

## Hair tube survey for the presence of red squirrels, *Sciurus vulgaris*, in Cwm Berwyn, mid Wales, 2013



Photo: Linda Priestley

## Background

The Mammals in a Sustainable Environment (MISE) project is a partnership between Waterford Institute of Technology, Waterford County Council and the National Biodiversity Data Centre in Ireland and The Vincent Wildlife Trust, Countryside Council for Wales and Snowdonia National Park Authority in Wales. The project is part funded by the European Regional Development Fund under the Ireland-Wales Programme 2007-2013 (INTERREG IVA), with the aim of fostering community involvement in Wales and Ireland in mammal conservation. One of the ways in which this is being achieved is by providing a range of workshops where volunteers are trained in field skills for mammal surveying, and also through volunteer participation in field surveys. No prior knowledge or experience is necessary to take part and anyone who is interested in getting involved in mammal conservation and monitoring will be given help and training from expert mammal ecologists.

The Molecular Ecology Research Group at WIT have developed techniques for identifying mammals from non-invasively collected samples such as hair and scat or spraint (faeces). They will use these forensic DNA techniques to confirm the species of surveyed mammals from samples collected by volunteers, and also to provide further information on haplotypes, sex and genotypes of individual animals where possible.

## Red squirrels in mid Wales

The red squirrel (*Sciurus vulgaris*) is the only squirrel native to the UK. Red squirrels were once common and widespread throughout Britain and Ireland but, although still abundant in parts of Scotland and Ireland, they are now rare in England and Wales and have been replaced by the introduced grey squirrel (*Sciurus carolinensis*) across much of their range. The main threats to the red squirrel are loss of habitat, competition from the larger grey squirrel and squirrel poxvirus which is harmless to greys but usually fatal to reds.

Grey squirrels are able to digest large seeds such as acorn, even before they are fully ripe; and therefore in broadleaved woodlands they can feed more efficiently than reds and out-compete them for resources. Conversely, small seeded conifers are less favoured by grey squirrels and so red squirrels may have a slight competitive advantage where there are large areas of coniferous woodland. Conifer plantations dominated by Sitka spruce will only support low densities of red squirrels but, with slight alterations in woodland management, these can provide significant benefit for red squirrels while still disadvantaging the greys. Tree species of particular value to red squirrels include lodgepole pine, Norway spruce, Scots pine, and larch. It is also important to have a mix of tree species to

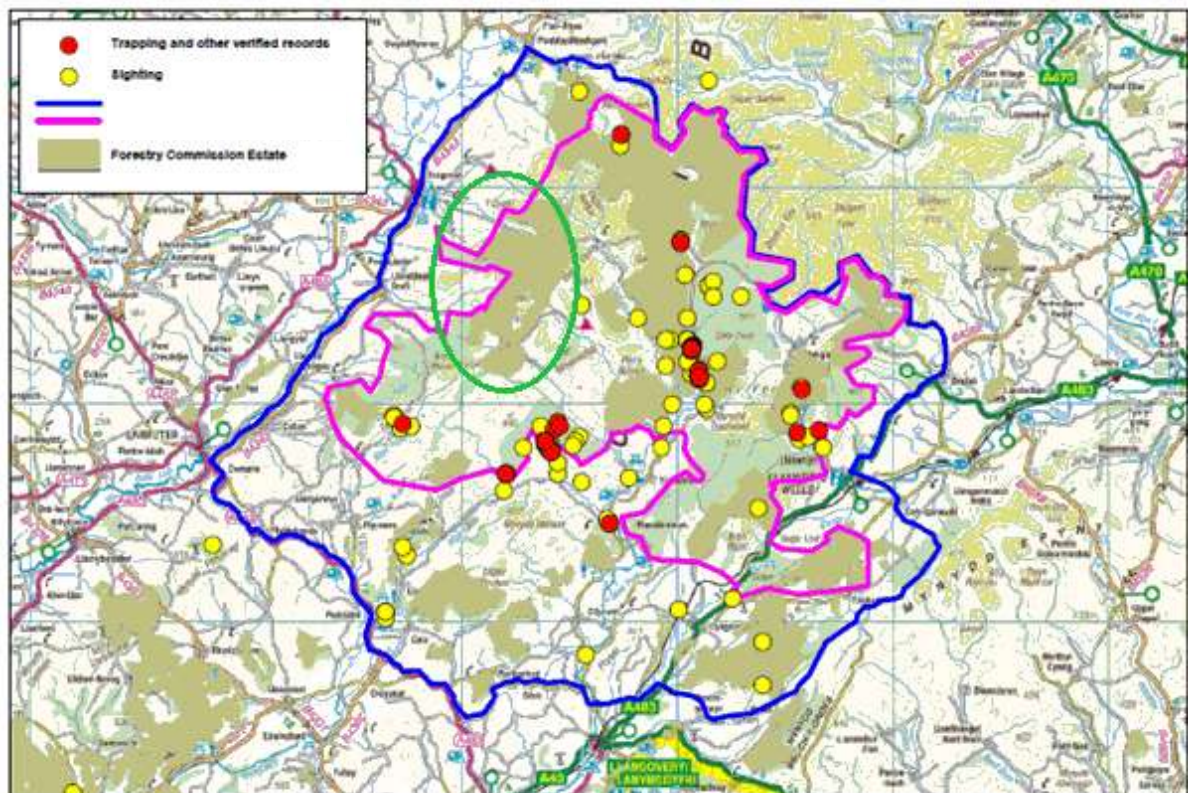
reduce the impact of poor cone years in any one of them. Habitat continuity is vital to red squirrels, and maintaining connectivity between seed-producing areas prevents red squirrels being isolated from food sources and from each other.

There are still three significant red squirrel populations in Wales: on Anglesey and Clocaenog in north Wales, and in mid Wales around Llyn Brianne. The mid Wales red squirrel population is present within coniferous plantations in forests which together total 3500 ha of uplands and steep river valleys. Between 2004 and 2006, the mid Wales red squirrel partnership (MWRSP) investigated the distribution and genetic make-up of the red squirrel population in some of the mid Wales forests by live trapping.

## Survey site and methods

### Cwm Berwyn

Cwm Berwyn Forest (NGR SN 727573), near Tregaron, Ceredigion, is an upland spruce plantation, owned and managed by Natural Resources Wales (formerly Forestry Commission, Wales). The forest is primarily managed for economic timber production with some public recreational use. It is located in the north west of the mid Wales red squirrel focal area (see figure 1).



**Figure 1.** Map showing the location of Cwm Berwyn (circled in green) within the mid Wales red squirrel focal area (outlined in pink) and buffer zone (outlined in blue). Trapping records of red squirrels between 1999 and 2010 are shown by red circles and reported sightings during the same period by yellow circles.



**Figure 2.** Cwm Berwyn, showing area of naturally regenerating spruce.

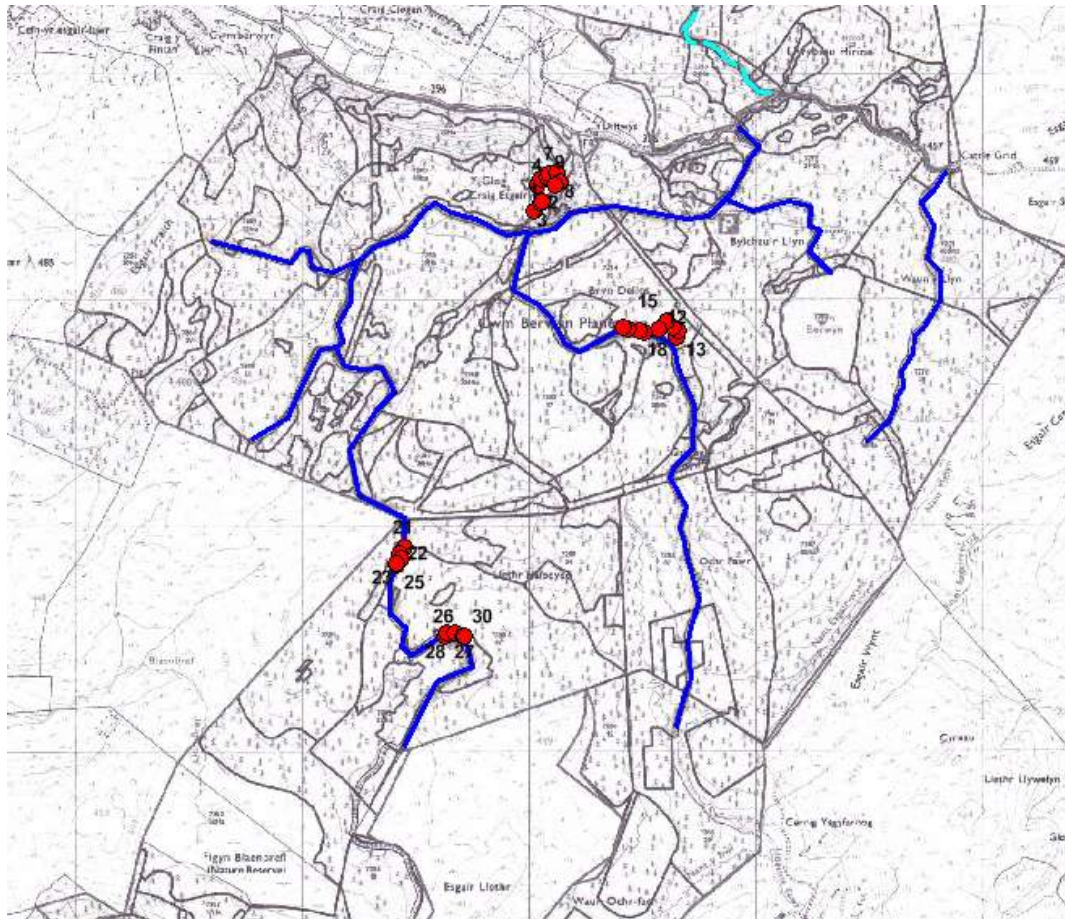
No trapping had been carried out in Cwm Berwyn, although there had been some sightings of red squirrels in the area, and a MISE volunteer survey in August 2012 found evidence of squirrel feeding in several sections of the forest. To follow this up, a number of volunteers with the MISE project went out in March 2013 to put up baited hair tubes to determine if red or grey squirrels were present, and to collect hair samples for DNA analysis.

Hair tubes were constructed from 65mm square plastic downpipe cut into 300mm lengths. Two holes were drilled in the bottom at each end to pass cable ties through for attaching the tube to a branch, and a 50mm square of 2mm thick corex covered in double sided adhesive tape was placed inside each end of the tube attached to the top (see figure 3).



**Figure 3.** Showing the side (left) and end (right) view of a hair tube in position (adhesive tape backing strip protruding from end of tube to be removed before use). Photos: M. Shersby.

30 hair tubes were put up in 3 discrete lines of 10 through the wood (with a break between tubes 25 and 26 where habitat was unsuitable). Tubes were placed in areas where squirrel feeding remains had been found during the previous volunteer survey, and were all in proximity to lodgepole pine, a favoured food source for red squirrels. The location of the tubes is shown in figure 4 below.



**Figure 4.** Map showing the location of each hair tube (red circles) within Cwm Berwyn.

Tubes were wired to suitable horizontal branches at about shoulder height and spaced approximately 20m apart. They were baited with shelled peanuts and checked and replenished with fresh bait and sticky pads at least once a month from April to July. All pads with hairs present were put in a sample bag with a unique MISE sample number and stored frozen until being sent to the laboratory at Waterford Institute of Technology where DNA was extracted and analysed.

## Results

Between April and the end of June 2014, 27 samples were collected from the hair tubes. All samples were inspected with a hand lens initially and some were found to contain fragments of feather, not hair, so were discarded. Hairs were present on 19 samples and these were sent to Waterford for further analysis.

Of the 19 samples from which DNA was extracted, 13 tested positive for red squirrel and of these 6 yielded DNA of sufficient quality to determine haplotype (see table 1).

**Table 1.** Details of DNA results for each sample

MISE no.	Sample date	Collected by	Hair tube number	DNA result
10802	01/05/2013	Bill Fisher	15	red squirrel (hap not determined)
10775	01/05/2013	Bill Fisher	18	red squirrel (hap not determined)
10767	01/05/2013	Bill Fisher	20	red squirrel (hap not determined)
10844	15/05/2013	Bill Fisher	14	-
10848	15/05/2013	Bill Fisher	12	IEGB1 hap (common Irish, British museum)
10755	29/05/2013	Bill Fisher	17	-
10779	29/05/2013	Bill Fisher	20	-
10759	29/05/2013	Bill Fisher	14	-
10771	29/05/2013	Bill Fisher	15	-
11085	29/05/2013	Bill Fisher	18	red squirrel (hap not determined)
10751	12/06/2013	Bill Fisher	20	-
10821	12/06/2013	Bill Fisher	20	red squirrel (hap not determined)
11066	12/06/2013	Bill Fisher	14	IEGB1 hap (common Irish, British museum)
10859	12/06/2013	Bill Fisher	15	IEGB1 hap (common Irish, British museum)
10836	12/06/2013	Bill Fisher	13	red squirrel (hap not determined)
10851	25/06/2013	Polly Walker-Penn	20	IEGB1 hap (common Irish, British museum)
10847	25/06/2013	Polly Walker-Penn	13	WC3 hap
10855	25/06/2013	Polly Walker-Penn	17	IEGB1 hap (common Irish, British museum)
8951	25/06/2013	Polly Walker-Penn	17	red squirrel (Hap not determined)

All positive samples came from tubes 12 to 20 in the centre of the wood. Two haplotypes were present, so the samples came from at least 2 different individual animals but possibly more. One of the haplotypes, WC3, was already known from the mid Wales squirrel population but the second haplotype, IEGB1, has not been found here before.

## Discussion and further work

The results of this study have confirmed the presence of red squirrels in Cwm Berwyn and found a haplotype not previously known from Wales. Prior to this finding there were only 5 haplotypes known in Wales: one extant (ang1) and one extinct (ang2) on Anglesey, two in Clocaenog (wc3 and wc9) and 3 in mid Wales (mw1, wc3 and ang1) of which mw1 was unique to mid Wales (Ogden *et al.* 2005). It is thought that, because mw1 and wc3 are more similar to each other than the 2 haplotypes found in Clocaenog, it is likely that the mid Wales haplotypes belong to a relatively narrow lineage that may include an ancestral Welsh population, whilst the Clocaenog population is probably comprised of more widely mixed lineages. The newly found haplotype, IEGB1, is currently the most common haplotype in red squirrels in Ireland and it is thought likely to have derived from British translocations in the past, given that IEGB1 was found in a British museum specimen. However it had not previously been recorded in any extant red squirrel population in Britain (Finnegan *et al.* 2008).

During the survey period no grey squirrels were detected in the hair tubes, however grey squirrels have been seen in Cwm Berwyn so this should be monitored in future.

The results of this survey have provided valuable information which will be used to inform management of the woodland. It is recommended that further surveys and monitoring be carried out using hair tubes in previously un-surveyed parts of the mid Wales red squirrel focal area.

## Acknowledgements

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## References:

- Finnegan, L.A., Edwards, C.J. & Rochford, J.M. (2008) Origin of, and conservation units in, the Irish red squirrel (*Sciurus vulgaris*) population. *Conservation Genetics* 9:1099-1109 DOI 10.1007/s10592-007-9419-7
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