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Spring Newsletter



Pine Martens

Becky Hulne of the Mid-Wales Red Squirrel PA. told the UK Squirrel Accord: "In the light of evidence from research into the impact of pine martens on squirrel populations in the Republic of Ireland, we are very excited about the potential impact of the VWT pine marten restoration programme on the red squirrel population in mid Wales



The pine marten was once the second most common carnivore in Britain during the Mesolithic era. The clearance of woodlands, together with predator control, had a devastating effect on the pine marten population and by 1915 this species was confined to just a few of the more remote areas across Britain and Ireland. Small populations survived in Wales and the Marches and in areas of Northern England, with relatively strong populations still present in parts of the Scottish Highlands.

Today populations are expanding in number and range in Scotland and Ireland. In England and Wales the population has not recovered from its decline and pine martens live at very low densities with a very restricted distribution. In England pine martens have recently been recorded in Shropshire and the New Forest, and occasional records have come from the Lake District, Northumberland and the North York Moors. In 2015 the VWT carried out a population reinforcement in mid-Wales by translocating pine martens from Scotland.

The work of the Vincent Wildlife Trust.

The VWT has been studying the pine marten for more than 30 years and has published, or has contributed to, a number of research papers on the pine marten. This work has included investigating the distribution and status of the pine marten in England and Wales, documenting pine marten range expansion in Scotland and developing and trialing field techniques for monitoring pine martens.

In 2011, the Trust developed a long-term Pine Marten Conservation Strategy in collaboration with other statutory and voluntary conservation bodies. What is clear from our extensive studies carried out over several decades is that numbers of this elusive mammal in England and Wales are so low that without intervention the pine marten is likely to become extinct in England and Wales.

In 2014, the VWT in consultation with and support from various conservation bodies launched its **Pine Marten Recovery Project**. The aim of the project is to restore self-sustaining populations of pine martens to England and Wales. The first step was completed in autumn 2015, with the translocation of 20 pine martens from Scotland to mid-Wales and further translocations will take place in autumn 2016. You can find out more about this ground-breaking project on the dedicated **project website**.

Becky Hulne of the MWRSPA told the UK Squirrel Accord: “In the light of evidence from research into the impact of pine martens on squirrel populations in the Republic of Ireland, we are very excited about the potential impact of the VWT pine marten restoration programme on the red squirrel population in mid Wales. Already some individuals have ventured in to the Mid Wales Red Squirrel Focal Site. We are keen to hear about the findings of Cat Nicol’s research on the impact of pine martens on grey squirrel numbers and behaviour. Our hope is that the increased presence of pine martens in mid Wales acts to reduce the number of grey squirrels in the focal site; this would relieve the pressure on our vulnerable red squirrel population enabling them to thrive.”

“Understanding how interactions between species has shaped the communities we see today is increasingly important as new species arrive in those communities owing to climate change as well as humans introducing exotic species” said Professor Xavier Lambin Aberdeen University.

THE ENEMY OF MY ENEMY IS MY FRIEND.

Formulating and experimentally testing theory for indirect interactions with recovering pine martens, red squirrels, invasive grey squirrel and squirrel pox virus.

Ecologists seek to predict what assemblages of species are able to coexist to form communities’ **writes Professor Xavier Lambin, FRSE, FRSB, Professor of Ecology at Aberdeen University.** Understanding how interactions between species has shaped the communities we see today is increasingly important as new species arrive in those communities owing to climate change as well as humans introducing exotic species. Ecologists generally focus on direct interactions between different species within a community, mediated through predation, parasitism, herbivory and competition, and the knock-on consequences this has for persistence and extinction.

However, there is growing understanding of how many species also interact indirectly, through the influence of a third species. This can be because they share a predator or a pathogen whose impact on a given prey/host may depend on the abundance of the other prey/host. In some circumstances species that inhabit different locations may be linked by this process called “apparent competition” if a common predator rather than themselves is able to move between locations. Those predators that eat different prey species and vary their predation rate depending on the profitability of each prey (itself dependent on their size, density and how far predators have to travel to find them) may also strongly link species that otherwise weakly interact directly.

In this project, we will, for the first time, examine a situation that is common in nature but has hitherto been neglected: that of species interacting through BOTH a shared predator and pathogen. *‘Such complex indirect interactions may have precluded some species from existing in the same natural community but they may be presently shaping communities that have been recently disturbed by non-native species and where a process of disease-mediated species replacement may be underway’ quotes Xavier*

Because of the complexity of the interaction we want to focus on, we will first use mathematical models to explore the likely outcomes of plausible scenarios inspired by biological systems. Then we will formulate models designed to represent four interacting species that cause much interest by land managers and conservationists AND offer unprecedented scope to advance general understanding and improve models:

- 1) the pine marten, a predator native to the UK, is staging a strong recovery and gradually reclaiming its former range;
- 2) the grey squirrel, a non-native species from America that was introduced in the UK when pine marten were nearly extinct and is damaging to forestry interests because it eats tree bark and buds. It is

responsible for the disappearance of the smaller, more arboreal,
 3) native red squirrel from much of Britain;
 4) the squirrel pox virus, a disease introduced with grey squirrels to Britain and that infects grey squirrels where they are abundant without making them obviously ill but that kills virtually every red squirrel it infects. It has become clear only recently that this disease is responsible for a case of pathogen-mediated apparent competition and had a major role in the decline of red squirrels.

Our work will capitalise on the fact that the pine marten has now returned to much of Scotland, albeit in small numbers on the edge of its expanding range where they coexist with red squirrels, grey squirrel and the squirrel pox virus. A similar recovery took place in Ireland and their high pine marten density, and greater predation on grey squirrels than red squirrels led to the collapse of grey squirrel populations. The prospect of this scenario being repeated in the UK is filling conservationists and foresters alike with hope. We will make the most of the ongoing pine marten recovery to guide conservation action and test key the predictions from our models.

Crucially, instead of passively watching the impact of the slow rise of pine martens, we will experimentally augment marten numbers at the landscape scale to deliver faster and more convincing learning. Working where marten only recently arrived, we will increase their numbers in treatment landscapes and compare marten squirrel and disease dynamics with control landscapes to test whether predictions made by our models are matched by reality. Then, we will measure precisely marten density and find out where the landscape they hunt in relation to prey density and how much grey squirrel numbers have been depleted. We will also find out how often they eat grey squirrels red squirrels or field voles according to their abundance. We predict that grey squirrel numbers will decline where pine marten are most abundant but crucially we expect that the pox virus will first disappear from habitats where martens have depleted grey squirrels and eventually from entire landscapes at higher marten density.

In summing up Xavier told the UK Squirrel Accord “*Our project will be enormously informative not only for the focal empirical system but also, by advancing ecological understanding, for the many other ecosystems where pathogens shared by several hosts as well as predation shape communities*”.

Conservation of Broadleaved Trees

*An England without oaks would be like a summer without cricket – unthinkable**



England's broadleaved trees are under increasing threat from pest and diseases

Bark stripping by grey squirrels damages oaks and other broadleaved trees. Trees become more vulnerable to diseases and pests and may die



England's grey squirrels population is increasing and causing widespread damage

Fertility control offers a humane and long-term solution to reducing the impact of squirrels on broadleaved trees

Estimated cost: £641,000; £86-£170k per year for 5 years

Joint project with Animal Plant Health Agency; Royal Forestry Society and UK Squirrel Accord * Attributable to John Ingham Environment Editor Daily Express News Papers

APHA to the rescue of Broadleaved Trees (*Animal Plant Health Agency)

As lethal control of squirrels is often opposed by the public, fertility control, based on immunocontraception, could be used to reduce the impact of grey squirrels on broadleaved trees highlights Dr. Giovanna Massei from Defra's Animal Plant Health Agency in York.

Conservation of Broadleaved Trees: using fertility control to reduce the impact of grey squirrels

Background

Broadleaved woodlands are an integral part of our natural heritage. For example, oak trees support more species than any other native tree, including 284 insects that are food for birds and bats. However, broadleaved trees are increasingly under threat from diseases and non-native species. Among the latter, bark stripping by grey squirrels increases significantly the tree's vulnerability to pests and pathogens: trees become diseased and some die. As the population of grey squirrels is growing exponentially over the years, damage is widespread and new methods to control this species and its impact are needed.

As lethal control of squirrels is often opposed by the public, fertility control, based on immunecontraception, could be used to reduce the impact of grey squirrels on broadleaved trees. Immunocontraceptives are vaccines that induce antibodies to proteins or hormones essential for reproduction. Work carried out by the *Animal and Plant Health Agency (APHA)* and funded by Defra has demonstrated the effectiveness of single-dose injectable immunocontraceptives. Modelling suggests that grey squirrels could be eradicated from an area in a few years if > 70% were rendered infertile. The use of injectable contraceptives is constrained by the need to

capture animals. Therefore, developing oral contraceptives, and methods to deliver them, is now key to applications on a large scale.

APHA has developed a novel compound with potential as an oral immunocontraceptive, which now requires a formulation that elicits a better, long-lasting immune response.

A UK company has created a novel, patented technology that is available for such a formulation. This is based on the shells of spores and pollen grains, used to micro-encapsulate a wide spectrum of drugs. Pollen or spore-based encapsulation of drugs, including model oral vaccines, results in increased bioavailability and controlled release of these drugs. This technology has potential for the delivery of oral immunocontraceptives.

Aims

The overall aim of this study is to develop and implement a humane, safe and effective method for reducing the impact of grey squirrels on broadleaved woodlands.

The specific aims are:

- To develop formulations of oral contraceptives used to render grey squirrels infertile
- To design grey squirrel-specific systems to deliver oral contraceptives
- To carry out pilot field trials to assess feasibility, effectiveness and costs of delivering baits to grey squirrel populations

The expected outputs:

- A novel approach to reduce the impact of grey squirrels on broadleaved trees
- A new method to deliver oral contraceptives to grey squirrels
- Capacity and skills transferred to local groups involved in broadleaved trees protection
- An oral contraceptive to revolutionise the mitigation of human-wildlife conflicts

*The tale of Squirrel Nutken, which generations of our children have been brought up on, could be no more.....because of *the deadly squirrel para pox virus*



- Red squirrels are under threat from the Northern America grey squirrel introduced in the 1800s by park owners for their estates
- Grey squirrels are the carrier of the squirrel para pox virus
- Using the latest technology available in genetic research we can develop a vaccine to eradicate this disease
- **This means that:**
 - our vaccine will be safe and effective in the wild and not be able to revert
 - our work will be supported by the Veterinary Medical Directorate and European Medicines Agency
 - we will be safeguarding UK's 160,000 red squirrels
 - children will be given a chance to see Squirrel Nutken in its habitat
- **Estimated cost: £4.5m over 6 years**

Joint project with Moredun & Pirbright Research Institute, Red Squirrel Survival Trust and UK Squirrel Accord

*from Beatrix Potter's book and credit to Beatrix Potter's Squirrels



This note is the culmination of discussions of with the Veterinary Medical Directorate and Dr. Colin McInnes of Moredun Research Institute. The UK Squirrel Accord would like to record their thanks for the help we have had from both of these bodies.

UK Squirrel Accord's work with the development of a squirrel pox (SPQV) vaccine.

Conversation with the Veterinary Medical Directorate

The UK Squirrel Accord has discussed with the Veterinary Medical Directorate the possibility of producing a genetically based vaccine as opposed to the attenuated version. The aim is to produce a squirrel pox virus where at least one of the predicted virulence genes has been removed using recombinant methods. Our candidate vaccine would be a live GMO. The question we asked to the VMD, were they the correct authority that we should be talking to in terms of our ultimate goal of producing a licensed vaccine?

The reply from the VMD was:

- a. The VMD is the centralised route through the European Medicines Agency (EMA) is obligatory for all recombinant and GMO medicines
- b. The centralised route involves a European committee (CVMP) on which each Member States (MSs) are involved in the process and each member state will need to give assent
- c. It was recommended that early informal consultation with EMA/individual MSs is sought in the development process to support the project when it came up for review.
- d. MSs that would have a specific interest in this project, would be countries with squirrel populations such as the Italians, could because of their background with grey squirrels but the point was

made that only one state in Europe had the SPQV which is the Irish Republic.

- e. Clarification from EMA through formal scientific advice from the Committee which could be proceeded by informal early development advice from a select group of experts should be sought.
- f. VMD clarified that live GMO medicines can be experimentally trialled in the field in the UK through an Animal Trial Certificate which is time specific (2 years) and is applied for and granted/refused by the VMD with input from the authorities controlling use of GMOs in the field (GMO authorities in England and Scotland). Full authorisation – i.e. a Marketing Authorisation (MA) through the EMA would involve provision of data packages to address both the medicine regulations and the GMO regulations. How much of the original work published on a specific vector such as the pox vector is relevant needs to be demonstrated and so each product needs to stand alone but previous work can be drawn upon and therefore it is likely to be possible to justify the product is carrying the pox vector.

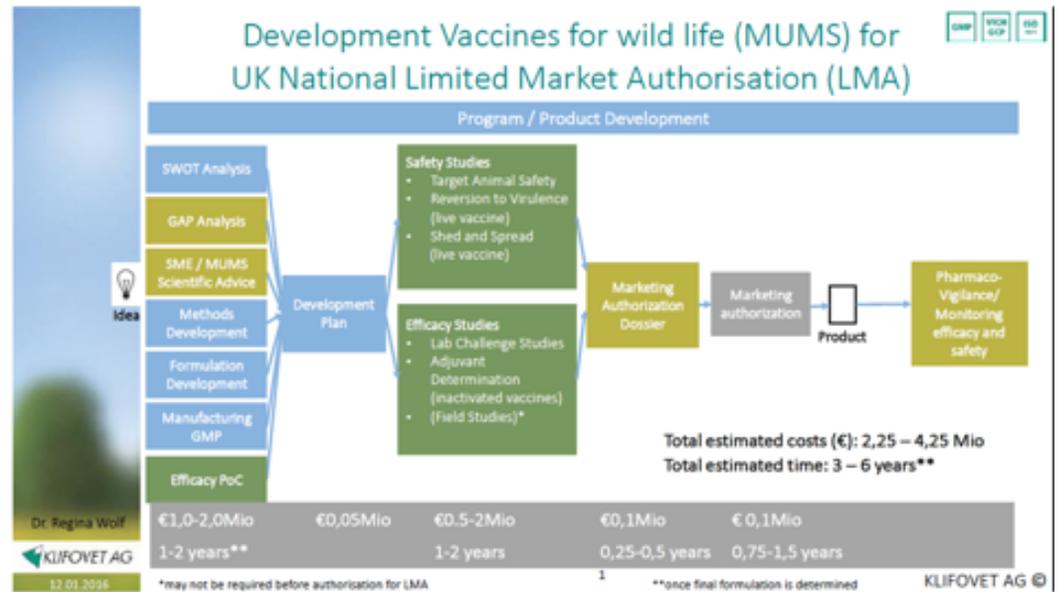
2. Our goal would be to vaccinate free living red squirrels – is there any advice that the VMD could give in terms of whether or not there would be special conditions put on such a vaccine.

The VMD answer was: It is a live GMO going into a wildlife species and therefore there would be a necessity to look at environmental aspects in both data packages for GMO and medicines regulations. It is too early to be specific on any special conditions. Oral administration is likely to have larger potential environmental consequences. We would also need clarification on the initial deployment area and an understanding of where red squirrels had been introduced and then been lost in the 19 century due to the SPQV and grey squirrel presence.

3. Would such a vaccine for red squirrels be considered under **MUMS (minor use minor species)** for registration purposes and could the VMD give any indication at this stage what the likely costs of registration be?

The VMD answer was: To get MUMS status the CVMP has to be consulted. It was recommended to consult with the MUMS office of the EMA as soon as possible. In terms of the project, we would have to get clarification to see if the vaccine is available for oral administration.

The process of developing the SPQV vaccine that the UK Squirrel Accord will follow is highlighted:



The next steps:

This is about broadening the discussion with relevant member states such as the Irish Republic and Italy.

Discussing with a number of bodies the possibility of producing SPQV Vaccine as an oral administered vaccine

Be aware that there are changes ahead:

Medicine regulations currently being revised which may lead specific EU harmonised requirements for trials

The work of the UK Squirrel Accord as highlighted to Defra in a recent meeting.

In January 2016 a delegation of UK Squirrel Accord members (4) led by The Earl Kinnoull met the two Defra Minister's Rory Stewart MP and Lord Gardiner. We highlight the conversation we had.

The Accord highlighted our concerns over the enormous damage that the grey squirrel has done to broadleaved woodlands in the age range of 10 to 40 years by its ring barking of the trunk and canopy of the broadleaf tree. We are increasingly coming to understand the multiple benefits economic, environmental and social – that trees, woodlands and forests deliver to our nation. The Accord are also increasingly aware of the number of threats to the health of our trees, of which the grey squirrel is arguably the number one threat. An Invasive, Alien Species (IAS), the grey squirrel causes significant damage to a wide range of species (especially, but not exclusively, broadleaved trees) and has led many a landowner to conclude that planting broadleaved trees is no longer viable. We simply will not be able to hand on to future generations woodlands like those that we enjoy today, nor create healthy new woodlands, without controlling the grey squirrel. We must bear in mind that the mature woodlands on our landscape today were established before the arrival and spread of the grey squirrel and hence the devastating effect of this species will only become more apparent with the passage of time.

Broadleaf Tree Vulnerability Mapping: The broadleaved woodland Vulnerability Mapping Index, to be completed in 2016, is likely to show that large areas of woodland in England are not subject to grey squirrel control. We believe that the management of broadleaved woodlands can be turned around through a landscape approach to shooting and trapping across those woodlands. A spotlight will be placed on woodlands that are not carrying out Grey Squirrel Control by use of the National Forestry research.

Squirrel Control Clubs managed by BASC: In our meeting we discussed the use of the English Public Estate (i.e. Forest Enterprise) to accelerate trialing of shooting with air rifles over bait using the BASC model. In this model recreational shooters are trained and tested on their shooting skills with air rifles and hold the BASC's £10m members' indemnity insurance. Individuals would only be permitted to control areas if they held current, time limited, area specific BASC members' licenses. It was also agreed that in certain circumstances that in vulnerable areas we all should consider taking the lead in launching the BASC regulated and risk managed scheme in an effort to encourage all landowners to adopt this technique of pest control.

Traps: The Accord and in particular its member - The European Squirrel Initiative - are working on a new new trap, which would ideally both reset itself multiple times and remotely signal that it had been activated. It would

need to pass the future AITHS standard and the one possibility is that we would need to find a venture capital backer to assist in funding the design and the licensing and manufacture of traps for both grey squirrels and other species. The total number of traps in scope was estimated at one million. The Accord and in particular its member The European Squirrel Initiative have been working with Goodnature Ltd of New Zealand to develop a gas powered squirrel trap that will considerably reduce the manpower bill for controlling grey squirrels. There was a consensus that there was an urgent need to develop new traps and their mass manufacture.

Adrian Vass 25 April 2016