Pine Marten

Technical White Paper

SureScreen Scientifics

Ecology of the Pine Marten

Shy and elusive in nature, pine martens (*Martes martes*) are cat-sized mustelids with dark brown fur and a characteristic cream 'bib' on their throats. With a preference for native woodland areas, they can also be found in coniferous woodland and rocky hillsides, making breeding nests between rocks, hollow trees or in bird or squirrel nests. Litters of 3-5 kits are born in the spring, becoming independent from their mother by summer. Pine martens are generalists, feeding on small rodents, birds, insects, and fruit, and may even feed from bird tables.

Pine Marten Decline in the UK

Pine martens are thought to have arrived in Britain at the end of the last glacial period and about 6500 years ago, they were the second most common carnivore in Britain and Ireland. As a woodland specialist, the pine marten thrived in the extensive woodland cover at the time. However, throughout the 18th and 19th centuries, populations declined dramatically due to habitat fragmentation, control measures by gamekeepers and trapping for fur. On the verge of extinction by 1915, only small isolated populations

survived across northern England, Wales and Ireland. Even today, pine martens are locally common in some areas of Scotland but are still very rare in the rest of the UK. With a total population of between 6000 to 8000 individuals across the UK and Ireland, they are mostly restricted to northern and central Scotland, with very low numbers in southern Scotland, northern England and Wales.

Legal Protection

Pine martens and their dens have been fully protected since 1988 under Schedule 5 of the Wildlife and Countryside Act 1981 and are now a priority species in the UK Biodiversity Action Plan. This protection means that they must not be trapped, sold or disturbed except under licence. However, regardless of this protection, poisoned bait and traps, often to trap hooded crows or foxes, are thought to cause many pine marten deaths every year. Individuals are also often shot when endangering hen houses, as well as being mistakenly killed instead of mink.

Despite the dangers still facing these elusive creatures, there are signs that the pine marten population across the UK and Ireland is increasing. Multiple reintroduction projects have occurred across England and Wales and there is evidence that populations are expanding, or at the very least remaining viable without the need for further translocations. There is also evidence that pine martens are naturally re-colonising parts of Northumberland and Cumbria.

Surveying for Development Planning

Due to the thorough legal protection afforded to pine martens in the UK, any development projects which may cause disturbance to potential den sites must be thoroughly surveyed. In the case that disturbance to a pine marten den is unavoidable in the process of development, a license may be applied for. However, a license will only be granted in the case that the planned work will have significant benefit socially, economically or environmentally, or if there is no alternative solution at all.

Due to the elusive nature of pine martens, and the fact that they are largely nocturnal, carrying out these surveys can be extremely difficult to undertake. Common methods used to confirm presence/absence of pine martens are the use of camera traps, scats and any records available locally.

As pine martens use regular latrine sites, often in conspicuous places such as an open rocky area, identification of scats can be a useful tool. SureScreen Scientifics' Forensic Ecology service offers DNA identification which can confirm if a scat sample belongs to a pine marten or another species. Additionally, we can also identify samples of fur to species level, dependent on the age of the sample, confirming whether they have come from a pine marten.

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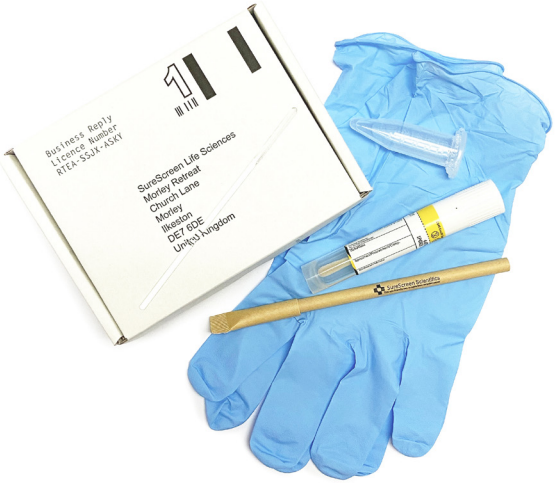
Sample Collection Method

Our sample collection method has been developed to be incredibly easy. SureScreen's sample collection kit contains everything needed for collection, including sample preservative and a postage paid box for return. Alternatively, samples can be sent straight to us, without purchasing a collection kit. A dropping sample and a reserve sample are required in case the extraction is unsuccessful the first time: the fresher a sample is, the more likely the test will be able to extract viable DNA. Scat surveys can be undertaken at any time of the year; however, pine martens are more active during the summer months and scat samples are more likely to be destroyed or obscured during the winter months.



A forensic ecology collection kit used to help collect and preserve samples until they arrive at the laboratory for analysis.

DNA Analysis

1. DNA Extraction

DNA is a two-stranded double helix shaped molecule made up of four different bases: Adenine (A); Cytosine (C), Guanine (G) and Thymine (T). All living organisms contains DNA in some form, and it is the pattern of the A's, C's T's and G's which are specific to every individual. However, within every species, genus, family, order etc., certain patterns are conserved which allow us to place unknown DNA within these groupings.

DNA extraction is the process of removing the DNA from within cells. The droppings are first shaken to break down the sample and ensure the maximum amount of DNA is extracted. This is followed by a series of solutions being added and centrifugation which gradually removes impurities and results in clean DNA at the end of the process.

2. Polymerase Chain Reaction

Faeces contains DNA from all different sources: the animal itself, it's food and any bacteria or viruses that may be living within the host. This DNA can be found at varying concentrations, but not at those high enough to be detected throughout the rest of the process. Therefore, we need to separate and amplify the DNA belonging only to the species in question using a process called polymerase chain reaction (PCR). In order to do this, we use primers. These act in the same way as a lock and key: through a series of heating and cooling cycles, they attach specifically to and multiply only the target DNA. After the PCR process is complete, millions of strands of pure target DNA have been created.

3. Sequencing

Once the DNA has been amplified, it is cleaned up to remove any impurities from the sample such as leftover reagents from the PCR. The concentration of the DNA is then checked to ensure that the PCR step worked. If a sample is too degraded (e.g. from exposure to sunlight, presence of inhibitors which stop the chemical reactions or just simply the age of the sample), the DNA will not have been amplified. If this is the case, we repeat the whole process with a fresh sample to ensure the greatest chance of successfully identifying the species. Once we are certain that we have extracted and amplified DNA, the sample is sequenced. This allows us to 'read' the DNA as A's, C's, T's and G's, for example: AGGAAACCTAGCCCACGCAGGAG. By comparing this unknown sequence to known sequences of other species, we can determine source of the sample.

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TTAGGTCAACCTGGCGCTCTACTGGGAGATGACCAAATTTATAATGTGATTGTAACCGCCCATGCATTTGTAATG
ATTTTTTTCATAGTAATACCAATTATAATTGGGGGCTTCGGAAACTGACTAGTGCCCTTAATAATTGGTGCGCCT
GACATGGCATTCCCACGTATAAACAACATAAGCTTCTGACTTCTACCCCCTTCTTTCCTTCTACTTTTAGCCTCT
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GCATCCGTAGACCTGACAATCTTTTCTCTACACCTGGCAGGTGTCTCGTCTATCTTGGGGGCCATCAACTTTATT
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ACAGCCGTACTTCTACTCCTATCCCTACCAGTATTAGCAGCCGGCATTACTATACTACTTACAGACCGAAATCTA
AATACTACCTTTTTCGACCCCGCCGGAGGAGGGGACCCCATCCTGTACCAACACCTGTTTTGATTCTTTGGGCAC
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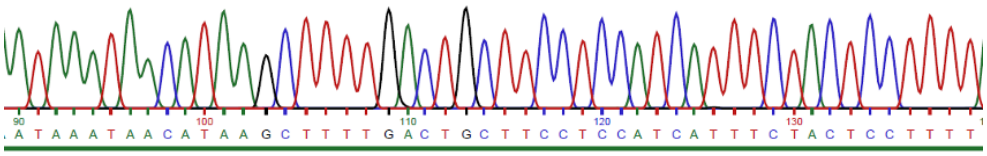
Part of a DNA sequence from the COI gene of a pine marten.

Using this method, SureScreen can identify a scat sample to species level, confirming either the presence of pine martens or the presence of a species with visually similar scat.



Originally thought to belong to a pine marten, SureScreens' Forensic Ecology service identified this sample to a brown rat (Rattus norvegicus)

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