establishment and revival of local mammal groups, conservation enhancements such as bat and pine marten boxes and educational resources. The data from our surveys will all be made publically available at record centres in Ireland and Wales, from which planning authorities, researchers and interested individuals can access the information. Finally, the lessons, achievements and successes from the MISE project will be used to help us create our next collaborative project which we hope will commence in the near future.

## Funding and Partner logos



**EUROPEAN REGIONAL  
DEVELOPMENT FUND**





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# Humans of MISE

## Meet the human dimension of the MISE Project

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### Lead Partner: Waterford Institute of Technology (WIT)

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#### Dr Catherine O'Reilly, MISE Project Leader



Catherine obtained a BA (mod) from Trinity College Dublin where she also carried out her PhD studies on unstable mutants in *Salmonella typhimurium*. Catherine completed postdoctoral positions at the Max Plank institute, Cologne, Germany and Durham University, UK, before being appointed as a lecturer in molecular genetics at the University of Sunderland. Catherine joined WIT in 1995 where she continued her research in molecular and microbial biology, but she also developed a

new interest in ecology. Catherine initially applied her molecular skills to develop novel DNA analysis techniques to monitor pine marten populations. Her research has now considerably expanded to incorporate a wide range of mammal species in the Molecular Ecology Research Group. These DNA techniques were integral to the establishment of the MISE project.

#### Dr Peter Turner, MISE Project Leader



Peter originally trained as a biochemist in Bath, and spent time working in neurobiology and enzymology in Dublin. He then worked in industry in the UK for 12 years developing biological toxic waste treatments and plastics derived from bacteria. Peter finally managed to escape the lab into Ecology after returning to Ireland. Peter now uses his broad scientific experience combining lab

based DNA methods and field ecology to track wild pine marten using forensic science.

#### Dr David O'Neill, MISE Project Manager



David graduated with a BSc (Hons) in Applied Biology with Quality Management from WIT. He also completed his PhD at WIT where he investigated the genetic systems behind the ability of seaweed to accumulate metals. David started with MISE in 2011 as the Project Scientist, originally working on the development and application of new DNA tests, and later became Project Manager.

Between the jigs'n'reels, his scientific interests lie in molecular biology techniques and has research experience in their application to study DNA in bacteria, algae and animals.



*The MISE Project was selected as one of 11 projects to showcase the programme.*



**Dr Lee Coffey, Former MISE Project Manager**

Lee completed a BSc (H) in Applied Biology with Quality Management and a PhD in Molecular Biotechnology at WIT in 2002 and 2007, respectively. In this time he gained experience in industry in both microbiological and pharmaceutical laboratories. Lee conducted his postdoctoral research at the PMBRC from October 2007 to March 2011, expanding the biocatalysis

research while also serving as manager of the Molecular Biology research lab. In March 2011 he became Project Manager for the MISE project until August 2013. Lee then left the MISE project to take up a role as Lecturer in the Department of Science, WIT and a Principal Investigator at the PMBRC where he is now leading the molecular biotechnology/biocatalysis research group.



**Edel Sheerin, MISE Project Assistant**

Edel graduated from the National University of Ireland, Galway with a BSc in Zoology. She joined the MISE team in September 2013 as Project Assistant and has been responsible for conducting the genetic analysis of MISE samples in the laboratory. In her free time she enjoys getting outdoors; hill walking, horse riding and surfing! Her

research interests lie in the field of conservation genetics and she intends to pursue a career in this area.



**Dr Denise O'Meara, MISE Project Officer**

Denise has a PhD in the area of red squirrel genetics from WIT and a BSc in Applied Ecology from University College Cork. Denise has been working with the MISE project since its commencement in 2011, and played important roles in the development and organisation of local otter surveys and worked extensively on

educational projects with school groups. Denise is passionate about science communication and outreach.



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## **Waterford City and County Council**

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**Bernadette Guest, Heritage Officer**

Bernadette is Heritage Officer with Waterford City and County Council. The Heritage Office provides a strategic and co-ordinated approach to managing heritage through the implementation of the Waterford Heritage and Local Biodiversity Plans and also provides advice and information on heritage projects, heritage funding and heritage legislation both within the local authority and to the wider community. The Heritage Officer

is involved in project management of the MISE INTERREG project. The project has provided significant data that is being used as environmental indicators feeding into the Waterford Habitat Map and informing conservation assessments within planning authority work programmes and policy.



*It was another fantastic opportunity to raise the profile of the project and showcase our work to the very best of Ireland's science community.*



**Andrew Harrington, MISE Project Officer**

Andrew graduated from UCC with a BSc in Applied Ecology, and after stints as a volunteer worker on a wildlife preserve in Oregon and as a science teacher back home in Ireland, joined the MISE Project at its commencement in 2011. Andrew has a wide interest in wildlife and conservation but has enjoyed the experience of working on wild

mammals and in particular bats. He is currently pursuing a part-time MSc on bat genetics in WIT.



### **National Biodiversity Data Centre, Ireland**

**Dr Liam Lysaght, Director**

Liam is Director of the National Biodiversity Data Centre in Waterford, a national organisation that collects and manages data on Ireland's biodiversity. He is originally an ornithologist by training, but has become involved in projects on many different aspects of biodiversity. He is currently leading

the Atlas of Mammals in Ireland project which will produce detailed distribution maps of over 60 species of mammals that are found in Ireland and its offshore waters. Liam previously worked with The Heritage Council and began his professional career as Park Ranger in the Burren National Park.



### **The Vincent Wildlife Trust (VWT), Wales**

**Dr Henry Schofield, Conservation Programme Manager**

Henry has worked for the VWT since 1990. After studying for a PhD in the ecology and conservation biology of lesser horseshoe bats, Henry set up the Trust's first bat reserves for this species. This was followed by further projects on rare tree bats. Henry's role is to have an overview of the

Trust's conservation and research projects, and to develop and oversee the Trust's conservation policy. Henry has a long-term interest in bats but enjoys working on all mammals. He is a keen amateur photographer and a trustee of BatLife Europe.



**Natalie Buttriss, CEO**

Natalie was appointed as the VWT's first CEO in 2007, bringing to the Trust extensive business, marketing and fundraising skills gained in her charity business career. Her responsibilities include working with the Board of Trustees in leading the strategic direction of the Trust, developing policies and managing the staff, finances and resources. She is directly involved in developing

key partnerships and funding bids and ensuring the work of the Trust is promoted to relevant audiences. Prior to the VWT, Natalie worked in the not-for-profit sector for over 20 years primarily for environmental charities including The Woodland Trust, Sustrans and Gloucestershire Wildlife Trust. She is based near Ledbury, Herefordshire, UK.



#### **Aline Denton, MISE Project Officer**

Aline, a Zoology graduate, joined the VWT in February 2014 as project officer on the Trust's partnership project, MISE. Prior to this, Aline had a 17 year career in the bio-pharmaceutical sector in manufacturing and compliance roles, and pursued her interest in the natural world in her spare time. Since 2009, Aline has been working and volunteering with a variety of conservation

organisations in mid Wales, including CCW (now NRW), and Denmark Farm Conservation Centre where she is now a Trustee. She is also an active member of her local bat group.



#### **Dr Jenny MacPherson, Former MISE Project Officer**

Jenny is a zoologist with a background in research on a range of mammal species including pine marten, dormice, red squirrel, water vole and mink. She gained an MSc in conservation at University College London and then went on to a PhD at Royal Holloway. She joined the VWT at the beginning of 2011 as Project Officer on the MISE project,

working with volunteers and local communities on surveys and conservation of a range of mammal species in west Wales. In 2014, Jenny became the Trust's Pine Marten Project Manager, managing the Pine Marten Recovery Project for England and Wales.



#### **Natural Resources Wales (NRW), Wales**

##### **Dr Liz Halliwell, Mammal Ecologist**

During the course of her career Liz has worked on a range of British mammals including badgers, dormice, mink and moles. She gained a PhD from Aberdeen University following research into the relationship between red squirrels and pine martens. In 2001 Liz joined the Countryside Council for Wales as Mammal Ecologist, providing specialist

advice, information and strategic overview of issues related to the conservation and management of terrestrial mammals. She continues in the same role in NRW, including managing of NRW's element of the MISE project and has welcomed the opportunity to get out and do more fieldwork!



#### **Becky Clews-Roberts, MISE Project Officer**

Becky's previous roles with The Mammal Society, RSPB Cymru and as a self-employed Ecological Consultant have enabled her to hit the ground running as Project Officer for the final year of the project in north Wales. Her knowledge of MISE was gained whilst volunteering for Ceri Morris on a variety of surveys including the Dwyryd Otter surveys, dormouse box checks and harvest mouse

nest search and bait pot surveys. She has very much enjoyed being part of MISE and working alongside such superb volunteers!



#### **Ceri Morris, former MISE Project Officer**

Ceri came from a background in Marine Biology, and previously worked with dolphins in Scotland and humpback whales in Australia. Returning to her native North Wales, she worked on conservation based projects focussing on communities, volunteers and public engagement. When she came to the MISE Project in 2011, she soon had to learn all about dormice, otters and

red squirrels, and quickly discovered a passion for sniffing out otter spraint! After 3 years with MISE, her dream job opportunity came up at NRW and she moved on to become a Marine Mammal Specialist where she provides advice on marine mammal conservation in Wales.



A photograph of a stoat, a small carnivorous mammal, standing on a mossy ground. The stoat has a brown back and a white belly. It is looking upwards and to the left. In the background, there is a large, textured tree trunk. The overall scene is natural and somewhat dark, with the moss providing a green contrast.

# Our Smallest Carnivores

MISE Surveys for Stoats and Weasels

Article by:  
Andrew Harrington  
Aline Denton

## Our Smallest Carnivores

The stoat (*Mustela erminea*) and the weasel (*Mustela nivalis*) are among the most elusive mammal species in the British Isles, and they are also our smallest carnivorous mammals, the weasel being the smaller of the two. They are closely related species and look very similar, with brown upper fur and white bellies, and long, thin bodies and short legs adapted to entering the burrows of their prey, such as rabbits and rodents, of which they are ferocious hunters. Although they look very similar, the stoat is much larger than the weasel, and also has a very distinctive black tail-tip which the weasel lacks.





*Due to their highly secretive nature very little is known about the ecology and population of stoats and weasels in Great Britain and Ireland.*

### The Distribution of Stoats and Weasels

While stoats and weasels coexist in Great Britain, weasels are completely absent from Ireland and there is no evidence that they ever lived there. Irish stoats are unusual in that they are considered to be a unique subspecies (*Mustela erminea hibernica*), as they have been isolated from their relatives elsewhere in Europe for a very long time, at least 10,000 years. Just to confuse things, many people in Ireland refer to the stoats there as “weasels”, but apart from being somewhat smaller and having a slightly different coat pattern to British stoats, there is no doubt that they belong to the same species!

### Secretive Nature and Surveying Difficulties

Due to their highly secretive nature very little is known about the ecology and population of stoats and weasels in Great Britain and Ireland. Although they are known to be widespread across both islands and assumed to be relatively numerous, the total number of stoat records in Ireland held by the National Biodiversity Data Centre at the time of writing (early 2015) was only 1,061. While this is enough to reinforce the assumption that stoats are widespread across Ireland, it is less than the number of records of pine marten (1,476 records) which is supposedly one of Ireland's rarest mammal species, and far less than fox (5,973 records) and badger (31,113 records). Our lack of knowledge on the state of the Irish stoat's



Stoat [*Mustela erminea*] © Brian Power.

population and its unique genetic heritage point to a need for more intensive work on this species to improve our understanding of how its population is faring. In Britain, there is also relatively limited knowledge about the population status of stoats and weasels. At present the only way of monitoring them on a large scale is by using records collected as part of the National Game Bag Census. Therefore, there is an urgent need for new techniques to systematically survey and monitor both stoats and weasels in Britain and Ireland.

### Innovative Survey Strategies

In an effort to carry out a systematic survey of stoats in County Galway, Kate McAney from the Vincent Wildlife Trust started a pilot study in 2010. She used hair tubes comprising foot-long sections of drainpipe baited with rabbit meat and a small rubber

band smeared with glue placed across either end of the tube. These were placed in sets of ten in lines along hedgerows and stone walls, with one set of tubes being placed in as many ten-kilometre squares covered by Co. Galway as possible. The rabbit bait was used to entice stoats to visit the tubes, stick their head inside and leave a small tuft of hair stuck to the rubber band. All samples of hair collected were analysed at Waterford Institute of Technology for genetic identification.

The results showed that stoats were found to have visited hair tubes in 21 out of the 50 sites (42%) which Kate and her volunteers had surveyed. This does not necessarily mean that stoats were absent from the other sites, but it gives a good initial idea of where stoats are present in Galway.



## MISE Takes Action in County Waterford

As no similar surveys had been carried out in the rest of the country, in 2012 we decided to try out this method in County Waterford to see if the method would work here also, and if our results turned out to be broadly similar to Kate's.

In parallel to our hair tube survey, we also surveyed for stoats in ten sites across Waterford using a totally different method, which involved using trail cameras. These automatic infrared-triggered cameras are becoming ever cheaper, can give you a sighting without the need for DNA testing a hair sample, and are far less smelly than hair tubes baited with chicken which have been out for a few weeks! We set up our cameras in places both where we had seen stoats before, and where we hadn't, to see if we could pick up any stoat activity over the space of a couple of weeks at each place.

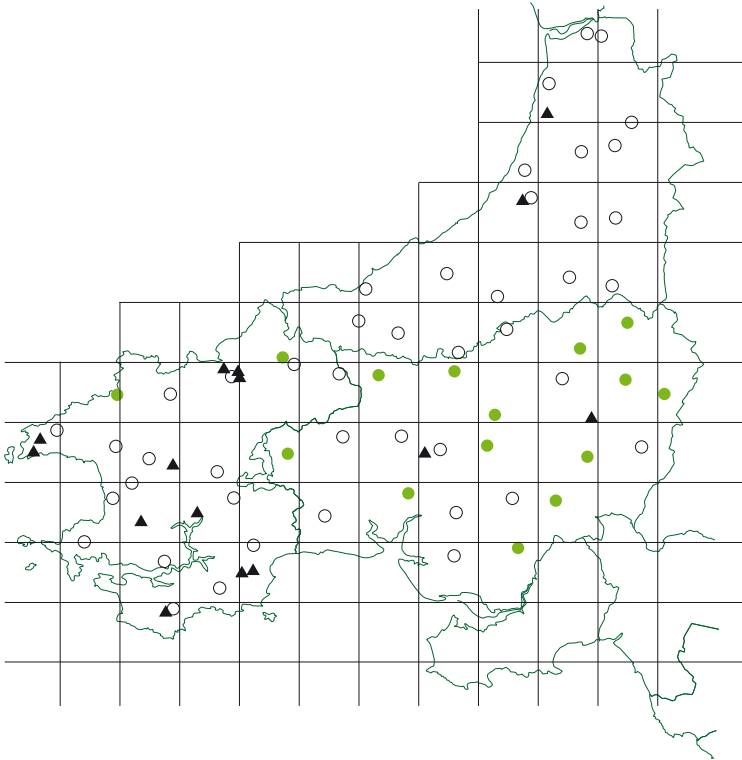
So far, out of the 28 ten-kilometre squares we have surveyed we have collected hair samples which tested positive for stoats from only 25% of these (7 sites), which seems to be much lower than the Galway survey. However, we have also been able to collect stoat sightings and roadkill in another three 10 km squares, increasing our coverage of stoat records. On the other hand, despite

gathering footage from over 200 days with our cameras, we had not a single sighting of a stoat, even though we captured images of plenty of other wildlife including foxes, fallow deer and pine martens! We collected stoat DNA samples from a wide variety of habitats, including broadleaf and conifer woods, lowland farmland, sand dunes and coastal cliffs, so it seems that they are widely distributed across Waterford's landscape. However, it still isn't quite clear whether our fairly low success rate means that we haven't got our survey method quite right yet and we are not attracting stoats that are present, if stoats are actually fairly rare in Waterford, or if something else is going on.

## Stoat and Weasel Surveys in Wales

In 2011-2012 MISE Project Officer Jenny MacPherson carried out a similar pilot project in West Wales, to investigate the effectiveness of hair tubes to detect the presence of both weasels and stoats. Each ten-kilometre square in the counties of Carmarthenshire, Ceredigion and Pembrokeshire was surveyed with the help of local volunteers, using baited hair tubes. A total of 61 sites were surveyed, and the 207 samples that were collected were DNA tested at WIT for both stoat and weasel. Weasels were detected at 15 sites across Carmarthenshire and Pembrokeshire, but

not at any of the survey sites in Ceredigion, and most interestingly, none of the sites were positive for stoat for some unknown reason. Surprisingly, dormice – a species generally considered to be arboreal and which we wouldn't have expected to use these hair tubes - were identified in seven of the sites. These samples were collected in the autumn however, and it may be possible that the dormice were checking out potential hibernation sites.



Survey sites where weasel was detected in Wales (green circles), sites negative for weasel (open circles) and locations of weasel records (since 2003) from Local Records Centre (black triangles).

## Future Survey Work

What's clear from this is that our survey methods for stoats and weasels are still far from perfect and we have a lot to learn about improving our survey methods and how best to study these elusive animals. It seems that using several approaches at the same time might be a good way of getting as much information as possible. However, we have made a very good start and we now have baseline information on the distribution of stoats from two counties in Ireland, and distribution of weasels in three Welsh counties. Any future work needs to focus on experimental trials of ways to improve the method at sites where stoats are known to be present from very recent sightings. Longer-term, we hope that the technique could be used as a cost-effective monitoring method and extended to further counties in both Wales and Ireland.



Example of a stoat hair-tube used in the Co. Waterford survey. A piece of chicken was secured with wire inside the tube, and sticky patches were placed at either end.







**Article by:**  
Denise O'Meara  
Aline Denton  
Becky Clews-Roberts  
Andrew Harrington

# Red Squirrel work in Ireland & Wales

People are genuinely fond of red squirrels, possibly because they are more readily seen than some of our more elusive species like the pine marten or otter. It is this emotional response that the red squirrel elicits from people that drives the public participation in red squirrel conservation.

People have for a very long time been intrinsically linked with squirrels, and their love and fascination at one time encouraged them to move, translocate and reintroduce red squirrels in the 1800s. Indeed, it was the same enthusiasm that saw the introduction of the grey squirrel into Britain and Ireland in the late 1800s and early 1900s, much to the detriment of red squirrel populations. Today, efforts concentrate on the conservation of the red squirrel and the removal/reduction of grey squirrel populations, but such efforts require prior scientific knowledge to inform such strategies.

The methods that MISE have used to survey for squirrels have been varied. In Ireland, Denise and Andrew were fortunate to be able to concentrate on the use of non-invasive survey techniques that do not require the surveyor to trap or handle the animal. In fact, when we survey for squirrels, we don't even have to see the animal. The technique

relies on the following; a piece of PVC tube wired horizontally to a tree trunk. Bait is placed inside the tube to lure the animal in, and a little sticky patch, strategically placed inside the tube captures a few hairs from the animal as they enter. The sample is then collected and DNA tested at Waterford IT to verify the species.

Using a suite of DNA tools we can identify the number of individual red squirrels from hair samples. This provides us with an insight into the minimum number of individuals present in a woodland, and also provides a picture of their overall genetic health. The mitochondrial DNA (the cell powerhouse) can also be sampled to reveal insights into the population history, like a genetic footprint. The combination of this information can be used to inform conservation plans for a population.

This type of work is great for volunteers and community involvement as specialist training isn't required, and the tubes can be left in place for a number of weeks at a time. To learn about some of our volunteer's involvement in this work, read about Michael Desmond's experience in the Nire Valley in Co. Waterford.

In Wales, Aline has engaged in more rigorous survey work in her role with the VWT. Red squirrels are rare in mid-Wales, often occurring at very low densities, and across much larger woodlands than in Ireland making them more difficult to detect using hair-tubes. In addition, grey squirrels are more common and by using hair-tubes there is an inadvertent risk that we could cause the two species to overlap and potentially increase the risk of disease transmission, particularly the squirrelpox virus.



*The genetic work in Wales and Ireland has revealed that both regions contain squirrels with unique genetic heritage.*

Instead, the VWT have been engaging in live trapping across very large woodlands. This began in 2013 when Jenny MacPherson (previous MISE PO with the VWT) led a team in a wide scale study at Bryn Arau Duon, involving 1800 trap nights over a 3 week period, resulting in 30 red squirrel captures. In 2014 a similar study was carried out at Cwm Berwyn by Aline with the help of Huw Denman and Don MacPherson, expert and licensed red squirrel trappers. Traps were set across these woodlands in spring-summer and required the assistance of enthusiastic local volunteers to check the traps and re-bait them. In autumn 2014 radio tracking also took place at Bryn Arau Duon. These were great opportunities for volunteers to gain experience and an insight into what is involved in squirrel trapping and radio-tracking from trained licence holders. Other mid-Wales surveys have taken place including at Cwm Cae'r Odyn, Cwm Gwenffrwd, Nant-ystalwyn, Dôlgoch, Llethr Gwinau, Cwm Berwyn and Bryn Mawr.



Red Squirrel [*Sciurus vulgaris*]  
© Maurice Flynn.



Red Squirrel [*Sciurus vulgaris*] © Padraig Kavanagh.

These areas are commercial plantations, and do not offer an ideal food resource for red squirrels, but this is where the species is managing to hold out, albeit at a very low density, because grey squirrels are present in the surrounding areas, pushing the red squirrel population into this less optimal habitat. We also found evidence of grey squirrels during some of our surveys. It was disappointing to learn that greys are using these plantations, and emphasises the importance of grey squirrel control by local 'Friends of Red Squirrel' groups.

In North Wales, Ceri Morris, the previous MISE PO with NRW, was engaged in survey work in Cwm Mynach with the aid of volunteers, and the current PO, Rebecca Clews-Roberts, has been continuing this work following a period of grey squirrel control. She has also installed feeder boxes and remote cameras with a team of volunteers in November 2014 to survey parts of Clocaenog Forest for red squirrels. Sticky patches were placed inside the feeders to collect hair for DNA analysis. Local based MISE volunteers are monitoring the boxes, and Rebecca is also encouraging volunteers to establish a 'Friends' group

to continue the work after MISE finishes in mid-2015.

The genetic work in Wales and Ireland has revealed that both regions contain squirrels with unique genetic heritage compositions. The red squirrels in mid-Wales for instance include squirrels with Welsh haplotypes that have not been found elsewhere in Britain, and interestingly, a haplotype common in parts of Ireland but that, until recently, was only found in museum specimens in Britain. The squirrels in Ireland have their own interesting story to reveal. While many of the squirrels appear to harbour relics of a British ancestry owing from reintroductions in the 19th Century, some of the squirrels in the Nire Valley for instance also have some central European heritage.

Through the efforts of the MISE project, we now know more about our Welsh and Irish populations, and the local volunteers who we have engaged with over the course of the project, now have the knowledge and awareness to help conserve these populations for future generations.





Article by:  
David O'Neill

# The Otter

When we started the MISE project back in 2011, the otter (*Lutra lutra*) was recovering in the UK from a well-documented human-caused population crash through the 1950s and 60s and was now at a “Favourable” or good status, but the species was thought to be not fairing so well in Ireland. Based on reported evidence of a declining population in the country since the early 1980s, the otter in Ireland was believed to be in an “Unfavourable” or poor status.

However, the National Otter Survey of Ireland 2011/2012 organised by the National Parks and Wildlife Service revealed that the otter was doing much better than previously thought. Ireland had in fact remained as a stronghold for the species. Similarly in Wales, the fact that good populations remained in much of the country supported re-colonisation, expansion and connectivity of otters eastwards in to England (as well as those moving south and north-east). In both Ireland and Wales, otters were quite widespread. All in all, this put us in a very strong position to explore otter ecology with our volunteers. True enough, once we started our otter surveys, we very quickly realised that we never seemed to be too far from evidence of otters.

Whether in rain, sun or snow, our surveys undoubtedly took us to some beautiful places. We conducted day surveys at many locations across the region, weekend events and even monthly spot checks on rivers in both Ireland and Wales.

Collectively our surveys successfully presented the type of valuable information that can be generated from community-based non-invasive surveying with support from DNA testing, and some examples are discussed below.





*Based on reported evidence of a declining population in the country since the early 1980s, the otter in Ireland was believed to be in an “Unfavourable” or poor status.*

Using our non-invasive scat survey method, over 5,000 faecal samples were collected during the MISE otter surveys. Through DNA testing by the team at WIT, the majority of samples were confirmed to be otter spraints (otter faeces), but what about the others? Exposure to the elements can ruin the DNA in a sample, so sometimes we just did not have enough genetic material to work with to identify a species. Alternatively, during our otter surveys, we often collected faecal samples from other potential species too. In Ireland for example, we regularly recorded otter, pine marten and mink using the same area and even passing under the same bridge to cross safely beneath busy roads. This in itself highlights the importance of installing tunnels and ledges under bridges or motorways to maintain habitat connectivity for wildlife.

As well as being able to identify species and sex from just faeces or hair samples, the most powerful genetic tool MISE has allows us to identify individual animals by DNA fingerprinting. This not only reveals how many otters were present at a particular site during the days preceding a given



Otter (*Lutra lutra*) © Brian Power.

survey, but with repeat surveys we can genetically recapture otters. This enables us to monitor habitat-use patterns in time and space. For example, we had monthly records of some otters on the same stretch of river in Co. Waterford, or in Anglesey we were able to record one individual moving just over 5 km in the space of a few days. We can also sometimes boost this level of analysis and explore family relatedness within a population, as seen with our work in Roaringwater Bay, Co. Cork. From samples

archived since 2010, we revealed the relationships amongst otters present at that time. Even now, right up to our most recent surveys there during the summer of 2014, our latest DNA analysis suggests that later generations of those otters are still living in the area.

An example of many otter spraints collected by MISE. © David O'Neill.



Our survey in Killarney National Park, Co. Kerry where we travelled out to some of the more remote islands of the park.





A view from the upland lakes of the Comeragh Mountains overlooking some of the rivers monitored during the annual MISE Co. Waterford survey and out to the Celtic Sea beyond.

On the Llŷn peninsula in north Wales, on one of our very first MISE surveys, a total of 124 spraints were collected from around the coast on that day. We found that for every 10 spraints collected, only one was left by a male otter. This was interesting to see considering you would more usually expect bias towards male samples in faecal surveys as a result of the sprainting behaviour of males for territorial marking. In terms of the number of individuals eventually identified, the female:male ratio came to 6:1. By analysing the data from our surveys in Co. Waterford, we can see that the number of spraints collected, resulting sex ratio and overall number of individual otters present in a particular water system can vary dramatically between months and years. This shows us shifting habitat usage that is possibly changing according to habitat suitability and prey distribution or availability.

As with many species, Eurasian otters are often regarded as solitary and territorial individuals. However, we recorded more otters at some locations than we had anticipated, mainly based on what was known about otters from intensive studies elsewhere. As our results and those of research teams elsewhere come to light, we are now beginning to see evidence suggesting a more social animal displaying flexibility in terms of functioning in solitude or with familiar groups. This effect was seen most often by us along the coast, especially at points around the mouths of rivers or streams. This was likely for communication or territorial “signposting” along busy thoroughfares to and from fresh water or en route from inland water systems to rich coastal foraging patches and vice versa. (See our work in Cork City (White et al. 2013),

which is available on our website). We also recorded multiple otters converging to forage due to temporary food gatherings. We recorded this at the upland lakes of the Comeragh Mountains in Co. Waterford



An example of an otter's footprint found on a beach during the Dwyrdd survey, Wales. Note the imprint of the 5 toes and webbing.

during spring 2012; analysis of the hard parts (i.e. bones) of these spraints suggested that the otters were predated on throngs of spawning frogs.



An image showing the bones found in an otter spraint during a MISE dietary workshop.

We see a complex network of various water bodies through rich habitats and it can be difficult to know when exactly the different otters arrive at a given site - Was it the same morning, day or week? At this point,

it is worth noting that the genetic tests developed at WIT are more sensitive than alternative options for this type of work. Having carried out controlled experiments with captive otters at the Wildwood wildlife park in the UK, the window of time for collecting samples with usable DNA can be greater than previously known, so this must be considered when estimating the time that has passed between visiting otters.

Collectively, these research outputs show us the importance of systematic and long-term monitoring for wildlife and how we cannot generalise between species and even different populations of the same species to fully understand their dynamics, social organisation and ecology. We need to go to areas and conduct regional studies to inform effective conservation plans and we have shown that the support of volunteer citizen scientists is fundamental to taking this course of action. In a global context, the range of the Eurasian otter spans three continents (Europe, Asia and Africa) and is found from Ireland all the way to eastern Asia. Ireland may be a stronghold for the species, but the Eurasian otter occurs at either very low or unknown numbers in many European countries and in fact is almost extinct in China. There is still a heightened concern about the conservation of this species. We are in a challenging time in terms of otter research as we look to sustaining our otter populations and encourage the recovery of others, all whilst facing new challenges in to the future. It is exciting to imagine an expanded version of the MISE project model as we move forward towards conservation actions for the species and indeed others around the world.



Otter photo © Brian Power.





*We are in a challenging time in terms of otter research as we look to sustaining our populations and encourage the recovery of others.*





# Pine Marten

## in County Waterford

**Article by:**  
Peter Turner  
Andrew Harrington

### **Pine Marten in Portlaw Woods**

The pine marten is a carnivore related to otters and stoats, they weigh from 1kg (females) to 2kg (males) and live on anything from fruit to small mammals and birds. Although they occupy a territory of around 200ha, probably for their whole lifespan of around 7 years, they are rarely seen by people. Pine marten stay under cover and although they often forage by day their agility and secretive nature mean that sightings are rare, they are most often seen as roadkill, probably as a result of looking for territory as juveniles.

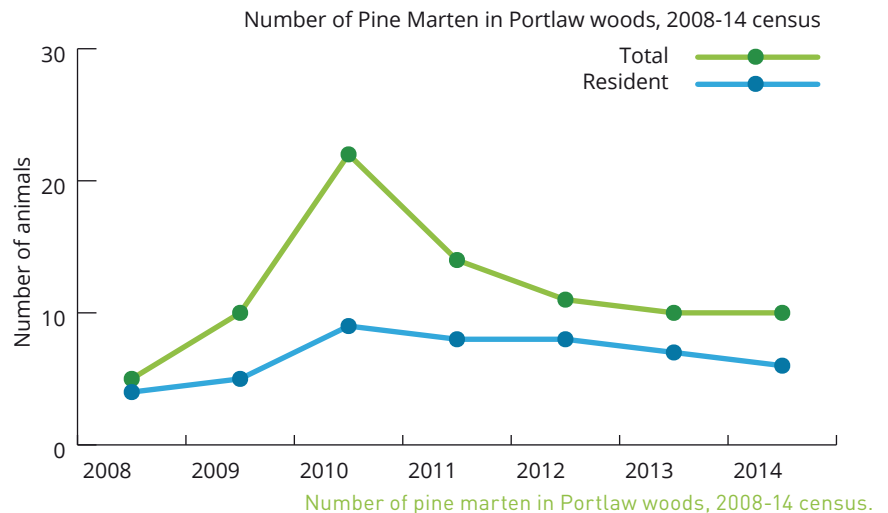


*Although they occupy a territory of around 200ha, probably for their whole lifespan of around 7 years, they are rarely seen by people.*

There have been pine marten in Co Waterford probably as long as they have been in Ireland. In the early 20th Century Rutledge (one of the great Irish naturalists) commented that "...they (pine marten) are fairly numerous as a result of the protection afforded them by the late Lord Waterford." It seems that whilst pine marten were much reduced by persecution and habitat loss in Ireland as a whole in the 19th Century, they survived in the landed estates of Co Waterford. As large estates and the hunting and gamekeepers associated with them declined, local knowledge of pine marten populations also declined and little is known of the Irish pine marten population in the 20th century. This has been addressed in more recent times by extensive survey work, (O'Sullivan, 1983 and O'Mahony et al. 2012).

## The Annual Census

The Molecular Ecology Research Group at WIT was established in 1997 to use new DNA based methods to study the local pine marten population. DNA had been used to identify pine marten scats (droppings) in Scotland and in Canada hair using hair traps had been used. At WIT a new design of hair trap was developed and new methods of DNA extraction and analysis were used on the samples collected. The combination of new methods and long timescale has offered an unusual opportunity to monitor this population since 2008, and perhaps for a longer period into the future. The study area is about 320ha of Portlaw woods and is all forested, although the forest ranges from areas of newly replanted clearfell to high forest. In addition to the non-invasive survey work live traps have been used for several years in order to assess breeding success in the population by examining female pine marten for signs of lactation.



## Census Results

Pine marten were present in the site throughout the study period but the numbers varied considerably from 6 in 2008 to a peak of 22 in 2010. In 2008, 44 scats and 195 hair samples were collected, DNA was extracted from them and analysed for species, sex and individual identity. Six individuals were identified that year in the study area, 3 males and 3 females. In the 2014 the number of samples had risen to 280 scats and 207 hair samples and a similar number of pine marten were found.

It seems that this represents a variation in breeding success, if the numbers are divided into animals that established a territory and those that were just transient the latter shows a peak but the established numbers do not. It seems that the variation in numbers represents a variation in breeding success. Although the methods used do not track animals in the way that radio-tracking might they do give some indication of the nature of the animals' territorial behaviour. As with other populations studied same sex

territories do not overlap, although how this is defended is not known, probably by scent marking rather than by aggression. It seems that in Portlaw woods all the area is used and territories are around 50 to 200 ha. This probably reflects the richness of the habitat and its abundance of food. In Declan O'Mahony's radio tracking study in an upland conifer forest in Co Leitrim he found territories were larger and did not occupy all the available forest.



Co. Waterford study site and female pine marten territories in 2013.



## MISE and Pine Marten

The MISE project has allowed the pine marten census to continue during 2011-2014 both by funding genetic analysis and by the involvement of volunteers. Volunteers from Wales and Ireland have helped with live trapping and scat surveys. Live trapping has offered the opportunity for members of the local and wider community to see pine marten up close too, something rarely possible under normal circumstances. At a number of public events project staff have taken groups into the forest to talk about the research and about the local pine marten population.

## Expanding the Search for Pine Marten

In 2012 and 2014, MISE staff and volunteers carried out several "Forest Mammal Surveys" across Co. Waterford and south Co. Kilkenny. The main aim of these surveys was to gain more information on the distribution of pine marten in these areas, where very little was previously known about the presence of this species but large areas of suitable woodland habitat is present. We collected scats and signs of any wild mammal that we could find, but we particularly searched for potential pine marten scats, which we could confirm by DNA testing.

Thus far, we have confirmed the presence of pine marten at 19 out of 27 sites (70%) we have surveyed. These positive sites are spread out over our entire search area, including in the forested hills above the Suir Valley on both the Kilkenny and Waterford sides, in the foothills to the east and south of the Comeragh Mountains in mid-Waterford, and in the wooded valleys in the foothills of the Knockmealdown Mountains in west Waterford. Therefore, it is clear that pine marten are widespread across many parts of Waterford outside of our core study site at Portlaw, but as yet we do not know anything about these populations, including if they are in such high numbers as in Portlaw.



Public event during live trapping work allows people to get close to a wild pine marten.



Releasing trapped pine marten.



Pine marten taking bait from a hair trap.

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Image © Maurice Flynn.



*At WIT a new design of hair trap was developed and new methods of DNA extraction and analysis were used on the samples collected.*



# Bats

**Article by:**  
Andrew Harrington

When I started working on the MISE Project I knew very little about bats, but as I was given the task of taking on the project's bat work in Ireland, I had to learn quickly! The initial plan was to visit bat roosts in County Waterford and collect bat droppings. These would then be stored long-term in a freezer with a view to a later project which would examine the prey remains in order to determine if climate change is having an effect on the diet of bats.



*This survey shed light on the distribution of summer bat roosts in the county, but many bat species move to different roosts to hibernate in the winter.*

## Where to Begin?

However, the first thing we had to do was to find the roosts. Although we soon learned of several bat roosts we could visit to begin collecting bat dropping samples, there seemed to be very little information available on roosts in Waterford in general. We needed a way of systematically finding bat roosts, and from here our bat work evolved from its original aim.

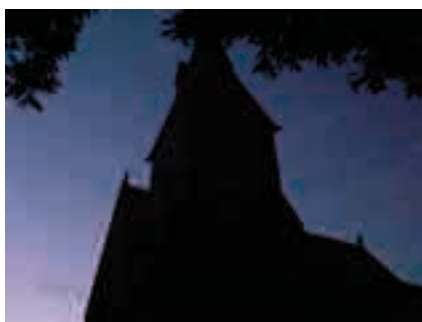
I decided to look at different types of structures as a starting point. Bats naturally like to roost in trees and caves, but they also use man-made structures like houses, churches, bridges and other buildings. Many of the bridges in the county had already been surveyed for the presence of bats, so I didn't need to focus on those; houses and farm buildings were tricky as I didn't want to intrude on people's privacy and there are probably thousands of each type of building in the county so I wouldn't know where to start. Trees would also be difficult, so I was left with churches.

## Bats in Churches

I knew that the Bat Conservation Trust (BCT) had carried out a series of "Bats in Churches" surveys across Great Britain, and a survey of a selection of churches had been carried out in an area across Dublin, Kildare and Meath. Both of these studies highlighted that churches are often occupied by bat roosts. There seemed to be a gap there, and with the help of Bat Conservation Ireland's Conor Kelleher and Tina Aughney we set up the "Waterford Bats in Churches Survey".

## Waterford Bats in Churches Survey

We began by sending a questionnaire survey to clergy across the county and followed up with visits to churches during the summer where possible. This was the kick start we needed to start identifying roosts, and once we got going the survey gained momentum. This summer survey has continued from 2012 to 2014 and so far out of a total of 104 churches that we've identified, we've surveyed 78 churches, many of these with the help of volunteer surveyors.



An example of one of the churches we surveyed for brown long-eared bats.

Of the 78 churches, we identified 45 as containing bat roosts which we did through dusk bat surveys to observe bats exiting the buildings, or (for most sites) by finding signs of the presence of bats, including droppings or dead bats. This survey shed light on the distribution of summer bat roosts in the county, but many bat species move to different roosts to hibernate in the winter, as they need different environmental conditions than in the summer. Also, hibernation roosts are even less studied in Ireland due to the difficulty of finding them, as they are often found in underground sites such as caves or mines which can be difficult

to access. Therefore, we also decided to try carrying out hibernation roost surveys in February 2013 and 2014 to investigate whether any of the caves known to exist in Waterford had any sign of hibernating bats.

## Bat Hibernation Study

This took us to some of the most interesting and eerie places in the county, investigating caves scattered throughout the limestone valley between Lismore and Dungarvan. Most of the caves are well hidden, tucked away in little woodlands and field edges in farmland, which gave us the task of trying to figure out which landowner to contact for permission to carry out the survey. Once we had got around these obstacles and had found the caves, some took us several hundred metres underground into caverns decorated with stalactites and some even containing seemingly bottomless pools and flooded passages. With the help of Henry Schofield from the Vincent Wildlife Trust (VWT), who is a bat worker with plenty of experience of doing this in the UK, we did find signs of the presence of bats in five caves, although it is difficult to tell for sure at what time of the year these had been left behind and highlights the difficulties of identifying hibernation sites for definite. However, we had more luck at an abandoned railway tunnel where we found a single hibernating Natterer's bat tucked away in a crevice.

Taking these church and cave sites along with other places where we have managed to find signs of the presence of bats, we have so far identified 71 bat roosts, which is a great increase on the number of roosts which were previously recorded in Co. Waterford.



## The Identification of New Bat Roosts Confirmed by Novel DNA Techniques

Another strand of the work we have been doing is the development of DNA tests for bat species, similar to what we have previously done for otters, squirrels and so on. There are 11 species of bat that have been recorded in Ireland, and it can be very difficult to tell which bat species is present in a roost simply by looking at their droppings. For the purpose of this project, we have developed DNA tests for each individual bat species. Using these species identification tests, we now not only know that the 71 bat roosts in Co. Waterford exist but we also know which bat species inhabit them for the majority of sites, and have information on the number of bats present at a subset of these roosts by carrying out dusk emergence counts with bat detectors.

## Contributing to National Surveys

As well as expanding our knowledge of the distribution of different bat species in Waterford, there have been several “spin-offs” from the core bat roost survey project. Probably the most important is where we have contributed to the national brown long-eared bat monitoring scheme, which is co-ordinated by Bat Conservation Ireland. Since the summer of 2012, we have built up a dedicated group of volunteers who monitor a group of selected brown long-eared bat roosts to count the number of bats at each roost as they exit at dusk, three times each summer. These counts are collated in a national database, which is helping to provide estimates of the population size and long-term trends for this species in Ireland. As well as helping with counts, the new brown-long eared bat roosts we have discovered have added to the number of monitored sites in Waterford, and provide a

pool of new sites which could potentially be monitored in the future. This core group of volunteers also forms the basis of the newly-formed Waterford County Bat Group, which we launched in May 2014.

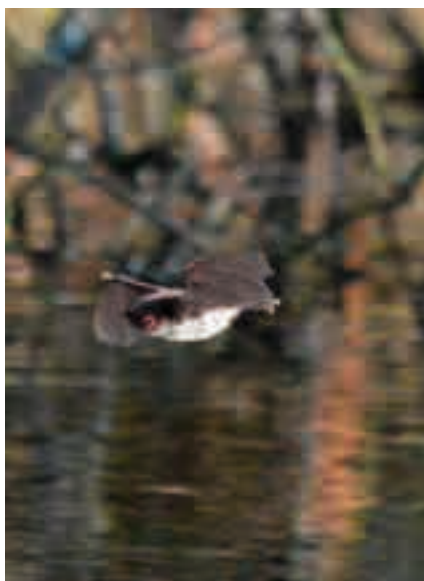


Image © Brian Power.

## Bat Conservation Actions

Apart from the main bat projects we have carried out as described above, we've contributed to the conservation of bats in Waterford in other ways. Among other things, we've set up two bat box schemes in Cheekpoint and Lismore which are already having a positive effect of bats in these areas (see our article on habitat improvements). We've also been joined on several occasions by experienced (and licensed!) bat trappers, including Sam Dyer, Kate McAney, Henry Schofield and Tina Aughney, who have helped us to catch bats in mist nets or extract them from bat boxes in several sites in Waterford to take body measurements of the bats we caught, providing us with experience of carrying out this delicate job. This data has contributed to a new database of body measurements (or “biometrics”) of the different bat species in Ireland, which

is a very useful tool for bat workers when identifying bats in the hand, and has been published by Bat Conservation Ireland in a beautiful new book, “Irish Bats in the 21st Century”.

## Looking into the Past and Towards the Future

We've achieved a lot during the course of our bat survey work since 2012, but as the MISE Project draws to a close we hope that some of this work will continue to have a positive effect. As well as the new information we've discovered about bats in Waterford, we hope that the Waterford Bat Group will continue to carry out monitoring of roosts that will benefit our knowledge of Ireland's bats into the future, and the habitat improvements will provide a home for bats for many years to come. We've also collected a valuable archive of bat droppings from the many roosts we've discovered, and this may be a valuable tool for researchers in the future to examine the impact that climate change will have on the insect prey available to bats in the coming decades.

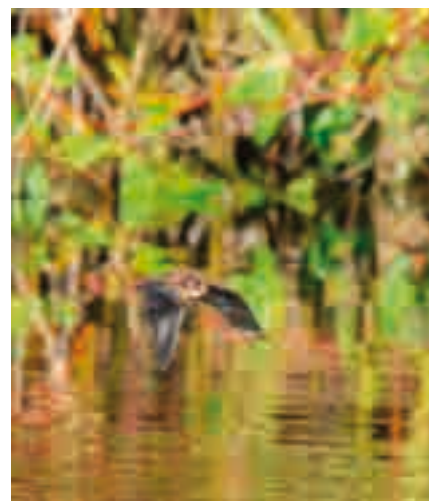


Image © Brian Power.





*There are 11 species of bat that have been recorded in Ireland, and it can be very difficult to tell which bat species is present in a roost simply by looking at their droppings.*





# Searching for Britain's Smallest Rodent Harvest Mouse

Article by:  
Aline Denton  
Becky Clews-Roberts

With only 30 records between 2000 and 2013 (Cofnod report March 2013 Tapping, R; Harvest Mice in Wales – Where might they Be?), we knew that locating harvest mice in Wales would be tricky - they are, after all, the smallest rodent in Britain! However, MISE volunteers stepped up to the challenge and have made a concerted effort to help us find them. Indeed, more than 800 volunteer hours have been spent carrying out bait pot or nest search surveys and owl/ raptor pellet dissections between 2011 and 2014.

The harvest mouse is our smallest member of the rodent family at just 5-7cm long and weighing the same as a 20p coin. Its small, hairy ears distinguish it from all other British mice and its most outstanding feature is the prehensile tail used as a fifth limb to assist with climbing grass stems. A further unique adaptation that the harvest mouse has is its ability to construct tightly woven nests within its preferred grassy habitat, leaving a useful sign for mammal surveyors.

MISE Project Officers were keen to train volunteers in order to equip them with the knowledge and skills required to undertake surveys using a range of techniques. Six survey training workshops were arranged between 2012-2014 where a presentation was given about harvest mouse ecology and

the theory behind the survey methods was discussed. These workshops were followed up with hands-on practical survey training to ensure participants could recognise suitable habitat and the field signs – distinguishing a vole nest from a harvest mouse nest has tested us on more than one occasion! Several of our volunteers felt confident enough following the training to undertake their own surveys and we hope that this will continue.

Raptor and owl pellet analysis workshops were also organised. This can be a useful, indirect method of detecting the presence of harvest mice in an area. Barn owl and kestrel pellets are easiest to collect in the field compared to other birds of prey since they have preferred roost locations

often known to local birdwatchers. Once the pellets are dissected and the remains sorted it is possible to identify harvest mice skulls from the number of root holes left after removing the molar teeth. In the case of harvest mice, 5-root holes become apparent, which is a unique feature of harvest mice. The presence of harvest mouse remains in a pellet gives an indication that they are present within the territory of that bird species.



Harvest mouse skull showing 5-root holes that become apparent once molar teeth are removed.

## Using innovation to find the 'needle in a haystack'

One of the aims of the MISE project was to trial innovative techniques for monitoring our native mammals, and in the case of the harvest mouse, we used bait pots. The initial survey method, trialled in 2012 at Chester Zoo's release scheme, involved attaching pairs of plastic pots horizontally to bamboo canes. The lower pot was at ground level, whilst the second pot was placed 1 m high in the stalk level of long grass, brambles and bushes where harvest mice spend much of their time. The canes were then placed in two parallel 100 m transects with 10 canes in each using a total of 40 millet-baited pots. After two days, droppings found within the pots were collected and DNA tested by the MISE team at Waterford Institute of Technology (WIT). Interestingly, all the samples that tested positive for harvest mouse DNA came from the upper-level bait pots.



MISE Project Office Ceri Morris, carrying out the initial 2-pot method.

This early trial showed that this was an effective technique to detect the presence of harvest mice, but we also recorded a variety of other species (non-targets) such as pygmy shrew and wood mouse using the bait pots. In order to hone the method and reduce the number of non-target species entering the pots, former MISE project officer Jenny MacPherson with the help of Eloise Neighbour from the Wildlife Trust, modified the pots with excluder guards, wire cages (11 mm diameter) around them, thus only allowing smaller species like the harvest mouse and pygmy shrew to enter. These were successfully trialled at the Wildlife Trust reserve at Parc Slip.

Of all the bait pot surveys undertaken (43 in total), two sites were positive for harvest mouse DNA. One such site was the Wildlife Trust of South and West Wales' Ffwrdd Farm Mire reserve in Carmarthenshire and Project Officer Aline Denton from the VWT was overjoyed when Edel Sheerin and Catherine O'Reilly at WIT confirmed that droppings collected were positive for harvest mouse. Positive results like this, no matter how few and far between they may be, really help to encourage volunteers to continue the survey effort.



Image of a harvest mouse winter nest, made visible after a burn of scrub as part of habitat management work at Cors Eddreiniog. Image © Ceri Morris.



Non-breeding nest found at Cors Geirch National Nature Reserve, Llyn Peninsula in November 2014. This reserve is managed by Natural Resources Wales. Other nests have been found at Cyttir Local Nature Reserve, Llandegfan on Anglesey and at another site in Carmarthenshire. Image © Becky Clews-Roberts.

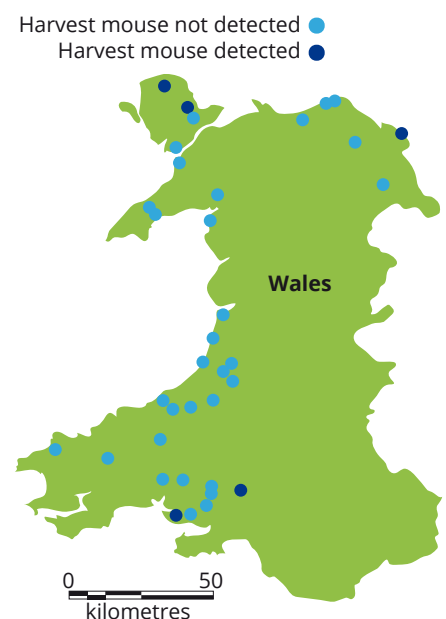
The fact that we have found presence of harvest mice at several sites by carrying out nest search surveys (seven out of 15 sites had harvest mouse nests) proves that a combination of using the latest technology and the more traditional survey techniques really works. The map below details the survey techniques undertaken along with the results.

## Into the Future

Even though a large number of harvest mouse surveys have been undertaken during the MISE project (see map), there are still large areas of Wales that have not been surveyed. As such, we sincerely hope that local mammal groups, Wildlife Trusts and individuals will continue with the search for harvest mice in Wales. We can provide guidance, bait pot survey kits, the PowerPoint presentations from the workshops and the publications mentioned below. So do get in touch if you intend to carry on with the search! We would ask that records be logged with the four local records centres in Wales.

## Outputs

Two publications have been created by the MISE Project: a postcard "Have you seen this mouse?" which encourages readers to help us with the search by showing clear images of harvest mouse nests and when and where to look for them, and a booklet written by acclaimed writer and biologist Dr Amy-Jane Beer, "The Harvest Mouse – an introduction to our smallest rodent". Both of these publications should serve well as a legacy to the project since the information within them will remain valid for years to come.



Map of harvest mouse survey results including both nest searches and bait pot surveys. This map was created with the help of Andrew Harrington.





# Discovering Dormice in Wales

Article by:  
Aline Denton  
Becky Clews-Roberts

There are many organisations and individuals in Wales who monitor dormouse nest box schemes, mostly in conjunction with the National Dormouse Monitoring Programme (NDMP), of which there are 65 sites. However, when the MISE project started in 2011 with hazel dormouse (*Muscardinus avellanarius*) as one of the species of interest, the Project Officers were tasked with determining how best to support the ongoing work. Whilst dormice go into slumber mode for part of the year, the MISE team certainly didn't follow suit!

The population of dormice in Wales is described as 'scattered'. Since the species is highly reliant on a good structure of connecting habitat in which to disperse and find resources, aerial maps were scanned to locate areas where nest boxes had yet to be placed. We also used data from The Vincent Wildlife Trust's dormouse distribution survey published in 2001<sup>1</sup> as well as previous records of nests and nibbled nuts. The results

were nine new sites where tubes and/or boxes were erected, two in North Wales and seven in West Wales including a community woodland site and a conservation centre in Ceredigion. A further seven sites in North Wales where nest box schemes were already in existence were supported by MISE with additional boxes or tubes and/or staff and volunteer time.

Unsurprisingly, it has not been difficult for the Project Officers to get a full complement of volunteers when undertaking dormouse box checks - just see the images in this article to see how cute dormice are! Of those sites that the MISE team have been involved with, we have had positive results from three sites with either signs of dormouse presence, for example nests built by dormice in nest boxes or tubes, or live animals.



Local volunteers making dormouse boxes, Small World Theatre, Cardigan.

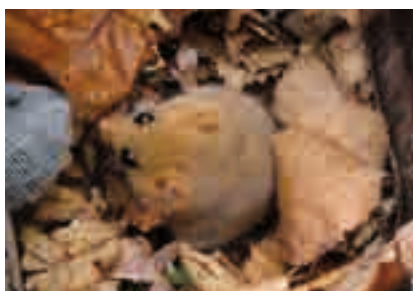
One of the sites where volunteers were thrilled to find dormice was Cwm Clettwr in Ceredigion, managed by the Wildlife Trust of South and West Wales. This site produced its first dormouse in one of our boxes in September 2012, and numbers have increased each year since then. During our monitoring visit in September 2014 we were delighted to find a whopping 21 dormice. Dormice have also been found at Pentre Ifan/Ty Canol in Pembrokeshire, managed by Pembrokeshire Coast National Park, NRW and a private owner. These sites are now monitored as part of the National Dormouse Monitoring Programme. The remaining sites in Wales will continue to be monitored by volunteers, keeping fingers and everything else crossed that they find a dormouse!

The latest site in North Wales to prove positive was in Dolgarrog, which is in the Conwy valley. Fourteen boxes were placed in 2011 by the North Wales Wildlife Trust and MISE Project Officer Ceri Morris added a further nine boxes in April 2012. Ceri found two nests in boxes since then but no live sightings and when she moved on to a new role within Natural Resources Wales in July 2014, she thought she'd lost the chance of finding live animals at the sites that she had been involved with. When new Project Officer Becky Clews-Roberts asked Ceri to join her to check the Dolgarrog boxes, she jumped at the opportunity!

We spent a long morning locating and checking the boxes and were giving up hope of finding anything when Ceri called in a very excited voice that she had found dormice! We invited the landowner to join us as we carefully went about the check which involved sexing and weighing the two male dormice. It was such a triumphant moment for both Ceri, who had persevered at this site for nearly three years, and for

the landowner who could now proudly say that she had dormice in her garden! Discovering something new must be one of the most exhilarating experiences for anyone interested in wildlife as Vicky Buxton who owns the land in Dolgarrog where these latest dormice were found, says:

"Finding live dormice in one of the boxes on our land was very exciting and we feel privileged to know that we are helping to provide a haven for this rare species".



All images © Aline Denton & Jenny MacPherson, VWT.

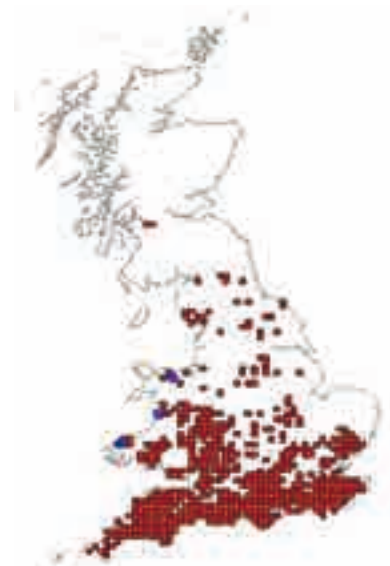
New records like this can be used to build a more accurate picture of species' populations which can determine future conservation action, furthermore, it highlights the importance of long term monitoring.

To ensure that these sites are monitored after the project has ended, the MISE team are training volunteers in how to check nest boxes and some are working towards a handling licence which is of course necessary for this European Protected Species. In addition, a Dormouse Conference was organised by the MISE team in 2011 with nearly 100 participants who gained knowledge and skills in order to assist with future surveys. As well as finding new sites with dormice, it is important to keep checking the boxes so we can try to understand how the population is faring. A further training course took place in October 2013 in Clawddnewydd, North Wales. Four volunteers heard talks by North Wales Wildlife Trust on dormouse ecology and how to monitor them. This was followed up by a visit to nearby Bontuchel where there exists a stable dormouse population which are regularly monitored. The volunteers learned the techniques for checking boxes and how to handle dormice - both valuable lessons for future monitoring.

Another way to determine dormouse presence is to check nibbled hazelnuts. Species such as wood mice, voles, squirrels and dormice all eat hazelnuts but leave distinctive marks that enable a trained eye to determine what has eaten the nut. Six nut hunts were organised in the West Wales area between 2011 and 2013, and dormouse nibbled nuts were found at two of the sites in Carmarthenshire, near Brechfa and Pont Abraham. Nut hunt events were also organised in Dolgellau and Betws y Coed in 2011 and 2014, sadly no dormouse-nibbled nuts were found during these two surveys but all events were crucial in raising awareness of the species with participants learning skills and knowledge to undertake their own nut hunts in future.

If anyone wishes to take on the monitoring of a site(s) then please contact the MISE Project Officer (Aline or Becky) before the MISE Project ends on 30th June 2015.

We'd like to thank volunteers at the Small World Theatre in Cardigan; NRW volunteers at Cors Caron NNR and Community Justice Interventions Wales (CIJW) for their help in making dormouse boxes.



Map showing dormouse distribution in 2011. Blue dots are locations where dormice have been found during MISE surveys. Data courtesy of the NBN Gateway with thanks to all the data contributors. The NBN and its data contributors bear no responsibility for the further analysis or interpretation of this material, data and/or information.





**Article by:**  
Denise O'Meara  
Andrew Harrington  
Aline Denton  
Becky Clews-Roberts

# Educational Activities

## Nature and Schools

Over the last three years, a large part of the work we have undertaken in Ireland has involved visiting and carrying out small projects with school groups. Many of us remember the little “nature table” displaying birds’ nests and autumn leaves in the corner of the classroom when we attended primary school back in the mists of time and they are still a nice feature of classrooms we have visited more recently.

However, it is great to see that environmental awareness is constantly on the increase in primary schools, especially since the coming of the Green Schools programme which is co-ordinated by An Taisce – The National Trust for Ireland. This is an attempt to help

schools become more environmentally aware, for example by encouraging them to recycle more and taking energy saving measures within the school and at home, earning “Green Flags” for each measure. Conveniently for us, the most recent green

flag, the “Biodiversity Flag”, was rolled out for schools around the time that MISE started in 2011, and we soon realised that there was a big gap in Ireland for environmental-related education initiatives.



*Green Schools programme is co-ordinated by An Taisce – The National Trust for Ireland.*

### MISE and Schools

One of the first tasks we undertook as a project was a visit to 4th Class (10 – 11 year olds) at the Holy Trinity National School in Fethard, Co. Tipperary where we piloted the “MISE School Visit”. Such was the success of this first visit and the positive feedback we received from the school we decided to roll out a full programme.

We initially wrote to primary schools in Co. Waterford and asked them if they would be interested for the MISE Project Officers to visit some of their classes. The visit would involve a talk to their students about mammals and wildlife followed by a ‘make and do’ session where we would get the children involved in a survey within the school grounds.

The response was overwhelming. Teachers and entire schools jumped at the opportunity for us to visit. We set about creating programmes suitable for different age-groups so that the programme could be as simple as a chat about furry critters with 5-7 year olds, to encouraging the more senior classes in making footprint tunnels and designing their own ecological surveys.

When we visited schools to talk to classes about Ireland’s wild mammals, we were often surprised at how much knowledge the pupils already had and as much as possible we tried to draw this out for them to share among the whole class, only adding in extra information when we needed to. Usually there were one or two experts who came out of the woodwork to surprise everyone, even the teacher, with their depth of knowledge!

### Case Studies

Some of the primary schools we worked with went on to enter science competitions. Rathgormack National School Co. Waterford took part in the MISE-led “Small mammals in School yards” initiative in January 2012. In the classrooms, they learned about Irish mammals and outside they conducted bait pot surveys for small mammals and

used small mammal footprint tunnels. The school subsequently participated in the Ericsson Primary Schools Science Competition co-ordinated by the Atlantic Corridor Programme and were successful in qualifying for the National Finals held in Athlone Institute of Technology in March, 2012.

Seafeld National School in Bonmahon, Co. Waterford also engaged in a project with MISE and conducted surveys of their local environment by searching for otters, bats and small mammals. They made their own school more wildlife friendly by building bat boxes, bird tables and bug hotels which they hope will encourage more bats, birds, insects and pygmy shrews (due to the higher availability of insects) to visit and reside near their school. They created an awareness campaign called “Bio-Eye” and entered the Eco-Unesco Young Environmental Awards (an organisation aimed at creating environmental knowledge among young people), and reached the national finals for the primary school category. The judges commended the team on their knowledge of their local wildlife and for their decision making, team work and communication skills.



The Light of Christ Girl’s School in Dunmore East, Co. Waterford joined us for a pine marten day at Portlaw Woods. They learned how to identify field signs of pine marten, and also learned how we use hair-tubes and trail cameras to monitor their populations. The highlight of the day (and indeed one for the project) was when we discovered we had captured a pine marten family on the

trail camera, and it was fantastic to see the students so excited when they realised they were in the same vicinity as these secretive mammals.

And it’s not just primary schools we’ve worked with. St Declan’s Community School in Kilmacthomas, Co. Waterford also joined us in Portlaw Woods for the annual live trapping survey (see Peter’s article on page X). This was a rare opportunity for local students to see a pine marten, a great way to increase local knowledge and awareness of the species in the locality.



We worked with the Transition Year (15 to 16 year olds) Biology class at De La Salle College in Waterford City. We demonstrated to the group how to conduct non-invasive surveys for small mammals using bait pots and we even found otter spraints near the river which borders their sports field. We set up a mobile DNA laboratory within their own science laboratory and everyone learned how to extract DNA from their samples. This was a really nice experiment for a biology group that successfully mixed ecology and molecular skills.

One of our great successes has been working with St. Paul’s Community School in Waterford City. We were able to create projects for third year CSPE or Civic, Social and Political Education, a mandatory subject in the junior certificate, similar to the GCSE, around the theme of ‘Environmental Stewardship’. We conducted urban mammal surveys with the classes, where each member of the class was individually responsible for various tasks within the





*CALMAST organise summer science camps for both primary and secondary school children annually.*

project. We surveyed for squirrels, foxes, stoats, badgers and small mammals on the school grounds, assisting the students to create their own 'mammal tracking' survey methods. The students used their results to inform an urban wildlife awareness campaign on their school property. Their teacher, Tom Mullane, said that "all the kids did really well in the junior certificate exam, with many of them thankful for the practical, hands on experience they received in the MISE project which later helped jog their memories during their exam".

We have also worked with the autism unit at St Paul's, where some of the students are particularly interested in wildlife, and according to their teachers, working with MISE was a great way for some of the students to express themselves.

## Small Mammals at Schools

We paired our talks with a little school project for pupils to find out a bit more about some of the wildlife present on their school grounds, and we chose to focus on small mammals, in particular on those likely to be common in most areas: wood mouse and pygmy shrew, our only native small mammals; brown rat, bank vole and greater white-toothed shrew, all non-native species with the last only arriving on our shores probably in the last ten years; and hedgehogs which, while not exactly small, we thought would be a nice addition to our project.

All of these mammal species are assumed to be widespread and common across the entire island, at least in areas which they have already colonised (in the case of the vole and greater white-toothed shrew), but for this



reason they seem to be largely neglected by researchers and we don't actually know very much about their distribution in Ireland. This is important on several counts, not least because these small mammals form the mainstay of the diet of many of our predatory animals, including such charismatic species as foxes, pine martens, stoats, kestrels and owls; if small mammal populations get into trouble then so do their predators. Secondly, we need to track non-native species such as bank voles and greater white-toothed shrews, as they relatively recent arrivals here (within the last 80 years) and are still expanding their population across Ireland. It is thought that bank voles and greater white-toothed shrews could cause a negative effect on our two native small species and if these are declining it is important to track that; hedgehogs have also been reported to be declining in numbers in Great Britain in recent decades, but we don't know if something similar has been happening here. So, as well as educating pupils about some of our wildlife, we could also gather some useful information on the distribution of several small mammal species. We did this using two simple pieces of kit namely bait pots and footprint tunnels. Bait pots are simply a large yoghurt pot or small flowerpot, baited with peanut butter or dog

food (both favourites of small mammals). Small mammals visit the pot, eat the bait and leave us plenty of droppings, which we can then use for DNA testing to identify the species of origin. Footprint tunnels are baited triangular tunnels made of plastic posterboard, lined with an inkpad and blank paper to capture impressions of the



footprints of the mammals entering the tunnel to get at the bait.

So far we have visited 34 schools (mainly primary), mostly in County Waterford but also a small number in Counties Cork, Tipperary and Kildare. We have made 88 school visits, reaching approximately 2,000 school pupils in total.



*The children took part in small mammal trapping and other mammal related activities.*

## STEM Education

CALMAST, the Centre for the Advancement of Learning of Maths, Science and Technology, also based at WIT, promote Science, Technology, Engineering and Maths or more commonly referred as STEM. CALMAST organise summer science camps for both primary and secondary school children annually. Over the last three years, we have worked with both age groups to introduce students to mammal field signs at the Kilbarry Nature Park in Waterford City.

CALMAST also co-ordinates the Bealtaine Festival Celebrating Our Living Earth which incorporates International Day for Biological Diversity each May. Over the years, MISE has participated in this festival by leading public family nature walks in Cheekpoint, Colligan Wood and Portlaw Wood in Co. Waterford. We've opened the eyes of hundreds of people to the red squirrels, pine marten, stoats, bats, badgers and otters that live right on their doorstep.

## MISE Related Education Activities in Wales

In North Wales, Ceri Morris, former MISE Project Officer (PO) with Natural Resources Wales and present PO, Becky Clew-Roberts led projects with students that took place in Conwy at the local RSPB Wildlife Reserve, the local school at Ysgol Penmachno, the North Wales Adolescent Service (NWAS) and two children's clubs called Clwb Natur Blaenau and NEW Wildlife. The blended learning projects consisted of talks about Welsh mammals and surveys for mammals using footprint tunnels, bait pots and owl pellet dissections to look for small mammal prey remains. Feedback from NWAS was particularly heartening, as the teacher



said "they were delighted at how engaged and interested the students were in the projects as some of their students can appear detached in class, and this learning experience was enjoyable for the entire group".

Former MISE PO, Jenny MacPherson with the Vincent Wildlife Trust led an eco-day at Llanilar school in Ceredigion, the holders of an Eco-schools platinum award. The children took part in small mammal trapping and other mammal related activities. Jenny also organised a number of field trips for Amman Valley High school, Carmarthenshire, to learn more about red squirrels in one of the conifer plantations where they are occasionally seen. The children have now created a 'red squirrel' display board at the school. Jenny also gave talks at the school careers day. Aline Denton (current MISE PO with VWT) worked with Countryside Management students from Gelli Aur college in Carmarthenshire, and organised a talk on red squirrel conservation and a hair tube monitoring project in one of the red squirrel forestry plantations.

## Educating the Educators

Over the course of the MISE project we also participated in "Teacher Training" initiatives based at WIT and taught primary school teachers the skills they needed to replicate our work themselves in the classroom. We used our blended learning model developed for schools, and taught environmental-related material in the classroom, the laboratory and in the field.

One of our project extension work packages involves the preparation of an 'Education Pack' which will include project ideas for teachers. The pack will be piloted at a number of schools and will then be made available online so that teachers can learn how we used a particular set of skills and adapted them to different situations.





MISE volunteers Jacob van der Ploeg and Daan Smit recording results from an instrument in the lab © Edel Sheerin.

# A Day in the Lab

Article by: Edel Sheerin | - Behind the scenes!

## Introduction

So, you've searched woodland trails, hiked up mountains and scrutinized grassy river banks, in sometimes rather unforgiving weather conditions with the goal of collecting as much poo as possible for the MISE project. The last time you saw those samples they were in small plastic tubes or bags, and were sent off to the laboratory at Waterford Institute of Technology. Have you wondered what exactly happens next? How do we get all the information we need from the poo or hair samples collected during our surveys?

Throughout the lifetime of the project, our dedicated volunteers in both Ireland and Wales have collected thousands of samples. From otter and forest mammal surveys to red squirrel and pine marten hair tube surveys, the samples also include some unfortunate animals killed on our roads. See the examples below:

online databases. This enables those of us in the lab to view incoming samples from all project partners, in both Ireland and Wales, and allows us to prepare by keeping the lab fully stocked. Once the samples reach the lab they are stored in our giant walk-in freezer at WIT.

Following a survey, all details such as the GPS co-ordinates, field observations, tests required and sample IDs are recorded on our



### Getting DNA from the Sample:

The first step in the lab is to extract DNA from the sample, and this method varies slightly depending on the sample type. For example, if the sample is hair, first we need to break it down in order to release the cells that contain the DNA. With faecal samples, we use the cells that are rubbed off the intestine as the faecal material passes through the animal's gut, these cells coat the outer surface of the poo. A short protocol to liberate the DNA from the cells (If you wish to read further details on the DNA techniques please follow this link to our website <http://www.miseproject.ie/publications/reports-ireland/>).



Otter spraint © Kate Williamson.



Pine marten scat © Vincent Wildlife Trust.

Each sample we process is given a unique DNA extraction code. This enables us to quickly search our internal database, locate the sample (we have an archive of boxes containing almost 7,000 samples) and track its progress within the lab.

### So we have the DNA.... Next?

Once DNA has been made from all the samples of a given survey, we then test them to find out what animal it was from, if it was male or female, and in some cases we can also determine the DNA fingerprint to identify an individual. This information can be combined to tell us about the local animals in a particular survey area. We use the sex test as an indicator of the quantity and quality of DNA present in each sample, as a cost-effective and time saving measure, so that only the best samples are subsequently used to obtain a genetic fingerprint.



Hair sample © Terry Whittaker.



Small mammal faecal samples © Edel Sheerin.

All of this data is then plugged into statistics programs which enable us to study the genetic health of the animals and estimate the number of animals present in an area, sometimes we can even tell which animals are related to each other! This information will be used to advise conservation strategies for future management.

When all the results have been uploaded to the shared online database, the MISE Project Officers can then access them to use in survey reports and scientific peer-reviewed publications, these are made available online through the MISE website. We also submit records to data centres whose aim is to record and monitor the biological diversity within Ireland and Wales. In Ireland the records are sent to the National Biodiversity Data Centre (NBDC) and in Wales the MISE Project Officers contribute data to Cofnod (the North West Wales local records centre) and WWBIC (West Wales Biodiversity and Information Centre).



MISE Project Officer Aline Denton extracting DNA from harvest mouse droppings © Liz Halliwell.

### Lab Training:

We have provided lab training for volunteers from Ireland and Wales, where they learned the different DNA techniques and applied them to samples from our surveys. In keeping with our cross-border collaboration, we share our skills and expertise with our colleagues from Wales who have also visited the lab to learn about and carry out the DNA tests.



A close-up photograph of a red squirrel with a white belly, climbing a tree trunk. The squirrel is looking directly at the camera with its right arm extended upwards. The background is a soft, out-of-focus green forest.

# Conservation Enhancements

**Article by:**

Andrew Harrington  
Aline Denton  
Becky Clews-Roberts

A lot of the work that the MISE Project has been doing over the last three years has been focused on gaining more information on the wild mammals we are working on, all of which are of some conservation concern. For example, where are the hotspots of genetic diversity in red squirrels in Waterford that need to be protected? Where are the vulnerable harvest mouse and hazel dormouse hiding out in Wales? Can we better understand the conservation status of the otter population in certain areas of Ireland and Wales through DNA testing of spraints?



*While habitat improvements of some kind could probably be carried out for most mammal species, some species need more help than others.*

While we have gained a lot of information on these and other questions about the mammals we are studying, we have also tried to take action to make some kind of improvement to the habitat in certain areas, aimed at helping our target species in some way. Whilst large-scale habitat creation or restoration projects are expensive to undertake, our work has consisted of creating den- and nest-boxes which for a much smaller price tag can just as well have a positive (albeit smaller) effect. For many species, roost, nest or den sites may be at a premium and can be a factor limiting a species' population in some areas.

While habitat improvements of some kind could probably be carried out for most mammal species, some species need more help than others. For example, while artificial otter holts have been successfully used in some places to provide resting places where they may be scarce, the otter populations in our main study sites in Wales and Co. Waterford in Ireland seem to have no lack of suitable places to rest or to raise their young, as they tend to burrow holts into riverbanks, or can lie up in a hidden area under a large

rock, in a thicket of brambles or a stand of reeds. However, some other species can certainly do with a helping hand, including pine martens, bats, and dormice. All of these species respond well to the installation of additional nesting or roost sites in areas of suitable habitat, as one of the pressures on these species in many places is the lack or destruction of suitable resting places.

The natural roost sites of bats in Ireland and Great Britain before the arrival of humans would have consisted mostly of cracks or hollows in trees and to some extent in caves. However, human activity has massively reduced the available tree roosts, especially in Ireland where woodland cover was reduced to less than 1% of the country in the early 20th century. Bats now mostly have to roost in buildings and other man-made structures and are therefore vulnerable to disturbance and destruction of their roost sites. In light of this, bats can most certainly do with a helping hand, and bat boxes have been successfully used for some time to increase the amount of roosting space in areas of favourable habitat for bats.

With this in mind, we decided that erecting some bat boxes would be a simple and very positive measure to improve habitat for bats. In late 2013 we set up two pilot bat box schemes in County Waterford, in Cheekpoint and Lismore, with the help of local community groups. Cheekpoint is a small village in east Waterford surrounded by farmland and small patches of woodland, while Lismore borders the River Blackwater and large tracts of broadleaf woodland, and the schemes contain ten and twelve Schwegler woodcrete bat boxes respectively. In bat box checks between spring and autumn 2014, we were delighted to see the Lismore bat boxes being gradually discovered and occupied by bats. By the end of the summer, seven of the boxes had been occupied, indicated by either seeing the bats themselves or by piles of bat droppings in the bottom of each box. We were lucky enough to be joined by Tina Aughney of Bat Conservation Ireland for a workshop in late June, and she identified the three bats we found in the boxes on that occasion as soprano pipistrelles (*Pipistrellus pygmaeus*), and all of the droppings we have collected which have been DNA tested have also been identified as soprano pipistrelle. Our Cheekpoint bat boxes haven't yet been occupied (as of September 2014), but bats can be rather picky and may take some time to move into a new home, so this is no cause for worry just yet! However, the rapid occupation of more than half of our bat boxes in Lismore is a great result for their first year. In the coming year we plan to construct more bat boxes and distribute them more widely across County Waterford in other areas of suitable bat habitat, especially in woodlands.

In Pembrokeshire, 30 Schwegler bat boxes were installed in woodland at Ty Canol National Nature Reserve (NNR). As well as



Pine marten den box.





Henry Schofield from the VWT checking bat boxes.

increasing the roosting opportunities, the boxes have enabled us to investigate which species are using the woodland. Since being installed in 2013, the boxes have been checked twice a year by Dr Henry Schofield from VWT with the help of MISE volunteers. In May 2014, bats were found in 6 of the boxes, with bat droppings found in a further 2 boxes. Bats have since been found in 3 of the boxes, with droppings found in a further 11 boxes. The bat droppings have been sent for DNA analysis at WIT to confirm which species are using the boxes. Many volunteers see only a brief glimpse of a bat disappearing into the distance, so this project has provided volunteers with the opportunity to see bats 'in the hand' and get close views of at least 3 different species of bats, including Natterer's, brown long-eared and soprano pipistrelle.

Another mammal species we plan to target for habitat improvement is the pine marten. This species would naturally place its dens in large cavities in old hollow trees, well out of the reach of predators such as foxes. However, as for bats the almost complete destruction of our forests left very few of this kind of den site for pine martens, leading

them to use less secure den sites. In Scotland, den boxes have been successfully used by the Vincent Wildlife Trust to increase the amount of den sites available to this species in conifer forests, and female pine martens have often raised their young in these den boxes. To the best of our knowledge, pine marten den boxes have only ever been used once before in Ireland, in a scheme set up by the Vincent Wildlife Trust last year, so there is no indication of how successful they are yet. We have just begun to pilot the use of den boxes in January 2015, in two woodlands in Co. Waterford where we have been studying the pine marten populations for nearly ten years. While the pine marten population in Ireland is slowly increasing, it is still a rare mammal species and we are interested in examining whether den boxes would be a useful conservation measure for them here as well as in Scotland, by boosting their breeding success through providing safe den sites.

A number of conservation enhancements have been made for red squirrels in Wales. Pupils from Amman valley high school, in the area of the mid Wales red squirrel focal area, helped to make red squirrel feeders

and nest boxes. They then came along to one of the forests where reds are regularly seen and helped to install these, and also planted some 'squirrel-friendly' tree saplings. The MISE project has also encouraged grey squirrel management to support the conservation of local reds in north and mid Wales. We have commenced trapping at a site in north Wales where there may be very few red squirrels remaining, purchased grey squirrel traps as part of a trap loan scheme for volunteers, and provided training in grey squirrel control. At Clocaenog in north Wales, this work was undertaken in conjunction with the British Association of Shooting and Conservation (BASC), who provided additional expertise and contacts.

In north Wales, our work with dormice has involved both assisting with box checks at existing sites and placing new boxes and tubes in the hope of locating new populations. Thirty dormouse nest boxes and 10 nest tubes have been installed at four locations with positive results at one of these where two male dormice were found at a site in Dolgarrog, Conwy Valley in 2014. In west Wales, several volunteer groups have helped to make and install dormouse boxes, including Pontrhydfendigaid youth group in Ceredigion who made boxes for their local community woodland, Coed Y Bont. It is anticipated that local mammal groups and volunteers will continue to check these boxes once the MISE project has come to an end.

In summary, we have already carried out habitat improvements for a wide range of mammal species in sites in Ireland and Wales, and we will be continuing this work until the end of the MISE Project. We're already seeing the positive effects of these improvements, and we hope that they continue to benefit wildlife into the future, not only through directly providing more habitat for wild mammals, but through the training and ideas we've given to volunteers and community groups to continue carrying out this work elsewhere.





*We have just begun to pilot the use of den boxes in January 2015, in two woodlands in Co. Waterford where we have been studying the pine marten populations for nearly ten years."*





# MISE habitat surveys in Co. Waterford

**Article by:**

Andrew Harrington  
Bernadette Guest

Over the course of the MISE Project, much of the survey work that has been carried out by MISE staff and volunteers has focused on our target wild mammal species, aiming to find out more about their distribution and population numbers. However, wild mammals depend on having enough suitable habitat in the landscape to sustain their numbers, so having information on the quantity and quality of such habitats is just as important in the conservation of wild mammals as accurate population information.



*This first phase of habitat mapping was very successful, as it covered 413.5 square kilometres, or 22.5% of the area of Co. Waterford.*

This is especially true when we take into consideration that habitat loss due to human activity is one of the most significant factors leading to the decline and extinction of many wildlife species, including mammals. As well as the outright loss of habitat, habitat fragmentation can have a negative effect, where areas of suitable habitat for a particular species become so small and widely scattered due to human activity that they cannot provide enough space for that species to survive.

In general, the loss of areas of natural habitat has been increasing in Ireland in recent decades, as farming practices become more intensive and the country has become more developed and urbanised. Although some places are protected for the natural habitats and wildlife that they contain, such as National Parks and Special Areas of Conservation, many natural habitats exist outside of protected areas and are at high risk of damage and destruction. As well as providing living space for wildlife, natural habitats in many cases provide unseen benefits or “ecosystem services” for human populations, such as flood prevention and water purification in the case of wetland habitats, or the absorption of carbon dioxide from the atmosphere (which can help in the fight against climate change) in the case of woodlands. Therefore, there is a need to map out these habitats as much as possible

across Ireland, to identify where they exist and thus be better equipped to protect them for the benefit of wildlife and the services they provide.

For this reason, Waterford City and County Council (WCCC) commissioned habitat surveys of County Waterford to improve our knowledge of the areas of special importance for their natural habitats (and thus wild mammals). As the main focus of the MISE Project is on wild mammals, we decided to concentrate on the habitats which are of most importance to the main species that we have worked on in Ireland, i.e. otter, red squirrel, pine marten and bats. While red squirrel and pine marten depend to a large extent on woodland and scrub habitat, otters mainly spend their lives in wetland habitats (e.g. rivers, lakes, marshes), and for many bat species woodland and wetlands provide the most favourable hunting habitat, although they may not necessarily roost in these areas.

The first phase of mapping of habitats of importance for these species was completed in 2013. Our main aim was to identify “corridors” of suitable habitat for these species in Co. Waterford. Such corridors are important as they not only provide mammal habitat themselves, but they also connect larger areas of habitat, allowing animals to move between different populations and

prevent inbreeding, which can be a serious problem for an isolated population.

This first phase of habitat mapping was very successful, as it covered 413.5 square kilometres, or 22.5% of the area of Co. Waterford, much of which was achieved by collating habitat map data from a range of sources including National Parks and Wildlife Service habitat data. The survey demonstrated that many of the patches of semi-natural habitat which wild mammals rely on in Co. Waterford are in fact relatively well-connected, as they are spread out along several major corridors, including the Suir Valley and the foothills of the Comeragh and Knockmealdown Mountains. However, there are also some areas where mammal habitat is more fragmented, especially in east Co. Waterford, thus wild mammals in these areas may be more vulnerable to habitat loss and further fragmentation.

A second phase of habitat mapping was commissioned in 2015 and focused more on wetland habitats, which are important for otter populations providing hunting grounds and den sites in refuge habitats between larger waterbodies.

The large amount of habitat map data we now have is a very valuable tool for the future conservation of natural habitats in Co. Waterford, and the wild mammals that depend on them. Firstly, we now have “baseline” information on the state of these habitats, which we can use to track how these areas change in the future in terms of either habitat loss or gain. Secondly, such maps will inform policy and future work programmes relating to the conservation of natural heritage in Waterford. This information will be useful to a range of agencies involved in nature conservation and landscape management and will contribute to the development of a national habitat map guiding future conservation strategies for Ireland's wild mammals.





# Seafaring Bats



**Article by:**  
Aline Denton  
Becky Clews-Roberts

Our knowledge of bat migration in the UK is surprisingly limited. Unlike bird migration which can be monitored using satellite trackers, bats are too small to carry these devices. However, the discovery in the Netherlands in 2013 of a Nathusius' pipistrelle (*Pipistrellus nathusii*) which had been ringed in Bristol, England provided the first evidence that UK bats may migrate across the sea (Bat Conservation Trust (BCT) 2013).



*In autumn 2014, with permission from StenaLine, the detectors were installed on their three ferries that cross the Irish Sea.*

This species of bat has been recorded as a migrating on the Continent through ringing studies, and breeding populations are known in Ireland, but not to date in Wales. All this evidence coupled with occasional sightings of bats on oil platforms and ferries, fuelled the idea of the migrating bats project within MISE.

Setting out with the aim of finding evidence of bat migration between Wales and Ireland, we purchased Anabat Express detectors, the very latest in bat detector technology. Bats use high frequency calls to build up a sound picture of their surroundings. This 'echolocation' system enables them to hunt during the night. A bat detector such as the Anabat Express turns these echolocation calls into 'sound files' which we can then analyse using computer software. In autumn 2014, with permission from StenaLine, the detectors were installed on their three ferries that cross the Irish Sea. The advantage of using the Anabat Express detectors is that they can log the GPS position without having to manually note any delays to the ferries.

The Captains of the ferries were hugely supportive, actively helping to place the detectors (in awful weather!) and then continuing to replace batteries when necessary and download data from the SD cards for us to analyse. Below is an image of a typical sonogram which depicts the data captured from detectors. From these, we can determine those species of bat that have flown passed.

At time of writing, the detectors have been removed for the winter months and will be replaced for the spring migration period. Analysis of the data will take place soon.



We are also planning to place detectors on islands and promontories in the hope of picking up bat calls.

Jean Matthews, Mammal Ecologist from Natural Resources Wales, assists in the placement of the detectors on the Holyhead – Dublin Route. No amount of bad weather stood in our way!



Captain Eric Davies from The Adventurer has taken a keen interest in the project.

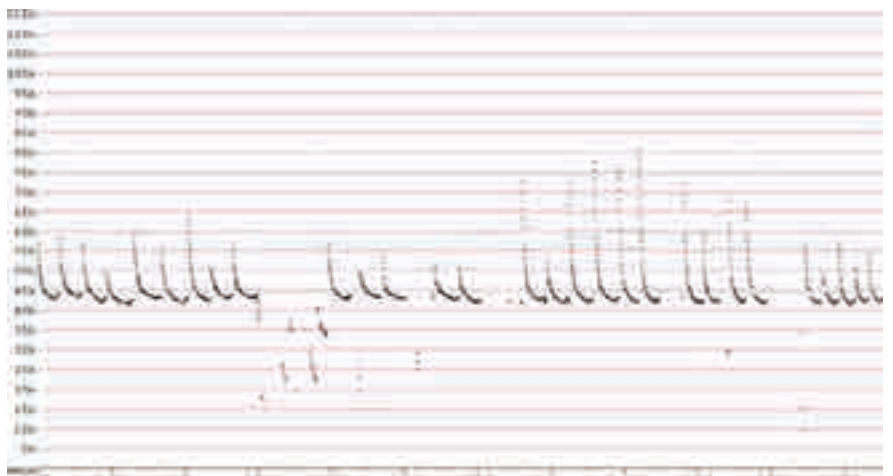


Image of a typical sonogram used to determine bat species.





Dr Catherine O'Reilly (WIT) and  
Dr. Henry Schofield (VWT) meet  
Irish President, Michael D Higgins.

**Article by:**  
David O'Neill

# Project Highlights

## Project Extension

During 2014, we were delighted to launch more project activities thanks to the award of additional part-funding by the European Regional Development Fund (ERDF) through the Ireland Wales Programme (INTERREG 4A). The project was progressing well through our original objectives and reaching milestones, so when the opportunity arose to secure more funding, we certainly didn't have to think twice about designing new and additional work packages.



*To have the MISE project and efforts of all the volunteers recognised in this way was no mean feat and was a real highlight for the team.*



The Molecular Ecology Research Group at WIT. From left to right: Andrew Harrington, Dr Denise O'Meara, Dr David O'Neill, John Power, Dr Catherine O'Reilly, Dr Peter Turner, Ciara Powell and Edel Sheerin (who was absent from the photo).

Admittedly this turned out to be a challenge, simply because we had so many ideas for what we could do! This in itself reflected the success in working with such interested and enthusiastic people and groups, and the strong collaboration between project partners, but was only made possible by the continued support and confidence of the Ireland Wales Programme.

Securing this funding meant we could build on the strengths of our partnerships developed through our original project activities to address some key topics that arose. During our last 6 months of the project we are focussing on more advanced training for volunteers, mapping of habitat networks and educational resources.

### Celebrating Ireland Wales Cooperation

In October 2014, the MISE project had the honour of meeting Irish President Michael D. Higgins at an Ireland Wales Programme event

held in Swansea University. MISE was one of just eleven cross-border projects selected to showcase the 2007-2013 Programme.

2014 was also the 20th year of the Programme and MISE was invited to attend the celebrations at Dublin Castle in November. The event was attended by Minister Brendan Howlin TD, Irish Minister for Public Expenditure and Reform, and Minister Jane Hutt AM, Welsh Minister for Finance, who both praised the achievements of the Programme. It was fantastic for MISE to be invited along to attend such important occasions.

### Irish Laboratory Awards

In December 2014, the Molecular Ecology Research Laboratory at WIT, or "MISE HQ", was nominated in the "Research Laboratory of the Year" category at the Irish Laboratory Awards. These awards recognise and celebrate the best the science industry has to offer, which includes both the people and

the laboratories who deliver the projects. The awards aim to acknowledge and encourage the skills and development within the science sector for today and years to come.

We were just one of seven research laboratories in the whole of the country to be short listed in a broad and highly competitive category. It was another fantastic opportunity to raise the profile of the project and showcase our work to the very best of Ireland's science community. To have the MISE project and efforts of all the volunteers recognised in this way was no mean feat and was a real highlight for the team.





Article by:  
Brian Power

# A Volunteer Perspective

I first encountered the MISE project through their Facebook page shortly after the project began in 2011. Having sent some otter spraint to the lab in Waterford IT, I was invited to join the survey team as a volunteer on their project on Dungarvan otters. This weekend long survey took place in conjunction with MISE colleagues from Wales who provided training and guidance on identifying otter spraints and field signs. I learned a lot on the first survey day from both talks and field work which took place in some very scenic valleys near Dungarvan. The project gave me the opportunity to meet many like-minded people as well as learn skills from professional ecologists while working in very scenic areas.



*One of the highlights of the project was seeing members of the general public being actively involved in ecological studies.*



Volunteers analysing owl pellets for the presence of small mammals.

Having enjoyed the survey so much I returned to Dungarvan as a volunteer over the next two autumns where it was fascinating to see the scientific interpretation of data collected on the previous years. I also took part in other otter related surveys including; Waterford and Cork Cities, Roaringwater Bay, Co. Cork, upland surveys in Co. Waterford and an otter diet workshop. All of these events and workshops helped to improve my wider understanding of otter ecology, and I was particularly interested in how the field collected data was used for DNA analysis to learn more about otter populations and how the results changed according to differences in habitats such as coastal, inland and urban areas.

Aside from otters, I also took part in forest mammal surveys and a small mammal

identification work shop. The former again provided me with valuable knowledge on interpreting field signs of various mammals which eventually led to me finding a population of red squirrels in my home county of Carlow where no evidence of red squirrels had been found on the last national survey conducted in 2007. The latter event provided me with great insight into the importance of small mammals and their role in broader ecosystems.

From a volunteers perspective I found the project to be a very successful. I gained a number of practical skills, met some very interesting people, saw some beautiful places and gained a greater understanding of the importance of mammals in ecology. One of the highlights of the project was seeing members of the general public being

actively involved in ecological studies. And of course being provided with the opportunity to see otters in the wild is always a plus!



Otter (*Lutra lutra*) © Brian Power.



Article by:  
Michael Desmond

# A Volunteer Perspective

The excitement over a few missing kernels of corn was bordering on childish, but when you have hopes raised and dashed, the first clues that you are not on a fool's errand can only result in a giddy feeling. Three years ago I answered a survey about seeing red squirrels in the Nire Valley Co. Waterford, I was subsequently contacted by Denise O'Meara and Andrew Harrington of MISE asking if I would partake in helping them collect squirrel hair samples.

The plan looked easy; place some, adapted, plastic pipes in an area frequented by squirrels. Entice the squirrel with corn and hazel nuts and with the use of sticky, very sticky, patches we would harvest samples of squirrel hair. The first area we set up in looked promising as it had plenty of hazels growing, but the squirrels were having none of it. After a month of waiting, checking, waiting we had nothing to show so we moved to a site deeper in the valley.

The tubes were left for a few days before being checked, but when I discovered that one of the tubes had all the corn and hazelnuts gone and hair samples on the patches I was giddy with excitement. What amazed me the most was only one of the four tubes was frequently visited, with one other tube visited only once and the remaining two yielding nothing. My excitement was tempered after two weeks of yielding good samples when the samples stopped but the bait kept been taken; the squirrel had figured out how to get the corn and hazel

nut out without paying the admission price of a few hairs!

By now I had started telling people what I was doing and a neighbour told me that he was feeding at least two squirrels at his bird table every winter. We set up two tubes, but amazingly only one tube yielded hair. As this tube was near a bird feeder we had to stop using corn because the birds were eating the corn as fast as we could place it in the tube. As soon as you moved out of arm's length the birds were taking the corn. Despite the birds we got some great squirrel samples from this site.

Word got around about what we were doing and I started getting calls about road kill, squirrels that had fatal encounters with cars. I started carrying a tin snips and sealable bags in my car to recover tails. We gathered about four tails. I also discovered squirrel road kill disappears quickly; it would seem to be a favourite with magpies, crows and other scavengers. An interesting aside about

carrying snips and sealable bags is we have got samples from a dead otter, two stoats, and a sparrow-hawk.



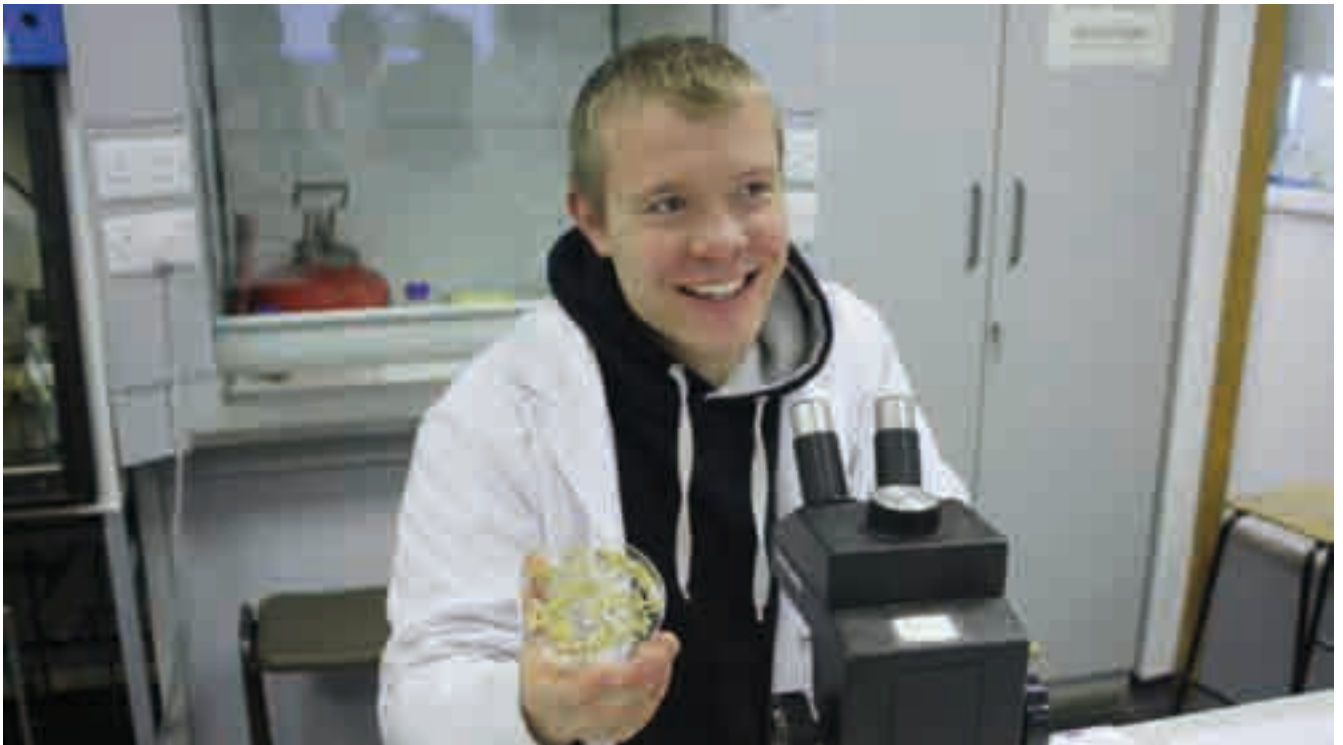
A stripped pine cone indicating the presence of squirrels.

Then, one day I was stopped in the local shop and asked "are you the one collecting squirrels" not knowing where the line of questioning was going, I sheepishly answered "yes". My inquisitor then dropped the bomb shell "what about the grey ones?" "There are none", I replied. "Oh yes there are", and he proceeded to tell me where they were. I desperately hoped he was wrong, but shortly afterwards I saw a grey squirrel near Ballymacarbry village. I have since seen three more greys in the area.

We are proud of our red squirrels and we have referred to the work of MISE and their study of the squirrels in our Tidy Towns' application, which brought positive comment from the judges. Denise and Andrew and the crew in Waterford have shown how important the Nire Valley Red Squirrels are, I hope something can be done to stop the advance of the greys.



Hair-tube used for red squirrel surveys.



Article by:  
Domhnall  
Finch

# A Volunteer Perspective

My name is Domhnall Finch and I recently started working as an ecologist for an environmental consultant based in Ireland. I have been to numerous events organised by MISE over the last few years, these include otter surveys in County Waterford and dietary analysis workshops.

As part of the otter survey events we were all briefed as to what signs we were looking for (e.g. spraints or faeces, slides, tracks and holts) and where the best places to find these would be. We were also shown how to collect spraints for DNA analysis. We were also shown the results of the previous year's data to show us where otters were present in the study area and we were shown preliminary DNA data regarding the sex ratios of the otters and how many individuals were genetically identified. Coming from a scientific background myself it was interesting to see the dynamics of the otter population unfold over the years, and it was very satisfying to know that I helped gather this data.

The dietary analysis workshop was something that I never thought I would be interested in. However, this was one of the highlights of my experience with MISE. I learned a lot of new information during this workshop. For instance, I had no idea that otters sometimes eat rabbits, but through microscope analysis of otter spraints we identified a toe nail of a young rabbit. It also helped that a leading expert was on hand to provide identification advice.

All the MISE events were absolutely fantastic and well run. Not only did I learn about the chosen topic e.g. otter ecology, diet and behaviour, but I also learned about all other mammal species due to the broad experience of those working on the project.

For example, a bat specialist involved with MISE was at one of the otter survey weekends where he caught bats (under licence) using a mist net. It was absolutely great to see brown long-eared bats up close. The events run by MISE were very important for my career as an ecologist. Through these events and advancing my skills and knowledge about Irish mammals, I am currently contributing on the design and planning of one of Ireland's largest mammal surveys covering over 20,000 ha of land. I know the knowledge and experience that I have gained through MISE events was instrumental in being able to organise and work on such a large project and I hope to attend many more events.



Article by:  
Amy Green

# A Volunteer Perspective

In July 2012 I decided that as my current job was due to end soon and there was no hope for an extension, I would bite the bullet and leave during the summer season so that I could get more experience in the field of wildlife conservation. I was lucky in that I already had several contacts in the field and they turned me towards the MISE project. At the time I had experience in bat surveys but in terms of mammals that was as far as my knowledge went!



The first time I went out volunteering for MISE it was at a local conifer plantation setting up red squirrel hair tubes. It was really interesting and taught me a lot, such as how grey squirrel hair is stripy, and how even if there are confirmed sightings of red squirrel, you still might not get any hair from the tubes! The hair tubes are really clever and answered the question I had had a couple of years previously of "what are those bits of drainpipe doing strapped to a tree?" I helped at this forest a couple of times and it was always interesting, and I met several new people who have since popped up in my working life.

I also helped with several harvest mouse surveys. Prior to my involvement with the MISE project, I didn't even know about these tiny, animated animals. Many hours were spent wading through tall grass collecting or setting up sample pots and there was a great reward when we went to Chester Zoo to learn about their breeding and a reintroduction project. At their release site we actually found a couple of nests which

meant I feel more confident about finding them in the field now. I have since spoken to members of the public about this lovely species and been a member of staff on search and training days for volunteers. We did have some issues with the survey technique in that we thought voles were eating the food before the harvest mice could get there (as they are very shy) and it was interesting to think about ways we could improve the technique.

One of the things I have enjoyed most about being part of MISE was meeting so many new people from different organisations all with the same aim and attitude towards wildlife. It has really helped broaden my learning experience as everyone has a different speciality, and it has increased my network of contacts across North Wales.

The most memorable thing I did as part of the project was to take part in three residential otter surveys. The first was in Ireland and was a fantastic opportunity for me as I had never been on an otter survey before. It was



great to help survey across such different habitats, from streams to beaches. This experience was amazing and that knowledge has definitely helped me further my career. I also took part in a pine marten scat survey which is something that doesn't happen so much in North Wales because if they are present, their numbers are very low. The second and third otter survey weekends were in Snowdonia and again the habitat was varied along with the weather but we soldiered on and found spraint.

Volunteering for the MISE project increased my skillset and work experience which helped me when I was applying for jobs, especially as I could now talk about the survey methods and species I had worked on. The MISE project is well recognised throughout the region, and this has increased the value of the experience gained by volunteers. I have since progressed my career and I am now a Project Officer for a landscape scale project in North East Wales and I do believe that if I hadn't volunteered with MISE then I may not be here today.



Red squirrel survey with Jenny McPherson and Huw Denman.

Article by:  
Megan Shersby

# A Volunteer Perspective

I first came across the MISE project during my third year at Aberystwyth University. Whilst I was busy with studying and a part-time job, I managed to occasionally volunteer as I knew that the experience would be fantastic and allow me to develop skills and knowledge that I wouldn't gain at university. I was able to assist on a few of the projects including searching for dormice and otter spraints, putting up hair tubes for red squirrels and pine martens, and analysing the diets of otters.

As well as learning about the research behind the work, and more about the study animals, this volunteering also gave me the opportunity to meet some amazing people. The officers involved in the project, who are incredibly knowledgeable and friendly, and of course, other volunteers. It is always a joy to spend time with people with similar passions, especially when you can learn from each other.

The time spent volunteering on this project has been brilliant as it has enabled me to apply for conservation jobs, leading to fieldwork in South Africa and more

recently, working with Wildlife Trusts. I now work mainly in the engagement side of conservation, and volunteering with the MISE project has given me the confidence to talk in greater depth about the species involved and inspire others to find out more about them. As a result of the project, I am confident at identifying otter spraint, and it features often in my blog posts and in a video on my upcoming YouTube channel. It is safe to say that my experience volunteering with the project has been extremely positive and has given me an incredible boost in terms of skills, knowledge and confidence.



One of the otter spraints analysed by Megan at a MISE event.



# MISE Inventory

## Tools of the trade



**Faecal samples**

We walk along forest tracks, the coast line or river banks in search of scats or spraints. We also use bait pots to collect small mammal faecal pellets.

**Target species:** Pine marten, otter, harvest mouse, dormouse, shrews.



**Hair tubes**

Plastic tubes are wired to trees or placed along the ground to remotely collect hair samples. The tubes are baited to attract the target species, and a strategically placed glue patch removes the hair.

**Target species:** Pine marten, squirrel, stoat, weasel, polecat and small mammals.



**Bait pots**

Small plastic buckets or pots placed in hedge-rows or in scrub. Bait such as peanut butter or maize is placed inside to lure the mammals in. We collect the droppings they leave behind.

**Target species:** Harvest mouse, dormouse, shrews.



**Field signs**

Signs left behind by animals as part of their normal behaviour which can be used by surveyors to identify the presence of a particular species. Apart from droppings, signs can include footprints, feeding signs, dens or nests, etc.

**Target species:** All mammals.



**Owl pellets**

Indigestible material regurgitated by owls. Pellets are deconstructed to reveal bones and hair of their prey. Prey species can be identified by morphological variations of skulls, or via DNA tests.

**Target species:** Small mammals.



**Volunteers**

One of the most powerful tools for conservation – people power. The support of volunteer citizen scientists is vital to help build up the information that is needed to sustain and conserve biodiversity.

**Target species:** All mammals.



**Lab tools**

The laboratories at WIT are equipped with the machines we need to complete DNA testing. Making the DNA from faecal or hair samples to identifying an individual's genotype can all be performed here.

**Target species:** All mammals.



**Cage traps**

Cage traps are used for in-depth ecological studies, and necessary for radio tracking studies. Trapping is also used for controlling invasive species like grey squirrels. Trapping requires appropriate licensing.

**Target species:** Pine marten, squirrels, small mammals.



**Bat boxes**

Small boxes built of wood or moulded out of a mix of wood and concrete to mimic natural bat roost sites. They are placed on trees or buildings to act as additional roosting sites for bats.

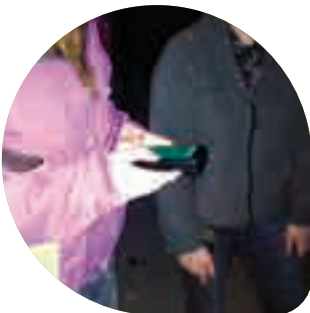
**Target species:** Bats.



**Bat nets and traps**

Several different types of traps for capturing bats, most of which include some form of net. Placed along the flight path of bats, allowing bats to be caught, studied and released without injury.

**Target species:** Bats.



**Bat detectors**

A microphone which picks up ultrasonic sounds and converts them into lower frequency sounds which we can hear. Used to listen to calls which bats make while hunting and can identify the species of bat making the calls.

**Target species:** Bats.



**Dormice nest boxes**

Wooden hibernation boxes positioned on trees in appropriate habitat. Surveyors check the boxes for signs of dormice, and licenced dormice surveyors handle and record their attributes.

**Target species:** Dormouse.



**Radiotracking**

Light-weight collars with radio-transmitters attached placed on animals. Signals from the collar are recorded to monitor the movements of the animals.

**Target species:** Red squirrel, pine marten.



**Record keeping**

Information gathered during surveys is recorded on log sheets. Together with GPS data and results from DNA testing, this information is then registered with national and regional record centres.

**Target species:** All mammals.



**Footprint tunnels**

Useful non-invasive method to observe mammal footprints. The mammal walks across non-toxic paint and leaves prints on white paper.

**Target species:** Hedgehogs, small mustelids, small mammals.



**Squirrel feeders**

Small boxes built of wood and are baited with nuts and maize. Can be built by groups of volunteers and can then be used to supplement the diet of red squirrels in targeted conservation areas.

**Target species:** Red squirrel.



**Den boxes**

Large boxes built of wood and placed high up on trees to act as additional den sites for pine martens.

**Target species:** Pine marten.



**Camera traps**

Remote cameras are usually attached to trees. Triggered using infrared sensors, we get some wonderful snaps showing who or what was moving about.

**Target species:** All mammals.





*One of the highlights  
of the project was  
seeing members of the  
general public being  
actively involved in  
ecological studies.*





*The genetic work in Wales and Ireland has revealed that both regions contain squirrels with unique genetic heritage.*

*While habitat improvements of some kind could probably be carried out for most mammal species, some species need more help than others.”*



**Mammals in  
a Sustainable  
Environment**





# Mammals in a Sustainable Environment

