WOODLAND TRUST

Wood Wise

Woodland Conservation News • Summer 2016

MARVELLOUS MAMMALS

BEAVERS RETURN TO OUR WATERWAYS

HEDGEHOGS NEED A HELPING HAND

PINE MARTENS CLAWING THEIR WAY BACK

WILD BOAR EXCITE OUR WOODS AGAIN

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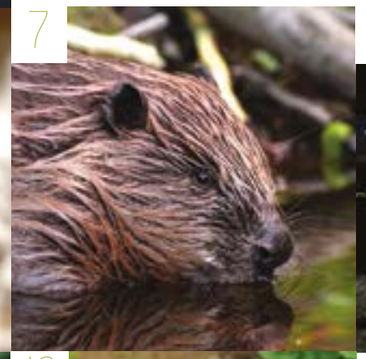

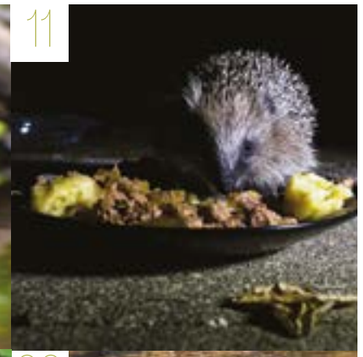

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Eurasian wolf

Mammals

Mammals are our closest living relatives and we share similar traits. Perhaps this is the reason many of us have such strong feelings for and connections with them.

Mammalian species are endothermic or warm-blooded, with hair (mostly), mammary glands and the neocortex section of the brain that controls sensory perception, spatial reasoning and awareness or subjectivity. This brain structure is not found in birds, reptiles, amphibians or fish – although birds and reptiles have a dorsal ventricular ridge that contains similar cells and is thought to perform similar functions.

In the UK, there are a variety of different mammals, from those found on land (e.g. badgers, ***Meles meles***) to more aquatics (e.g. otters, ***Lutra lutra***), to those in the seas (e.g. Risso's dolphins, ***Grampus griseus***). Despite the extinction of a number of our largest mammals, such as the Eurasian lynx, ***Lynx lynx***, since the end of the last ice age, there are still many that survive and that we strive to protect for the future.

Interrupting trophic cascades

The loss of our large, top mammal predators, such as wolves, ***Canis lupus***, through human persecution has caused an ecological imbalance in the landscape. The trophic cascade of the predator suppressing the abundance of its prey and altering its behaviour has disappeared for deer. Their increasing abundance and more brazen attitude are significantly reducing levels of vegetation. Along with the negative impact this has on the plant communities themselves, it has the knock-on effect of diminishing food and habitat resources for a wide variety of other fauna.

Aldo Leopold is credited as one of the first to realise and communicate the dangers of overgrazing through the loss of wolves. In *Thinking Like a Mountain* he writes "I now suspect that just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer... Perhaps this is behind Thoreau's dictum: In wildness is the salvation of the world. Perhaps this is the hidden meaning in the howl of the wolf, long known among mountains, but seldom perceived among men." [1]

Threats and opportunities

In our modern world, as with all our wildlife, the threats of habitat destruction and fragmentation, climate change, persecution and pollution are among the threats constantly hovering over the heads of the UK's remaining mammals. But is our affinity with them the reason so many of us willingly give valuable time and resources to their protection?

Woods are important for supporting a whole range of native mammals and some non-natives too, providing a fairly stable habitat and food supplies. Therefore, the protection and expansion of our native woodland resource offers opportunities to support the return or reintroduction of species. For example, the Woodland Trust is working in partnership with the Vincent Wildlife Trust to support their work in reintroducing pine martens, ***Martes martes***, to Wales. Research in Ireland has shown there is a correlation between increasing pine marten numbers and the reduction of the grey squirrel, ***Sciurus carolinensis***, population, which could be great news for our dwindling number of red squirrels, ***Sciurus vulgaris***.

This issue of Wood Wise focuses on a suite of woodland mammals and the work of various dedicated people and organisations to secure a balanced future for all.

[1] Leopold, A. (1949). *A Sand County Almanac*: And Sketches Here and There. USA, Oxford University Press.

If you go down to the woods tonight...

Henry Schofield

Bats - we tend to lump these enigmatic flying mammals together as if they all have ecologically similar needs and requirements.

Britain's bats do have common features, such as the ability to fly and their use of echolocation to navigate the night skies and find their prey. Their life history traits are also similar, with a complex annual cycle of autumn mating followed by winter hibernation and the gathering of females in spring to give birth, and their extraordinary longevity for such small mammals - some individuals live for over 40 years. But that is where the similarities stop.

The 17 breeding bat species in Britain have evolved over thousands of years and avoid competing with one another by exploiting different ecological niches. There are differences in their prey base, the type of habitat in which they forage, their roosts and their social structure. This great diversity of needs is fulfilled by our most diverse habitat - woodland. In managing woods for the different bat species, clearly one size does not fit all and prescriptions need to reflect this.

A place to live and a place to breed

Aside from bats' foraging needs, the most important resource woodland provides is roosting sites. In historical terms, bats generally fall into two groups: those evolved to roost in caves and those adapted to tree roosts.

The relative permanency of caves contrasts with the transient nature of tree roosts. Although trees may live for many centuries, the structures within them that bats use change over time; rot holes are continually enlarging, hollow limbs may be shed and storm damage may open up new roosting opportunities. This dynamic situation means colonies of tree-dwelling bats are constantly adapting to the changing suite of roosting opportunities. On top of this, tree roosts are usually confined spaces where droppings and parasites can build up. So tree bats typically switch roosts on a regular basis, allowing them to avoid unhygienic conditions but also identifying and adopting new sites as old ones become unsuitable.

Bechstein's bats

One of our most iconic woodland species is the Bechstein's bat, ***Myotis bechsteinii***. During summer males and females roost in different woodlands, with the females almost invariably found in old-growth oak forest. The females usually roost in old woodpecker holes and studies have shown a colony may use up to sixty different roosts over a summer. Clearly, protecting just a single roost tree is unlikely to have a significant conservation impact on a colony of this species.

In August, at the end of the breeding season, the sexual segregation in Bechstein's bats breaks down and the females disperse from their maternity woods into the wider landscape to mate. Recent evidence strongly suggests this species over-winters deep in fissures in caves and mines. For other species woodlands can remain their home all year around.

Barbastelle bats

The barbastelle, ***Barbastella barbastellus***, is a specialist moth predator and its roosting ecology provides an insight into the range of structures bats can use over an annual cycle. In winter, this species hibernates in cavities deep within trees where it is buffered from extreme weather conditions. In spring and autumn they are found under loose bark, but during the summer months pregnant and lactating females move into cracks in the trunks and branches of old or storm-damaged trees.

Robiller Naturlichter

Barbastelle bat

Gilles San Martin - Wikimedia Commons

Bechsteins bat

Noctule bats

Woodlands do not only provide bats with summer roosts and hibernation sites. Autumn is the time when most mating takes place and some species use mating roosts in tree hollows. The noctule, ***Nyctalus noctula***, is another woodland bat and one of our largest bat species. Males of this species attempt to attract passing females into these mating roosts by calling loudly from the entrance. They often set up a competition with one another around the edge of woodland glades. This behaviour allows the females to assess the quality of potential mates before they choose which mating roost to visit.

Enhancing roosting opportunities for bats

Clearly, the number and diversity of roosting opportunities offered in woodlands is very dependent on management practices. The best prescription for maintaining the dynamic creation of a supply of new roosts is not to over-manage them, but to allow a natural cycle of ageing and the development of climax woodland.

Where past practice has selectively removed older trees and also in newer plantations, roosting opportunities for bats can be supplemented by the provision of bat boxes. These come in a range of shapes and sizes and particular species can show a preference for a specific design. Traditionally, bat boxes have been constructed of wood but in recent years the manufacture of boxes made from woodcrete (a mixture of sawdust and cement) have proved very successful and have the advantage of lasting far longer than their wooden counterparts.

Bat boxes may be a temporary solution but it is far better to have natural tree holes. Natural cavities for bats are usually dependent on some trauma to the tree; either physical damage or through disease and rot. Surgery to remove damaged limbs or the felling of senescent trees often removes the very structures providing the most roosting opportunities for bats. This standing dead wood not only provides roosts; the saproxylic insects associated with it are also an important food resource for the bats.

Harald Süpfle - Wikimedia Commons

Noctule bat

Divide and devour: partitioning food resources in woodland

It is not surprising the diversity and biomass of invertebrate life found in woodlands attracts foraging bats. Most of our bat species are insectivores but the diet of some does include other arthropods such as spiders, harvestmen and millipedes.

Most bats that roost in woods also forage in them, but there are exceptions. The barbastelle, with its specialism on moths, often leaves woodland and ranges widely in the landscape. In the summer months the noctule hunts moths and large beetles over large water bodies or farmland. But the species the woodland loses at dusk are counter-balanced with new nightly arrivals roosting in nearby buildings.

The lesser horseshoe bat, ***Rhinolophus hipposideros***, roosts in the roof spaces of old buildings that mimic its traditional cave habitat, but it is almost totally dependent on woodland for foraging. It is adapted to hunt for small flying insects within vegetative clutter, often within the canopy of trees. Its short broad wings make it highly manoeuvrable and its echolocation call, the highest frequency of all British bats, is designed to detect the wing movements of small flying insects among dense vegetation.

The common pipistrelle, ***Pipistrellus pipistrellus***, a species that predominantly roosts in buildings during the summer, also frequently hunts in woodland. Its main prey are a similar size to those insects taken by the lesser horseshoe-bat, but its wing shape and echolocation calls make it adapted to fly and hunt in open areas. It can often be seen foraging in clearings or along the edges of woodland.

Pipistrelles, in common with most British bats, hunt by aerially hawking insects but some of our woodland foragers are gleaning specialists. Brown long-eared, ***Plecotus auritus***, and Bechstein's bats have huge ears. They hunt by listening for noises made by insects or other arthropods moving among vegetation or leaf litter, and can pick their prey off surfaces while in flight.

Increasing insect biomass and diversity

Woodland management practices aimed at increasing insect diversity and biomass will benefit bats. Among the most important of these is the creation of mosaics of habitat. Even species like the lesser horseshoe bat, which forages within canopy cover, has been shown to favour the ecotones along the edge of woodland glades.

Wet areas or streams within woodlands are also of benefit and the Bechstein's bat preferentially selects these as its foraging areas, probably because of the insect populations associated with them. Standing deadwood and decaying log piles will also help to increase insect biomass, and native night-scented plant species such as honeysuckle, ***Lonicera periclymenum***, attract nocturnal insects like moths (Lepidoptera species).

Find out what is there first

The exact ecological requirements of the different bat species are complex and methods of woodland management suitable for some species may be detrimental to others. Returning unmanaged woods back to wood-pasture probably has little impact on most woodland bats, but the presence of a well-developed understorey is vital for two of our most rare species - barbastelle and Bechstein's bats. It is well worth conducting bat surveys to determine which bat species are present before embarking on major changes in woodland management.

Beavering away at Bamff

Paul Ramsay

A mammal surrounded by controversy, the beaver is an excellent ecosystem engineer that can boost biodiversity. Is it destined to make a comeback across the UK?

There is a riparian and wetland rewilding project underway at Bamff, Perthshire, in which Eurasian beavers, ***Castor fiber***, play a key part. One evening at least four beavers were spotted sitting grazing on the rafts of sedge around the beaver ponds. Despite being fairly large they were still hard to make out. The wet guard hairs on the back of one individual were matted together to make a characteristic but confusing image. The striations in the fur looked rush-like and yet inimitably beaver. Another had come ashore and its outline was clear, silhouetted dark against the water. That evening was the first time this spring that a family of beavers was seen feeding on the raft of sedge and rushes. Most other evenings they had grazed the bog bean on the east side of the ponds.

Beavers are semiaquatic mammals that are well adapted for their way of life. The most obvious adaptations are their webbed hind feet. They also have fur-lined lips that can be closed behind the teeth[1], which allows them to gnaw under water. Beavers can stay submerged for around 15 minutes, although usually they do not spend more than about five minutes under water at a time. Their lustrous fur is well-insulated and waterproof. Oil from the anal glands is spread around the body by the beaver when it is grooming or being groomed, and this helps to waterproof the fur. Their nostrils and ears also close when submerged.

Tomasz Chmielewski - Fotografia przyrodnicza

Beaver

Beavers live in family groups that include parents, kits of the year and the young of the previous year, the last of which will leave the family sometime in the summer. Eurasian beavers tend to give birth to two or three kits per year. Fertility in the female varies with age, increasing at around six to eight years old and then declining[2]. If two-year-old dispersers, unable to find a territory and mate of their own, return to their parents, they are accepted back into the family, and stay on to help with the rearing of the current young.

Food choices

Beavers are choosy generalist herbivores. In winter they depend mostly on the bark of trees they have felled. Preferred species include poplar, ***Populus sp.***, and willow, ***Salix sp.***, birch, ***Betula sp.***, and ash, ***Fraxinus excelsior***. Beavers also eat the starch-rich rhizomes of water plants.

During the growing season they switch preferences and eat herbaceous plants. They are known to consume around 300 different species, including trees and aquatic plants such as water lilies, Nymphaeaceae family, pond weeds, Potamogetonaceae family, and bog bean, ***Menyanthes trifoliata***. On land you may come across small patches of grass that have been carefully cut, leaving tufts of coarser species that can look like pampas grass in a garden.

Living in lodges

Eurasian beavers live in bank lodges or burrows and sometimes, like the North American species, ***Castor canadensis***, in island lodges. In places where the bank is not high enough to provide space for a burrow, but the site is suitable otherwise, work will proceed until the bank above the burrow collapses. A roof of branches, sticks and mud is then built over the top and the burrow becomes a lodge.

Access to a lodge is by one or more underwater entrances that lead to an internal passage and subsequent chamber. The sleeping chamber is further in and higher up, and bedding is brought in to make the place more comfortable.

An individual family has a main lodge, but may also have subsidiary lodges and burrows. These may be co-occupied by otters, ***Lutra lutra***, water voles, ***Arvicola terrestris***, rats, ***Rattus sp.***, and other creatures, such as common toads, ***Bufo bufo***. Beavers may also share their main lodge with these creatures, although otters are not welcome when

Paul Ramsay

Bamff

there are young beaver kits about. In terms of interactions within their own species, beavers are strongly territorial and intolerant of the presence of individuals from outside their own family group.

Dam building

The beaver's world is built around the need to keep its lodge safe from predators, which means keeping the entrance underwater and out of the way of prying eyes and claws. The water level has to be managed to ensure this can be maintained, so beavers build dams to control water flow and depth. Raising water levels also makes more habitat accessible to the beaver.

John Pastor describes how beavers assess their landscape when deciding where to site dams in his recent and brilliant book *What Should a Clever Moose Eat? Natural History, Ecology, and the North Woods* (Island Press 2016).

Patrick Mackie - Wikimedia Commons

Beaver dam

Beavers are opportunistic when choosing materials for dam building and can utilise stones, sticks, logs, turf and mud dredged from the bottom of the stream or bank. Even plastic bottles and bank notes, or whatever is at hand.

Much depends on the flow of the stream to be dammed. If it is fast flowing, the beaver may stick the stems of branches into the bed to act as support piles and then add suitable material. Where the water is not flowing fast enough to justify the use of piles, the beavers start the dam by gathering material on the site. Next, supporting branches and poles are placed on the downstream side of the dam to buttress it against the flow of water. Then the beavers plaster the face of the dam with mud.

As the developing dam slows down the flow of water, sediments are dropped. Eventually these build up and add to the strength of the structure. In the meantime the growing dam filters the water that passes through it, or allows it to flow over and around the ends of the dam. Beavers react to this by lengthening the dam; adding material to it until it is high enough and long enough to span the waterway.

Controlling the flow

Beavers manage their dam and flow of water to suit changing circumstances. During droughts they keep the dam as waterproof as possible, while in times of flood they cut spillways to keep water flowing and prevent it from breaching the dam. If flooding does breach the dam they may wait until better weather before repairing it or repair it immediately, depending on how urgently they see the need for keeping to a particular water level. The situation is made more urgent if a main lodge is present in the pool behind the dam.

The surfaces of logs, sticks and stones that form dams quickly become coated in biofilms, which 'consist of bacteria, algae, fungi, protozoa, micrometazoa, exoenzymes and detritus particles enmeshed in a gelatinous polysaccharide matrix'[3]. These mainly bacterial mats break down agricultural pollutants, such as nitrates, phosphates and pesticide residues, and consume microbes in the water as it passes through. In this way dams contribute to cleaning water and reducing pollution.

In the 14 years they have lived at Bamff, the Perthshire beavers have built several dams that are around 25 metres long and a much larger one that is about 120 metres in length.

Central place foragers

At dusk each evening throughout spring and summer (and winter when the weather allows), beavers set off foraging. Around their territory they have feeding stations where they may take bits of branch for immediate debarking and eating, rather than taking it all the way home. Besides, there may be hours of dam maintenance and other work required before they go back to their burrow or dam around daybreak.

During autumn they prepare caches of timber bark in the pool next to their lodge ready for consumption. This is important in the winter when the weather gets really cold and they have to swim out under ice to get to it.

Canal creation

Beavers are creatures of habit. There are well-worn paths at Bamff that the beavers have created over time, and they leave dents in the bank where they haul themselves out. If the bank is too steep they dig into it to make a path; on flatter ground this initial excavation may become a canal to transport materials more quickly or act as an escape route.

Security is a key consideration for beavers when deciding whether or not to dig a canal, rather than continuing to drag branches back to a lodge or dam. Venturing far from the water's edge is hazardous for beavers, as humans, wolves and other predators may be on the hunt. Far better to have prepared a canal that offers possibilities for escape. Digging a canal can give better access to part of a forest that would be hazardous to reach over land, and each one can be around 100 metres long. At Bamff, beavers have dredged out abandoned forestry drainage ditches in compartments, which now flow again and are part of the beavers' communication network.

Biodiversity benefits

Often when beavers arrive in an area they change things. They may raise the water table by building dams across small streams and ditches. Trees whose roots are drowned may die and the standing dead trunks, or snags, become home to saprophytic fungi, lichens, mosses and all kinds of bacterial and microbial life. Invertebrate numbers increase and they are fed on by amphibians, fish, birds and mammals. Squirrels, *Sciurus sp.*, consume the fungi, and pine martens, *Martes martes*, may arrive to prey on squirrels, voles, Arvicolinae species, and mice, Murinae species.

Dead trees shed branches and beavers are sometimes extravagant in the way they abandon the bits of tree trunk they cannot move or do not need. Mosses, lichens, fungi and the other lifeforms previously mentioned colonise the decaying wood. Voles and mice use the prone trunks of felled trees as sheltered runways, but fall prey to owls, Strigidae species, stoats, *Mustela ermine*, and weasels, *Mustela nivalis*. Voles, squirrels and mice consume the spores of mycorrhizal fungi in the fungi they eat and spread these around the woodland in their droppings; these germinate to form mycelial networks that form intimate relationships with plant partners such as trees.

Snags develop holes , sometimes through saproxylic fungi creating cavities and sometimes drilled by woodpeckers, Picidae species. These become home to bats (Microchiroptera) and birds, including owls and the woodpeckers themselves.

Beavers are untidy creatures and the pools that develop behind their dams become littered with branches and other bits of tree. These provide shade for fish and amphibians, and offer them protection from predators such as herons, *Ardea cinerea*, otters, and mink, *Mustela lutreola*. The decaying bits of woody debris play an important part in the geomorphology of a watercourse and its flow characteristics. Course woody debris and large woody debris create baffles that slow currents during floods. They also make nursery pools that support an abundance of invertebrate and other life forms that in turn feed freshwater pearl mussels, *Margaritifera margaritifera*, and fish, such as brown trout, *Salmo trutta*, eel, *Anguilla anguilla*, and river lamprey, *Lampetra fluviatilis*. Trees and branches that have fallen across streams help with the connectivity of the landscape, for example squirrels and water voles use them as bridges.

Beavers have a preference for broadleaf trees, so in boreal forest, or its conifer plantation surrogates in the British Isles, their impact can reduce the presence of broadleaves. On the other hand, raised water tables may result in drowning the root systems of conifers such as Norway spruce, *Picea abies*, and enable their replacement by willows, *Salix* sp.. The demise of shade-casting broadleaves like sycamore, *Acer pseudoplatanus*, or beech, *Fagus sylvatica*, may lead to an explosion of birch and willow. Fallen trees themselves become bases for forest regeneration, as soils form on their decaying root plates and trunks.

The beaver returns

Owing to excessive hunting of the species for their meat, pelts and scent glands, by the end of the 19th century the days of the Eurasian beaver seemed numbered. Only about 1,200 individuals survived, scattered in isolated refugia around Europe. Thankfully legal protection and an international effort has led to the restoration of the beaver in Europe, to the extent that it is now listed as a species 'of least concern' by the International Union for the Conservation of Nature.

There is still some debate in the UK around the future of the beaver in the wild. Conservationists propound the benefits they offer to increased biodiversity, flood mitigation and the creation of a dwindling wet woodland habitat. However, some landowners focus only on the 'damage' beavers cause when they alter the habitat around them, perhaps not understanding the contribution that natural processes, including beavers in the right place, can have in managing some of the environmental challenges we currently face. Beavers lived in balance with our ecosystems for thousands of years before we drove them to extinction. Surely the successful return of the beaver must give us hope in a world that is dark with the threat of extinctions and the perils of climate change.

[1] Müller-Schwarze, D. (2011). The Beaver: Its Life and Impact. Cornell University Press, United States.

[2] Müller-Schwarze, D. (2011). The Beaver: Its Life and Impact. Cornell University Press, United States.

[3] Hax, C. L., & S. W. Golladay. 1993. Macroinvertebrate colonization and biofilm development on leaves and wood i n a boreal river. Freshwater Biology, 29:79-87.

Paul Ramsay

Beavor

Grahame Ritchie

Fighting to save the hedgehog

Henry Johnson

Hedgehog feeding

Spiny, charming, mysterious and in trouble; the UK's hedgehog, *Erinaceus europaeus*, population is a source of great concern in the conservation world.

While there is a swelling band of Hedgehog Officers in the UK – there are now three – there is one haunting sentence that people say too often: "I haven't seen a hedgehog for years". While this perhaps does not qualify as electrifying chat, it is actually very revealing of hedgehogs and their plight.

A significant proportion of the twenty thousand people questioned in 2005/6 for the 'Hogwatch' survey felt they were seeing hedgehogs less frequently. This counts as anecdotal evidence for what we now know to be true – the British hedgehog is in trouble. The headlines from the latest State of Britain's Hedgehogs (2015) review are stark: we may have lost up to a third of our urban hedgehogs and over half our rural ones since 2000.

This article is a tour of some of the more exciting areas of hedgehog conservation work currently being undertaken in the UK. The change we need to see to help this spiny treasure is achievable and will benefit us all.

Different 'hogs, different needs

People's Trust for Endangered Species (PTES) have been working in partnership with the British Hedgehog Preservation Society on hedgehog conservation since 2011. The programme of work is broad, to reflect the fact British hedgehogs have a myriad of lifestyles. Some inhabit remote, rural landscapes. Others contend with the sound of motorways and discarded kebabs. The threats that these populations face are different, and thus conservation activities must be sensitive to this.

In urban areas, hedgehog habitat is frequently lost to development and impermeable fencing can cause local extinctions. In rural areas, farmland management has stripped out the macroinvertebrates that hedgehogs eat from the fields. Both landscape types need research to pin down the key drivers of change and offer practical solutions.

Hedgehogs and woodland

Before humans drastically altered the European landscape, there were probably fewer hedgehogs back then than there are today. They are a woodland-edge species, rather like

Lars Karlsson - Wikimedia Commons

Young hedgehog

many of our common garden birds. So the fragmentation of woods from the Neolithic onwards and subsequent increase in their woodland-edge habitat would have encouraged them to spread.

In the modern era, British woods have suffered greatly for two reasons: a decline in traditional management regimes and overgrazing from increasing numbers of deer (Cervidar species). Both these factors can be expected to damage the value of woodland to hedgehogs, as they have the combined effects of reducing the diversity and abundance of invertebrates that they eat, and simplifying woodland structure.

For hedgehogs, a key feature of woods is the availability of scrubby vegetation within which they can hibernate. Any management that enhances the availability of this kind of habitat can be expected to benefit hedgehogs, as it also provides them with shelter from predation.

Understanding urban hedgehogs

Did you know there are hedgehogs in the middle of London? Seemingly healthy, but vulnerable due to its small size (around fifty animals) and isolation, the hedgehog population in Regent's Park represents the most urban of anywhere in the UK. They are a relic of a time when the green spaces in the metropolis were more connected. But, rather unusually for a hedgehog population, they now live only within the boundaries of this 166 hectare Royal Park, hemmed in by a swirl of traffic and development. For the past three years a research team lead by Dr Nigel Reeve and Prof. John Gurnell have been using a range of techniques, including GPS and thermal imaging cameras, to study the animals.

Since the 1970s, hedgehogs have been completely lost from six of the central Royal Parks, which reflects wider urban declines. Why has Regent's Park kept its hedgehogs when other similarly sized parks, such as Hyde Park, have lost them? If we can understand this we go a long way towards being able to guide park management for hedgehogs across the UK.

Political hedgehog

Wildlife conservation seems to have slipped down the political agenda in recent years. The sheer popularity of the hedgehog, and its ongoing decline in Britain, has facilitated discussions in Westminster. They have since been mentioned in the House of Commons several times, and Oliver Colvile MP has launched a petition asking for the hedgehog to be better legally protected (by adding them to schedule 5 of the Wildlife and Countryside Act).

The main benefit of this action is it would ensure hedgehogs are surveyed for at sites scheduled for development. Where they are found steps would be taken to mitigate for them, such as the addition of 'hedgehog highways' between gardens. These measures would benefit many other species too.

The deadline for the hedgehog petition is 11 August, sign here: https://petition.parliament.uk/petitions/121264

Not black and white

Badgers, ***Meles meles***, are the main natural predator for hedgehogs. In a landscape denuded of its wolves, ***Canis lupus***, bears, ***Ursus arctos arctos***, and lynx, ***Lynx lynx***, only badgers have the strength to overcome an adult hedgehog's spiny defences. The relationship between hedgehogs and badgers is complex as they also have a shared food resource, primarily worms and beetles.

The finger of blame is often pointed at the badger as a cause of the hedgehog decline, but this is overly simplistic. They do eat hedgehogs and they do influence the movement of hedgehogs, as you might expect from a predator-prey dynamic. But we must remember that badgers and hedgehogs have coexisted in Britain since the last ice age, and hedgehogs are declining in parts of the country that have very few badgers. Both of these native animals have a right to share our countryside – the challenge now is to understand these dynamics so we can fight for a British landscape that is rich in all our native wildlife.

Houses for hedgehogs and people

There is constant and increasing pressure for new housing in the UK and the environmental impact of these buildings depends on many factors. Sensitively planned developments, built on areas of low biodiversity value, can be a huge opportunity for urban-adapted species such as hedgehogs. In a political climate where the general trend is to relax the planning controls rather than tighten them up to improve environmental protection, the 'art of the possible' must be demonstrated to risk-averse developers. The RSPB/Barratt partnership development of 2,450 affordable homes at Kingsbrook is a key part in this, where the impact of a wildlife-friendly development will actually be measured. This involves monitoring the hedgehogs (and other wildlife) before, during and after the builders are at work.

Elsewhere it is important that we engage with developers to ensure they see the public relations opportunities of creating hedgehog-friendly developments at little extra cost. This iconic mammal has twice been voted the nation's favourite species, most recently in 2013 in a BBC Wildlife Magazine vote, so the media potential is significant.

Looking forward

Hedgehogs face a range of threats, some incompletely understood, and they continue to decline by several per cent per year. Yet with a popular animal there is always hope. In November 2015 the first national conservation strategy for the hedgehog was launched, mapping out actions up until 2025.

There are two key challenges to overcome. Firstly, there are still some important unknowns about hedgehog ecology and behaviour that need answering, which means funding more research. Secondly, the hedgehog decline cannot be solved by a handful of organisations working in isolation. We must collaborate and communicate to ensure future generations can experience the charms of spiny garden visitors after the sun goes down.

- Access the UK conservation strategy for the hedgehog: www.ptes.org/hedgehogstrategy
- To register as a Hedgehog Champion: www.hedgehogstreet.org
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Sue Myers

Hedgehog hole

Back from the brink: pine martens in Wales

Jenny MacPherson

Pine Marten

In the ancient wildwoods that once blanketed much of Britain, the pine marten was one of our most common carnivores, but today the story is rather different.

The pine marten, *Martes martes*, is one of six members of the weasel family (Mustelidae) native to the UK. Pine martens are about the size of a domestic cat, with males being slightly larger than females. In common with many carnivores, pine martens are solitary and territorial and, while a male home range usually encompasses that of one or two females, there is rarely overlap between adult male ranges.

They are attractive animals with light to chestnut-brown fur and a distinctive creamy yellow throat patch or 'bib', which can be almost apricot in some individuals. Pine martens are predominantly associated with woodland habitat and are adept tree climbers. Their many adaptations for arboreal life include powerful forelimbs, a long tail to aid in balancing and well-developed, semi-retractable claws.

Historical decline

Pine martens were once common and widespread in Britain. However, during the 19th century the species suffered one of the most dramatic declines of any UK mammal. This was largely due to increases in predator control as sport shooting rose in popularity, which compounded the earlier effects of habitat loss. By the turn of the 20th century, pine martens were extinct in almost all of southern Britain. The majority of the remnant population was restricted to north-west Scotland, with much smaller areas in the uplands of northern England and Wales. Here the species hung on in areas of remote forest and rocky moorland[1].

Slow recovery

In the latter half of the 20th century, the pine marten population in Scotland made a significant recovery, with an expansion south and eastwards from the core areas in the north-west Highlands. However, the species is still rare in Britain with population estimates ranging from 2,600 to around 3,500 adult martens in Scotland. South of the border the situation is very different, and there has been no discernible recovery of pine martens in England and Wales, where the species still remains very rare or absent altogether[2].

Pine martens do not usually breed until their third year and only have one annual litter of two to four kits, so it takes a long time for populations to recover once diminished. Records, mainly in the form of sightings, are still reported from parts of England and Wales, but it is unlikely these populations are large enough to be viable in the long term. It is probable that pine martens will naturally recolonise parts of northern England as the population in Scotland continues to expand southwards, but the large urbanised areas in north-west and central England may act as a barrier to dispersal further south.

A helping hand

The Vincent Wildlife Trust's Pine Marten Recovery Project began in 2014 to address some of these issues and help restore the mammal to suitable areas throughout England and Wales. Initially, a detailed study was carried out to look at the feasibility of using translocations as part of the conservation strategy for this species[3]. Modelling was used to identify regions with enough potentially suitable habitat to support a viable breeding population.

Although pine martens are not restricted to forests, each animal requires a significant amount (c.200 hectares) of woodland within its territory. Of all the areas considered, central Wales was prioritised as it has a large amount of well-connected, suitable woodland habitat and a low risk to pine martens of road mortality. This is also the region from which there was the most recent (2007 and 2012) DNA evidence of pine martens persisting.

Bringing in reinforcements

Following the preparation work, an initial two-year pilot reinforcement began in autumn 2015. Twenty healthy, adult pine martens were released into a large area of well-connected woodlands, with a further twenty animals released in autumn 2016. These are taken from robust populations across the north of Scotland to boost numbers and genetic diversity, so the endangered population in mid Wales can recover.

All the pine martens are radio collared and are being studied intensively for a long period following release. The data collected will provide a huge amount of information, which will inform subsequent reintroductions elsewhere. Some of the research is focused on how they use the habitats available to them in the release areas. From our initial radio tracking results, the first released animals made relatively long-distance exploratory movements, often using wooded river valleys to travel around before tracking back and settling in the release area. The observed avoidance of open ground is probably related to the increased risk of predation, mainly by foxes.

Suitable woodland

Extensive mature conifer plantations provide martens with plenty of cover and previous radio-tracking studies show they spend much of their time in such areas. However, while they may be used by pine martens as habitat and for feeding, even-aged plantations often do not provide good denning opportunities, generally due to the lack of deadwood habitat and cavity trees.

Pine Marten

Pine martens prefer tree holes for breeding dens so they can safely rear their kits above ground for the first weeks after birth. Woods with 'old growth' attributes, such as large old trees grown to maturity, deadwood habitat, cavity trees and natural areas, will generally offer more suitable sites for denning. These are likely to be semi-natural woods, riparian zones, long-established plantations, long-term retentions, non-intervention or minimum-intervention areas, or natural reserves where old-growth characteristics have had time to develop.


Nick Upton - naturepl.com

Pine marten box

Pine martens are predominantly nocturnal and return to a number of den and lie up sites within their home range during the day. A network of artificial den boxes was put up throughout the release area and we have observed animals using some of these. We have also tracked animals to natural den sites, including tree holes, squirrel dreys, rocky ledges and derelict buildings.

Benefits of a native predator

The return of a healthy pine marten population could provide benefits beyond the re-establishment of one of Wales' rarest and most charismatic mammals. It should help bring more income to the local economy through ecotourism, as is the case in Scotland. Furthermore, the interaction between the pine marten and the American grey squirrel, *Sciurus carolinensis*, has recently become a subject of great interest.

Distributional evidence from a study in Ireland suggests that in some areas where the pine marten is recovering there have been declines in grey squirrel numbers to the benefit of native red squirrels[4]. Work has begun on collecting data through field surveys and in collaboration with other organisations to enable long-term monitoring of potential impacts from pine marten releases on other species present, including grey squirrels.

Pine martens and woodland management

Where pine martens are returning, it is important woodland managers are aware of their presence and know the type and location of the features that should be preserved. Pine martens give birth to young, usually in above-ground breeding dens, from March-April. If a maternal (breeding) den site is identified, any planned operations in the immediate vicinity should be postponed or an exclusion zone created around the den for the breeding season. Further information and guidance can be found on The Vincent Wildlife Trust website: www.vwt.org.uk

A flagship woodland species

There is more woodland in the UK now than there has been for centuries and these woods are increasingly being managed for biodiversity. The pine marten is a native species that has been lost from most of the woodlands of southern Britain, so the biodiversity benefits of restoring viable populations here are high.

It is now recognised that diverse forests provide a range of benefits and are more resilient to changing environmental conditions, and many forest management plans aim to increase structural and species diversity to promote sustainability of forest ecosystems. The pine marten can be considered a flagship woodland species and healthy populations will be a good indicator of more naturally structured wooded landscapes and biodiverse forests.


SurreyJohn - Wikimedia Commons

Pine Marten


Nick Upton - naturepl.com

Surveying

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The return of the polecat

Lizzie Croose

One of our least-known mammals, once almost driven to the point of extinction, is making a comeback across Britain.

The polecat, *Mustela putorius*, is a native British mammal, a member of the weasel (mustelid) family and related to the stoat, *M. erminea*, weasel, *M. nivalis*, otter, *Lutra lutra*, and pine marten, *Martes martes*. The polecat is a similar size to a ferret, with a long slim body, dark fur and a 'bandit-like' mask of dark and light fur on its face. It lives in a variety of habitats, from farmland to woodlands to wetlands, and typically dens in rabbit burrows, log piles, hay stacks and sometimes farm buildings. Polecats are mostly nocturnal and solitary, and their diet consists largely of rabbits and rats. They mate during early spring and give birth to an average of four to six young, known as kits, during May or June.

Peter Trimming - Wikimedia Commons

Polecat

Human-wildlife conflict

Once widespread in Britain, the polecat was probably the third most common carnivore during the Mesolithic period, with an estimated population of 110,000 individuals. Historically, it has suffered a troubled relationship with humans. The name 'polecat' is probably derived from the French expression *poule-chat* meaning 'chicken-cat', which is likely to be a reference to its partiality towards chicken. The term polecat was also used as an insult; famously used in Shakespeare's *The Merry Wives of Windsor* in the lines 'Out of my door, you witch, you rag, you baggage, you poulcat, you runnion! Out, out!'

To add to its woes, the polecat's reputation for being foul smelling, as a result of the strong smell emitted from its anal gland as a defence when frightened or injured, is reflected in its Latin name *Mustela putorius*, which translates as 'foul-smelling musk bearer'. The polecat population underwent a severe decline during the 18th and 19th centuries, with the animals being killed in high numbers in order to protect poultry and game birds.

By the early 20th century, the polecat was on the brink of extinction, having been wiped out across most of Britain and confined to a small area of mid Wales and parts of Herefordshire and Shropshire. Thankfully, the polecat's fortunes improved and, due to a reduction in trapping pressure, the population began to recover during the 1930s. The presence of woodland has played a role as polecats have spread back across the landscape. Radio-tracking studies reveal their preferred habitat is woodland-edge, likely due to the concentrations of rabbits in this type of habitat.

Back from the brink

The Vincent Wildlife Trust (VWT) has carried out three national distribution surveys to document the polecat's recovery and range expansion. These surveys have been based on collecting records of individuals from naturalists and members of the public. The majority of records received are of polecats killed on roads, but many people report sightings of live animals, and some people are lucky enough to have them visiting their gardens.

Once polecats had become widespread again in Wales in the 1980s, they began to spread back into England and re-colonised parts of the Midlands during the latter part of the 20th century. The VWT's most recent national survey, carried out during 2014-2015, confirmed they continue to expand their range and have now re-colonised much of central, southern and eastern England. Today, polecats are found as far east as Suffolk and Norfolk and as far south as Devon and Cornwall. They are also present in north-west England, due to reintroductions during the 1960s-1980s, and this population is slowly spreading into Northumberland and Lancashire. Polecats are scarce in Scotland, with small populations present in parts of the central and northern parts of the country that originated from releases. On a national scale, the mammal is more widespread today than it has been in over 150 years, and has re-occupied much of its former range.

As polecats have spread from Wales, they have bred with feral, escaped or released domestic ferrets, *Mustela putorius furo*. When polecats and ferrets breed they produce hybrids known as polecat-ferrets. Distinguishing between the true species and hybrids can be difficult and prove challenging when recording, although they can generally be identified based on pelage (fur) characteristics.

The significance of the Welsh polecat population in a British context has recently become apparent from research at Cardiff University. Genetic analysis found that polecat-ferret hybrids most commonly occur outside Wales and on the edges of the polecat's range, thus highlighting the importance of the Welsh population for the conservation and restoration of the genetic identity of the British polecat.

Positive but tentative

Today, for the most part, this once heavily persecuted species has an improved relationship with humans, compared with 100-200 years ago. The polecat is legally protected under the Wildlife and Countryside Act 1981, which prohibits certain methods of killing or taking them, so fewer are intentionally killed than they were historically.

Nikki Charlton

Polecat kit

Peter Trimming - Wikimedia Commons

Polecat feeding

However, although its conservation status is favourable, there are several threats on the horizon which may hamper the ongoing recovery of the polecat. Firstly, they are vulnerable to poisoning from second-generation anticoagulant rodenticides. This occurs when they eat contaminated prey, such as rats, *Rattus* sp.. Research by the VWT in the 1990s revealed that a third of polecats had been contaminated by these rodenticides. As polecats spread into parts of the country with higher human populations and more intensive agriculture, it is possible that exposure to rodenticides will increase and hamper their recovery in some areas.

Secondly, polecats are vulnerable to being injured or killed in traps set for other species, such as rats, stoats or weasels. On occasions where they have the opportunity to take chickens or game birds, it brings them into direct contact with humans. In a survey carried out in the 1990s, most gamekeepers classed the polecat as a minor pest due to predation of game and wildlife. Although these negative attitudes are countered by the belief among many farmers that polecats control rabbits and rodents and thus provide valuable 'pest control.'

Overall, the picture looks positive for polecats as they continue their comeback across the country. It is seen as a real conservation success story and the return of a native species once on the brink of extinction is cause for celebration.

A hoofed legend returns

Kay Haw

The wild boar, *Sus scrofa*, is a beast of myth and legend, and was used as a symbol of courage by many cultures thanks to its ferocious nature when attacked. The tales of King Arthur include one of an enchanted boar called Twrch Trwyth – an Irish King turned into a boar for his wickedness.

However, like many of the UK's large, native mammals, it was hunted to extinction and disappeared from Britain perhaps as early as the end of the 13th century. Subsequent attempts to reintroduce them from Europe failed and these reintroduced boar became absent from the wild by the 17th century.

The fairly recent return of wild boar to the UK came as a result of diversifying farming practices. In the 1980s, farmers were keeping and breeding boar, predominantly imported from France, for meat. Escapes and releases took place when storms damaged fences, animal rights supporters liberated them or animals were apparently dumped by farmers, for example following bankruptcy.

While boar have appeared in the wild in a number of locations, most of these populations have not been sustained. In 2008, Defra estimated the UK's population of free-living boar to be around 1,000 individuals.

Brutes or beauties?

Wild boar in western Europe have ridges of long hair along their spines and bristly coats whose brown colouration often hides them well in woodland settings. The darker and lighter stripes of the squeakers (piglets) make them even better camouflaged against the woodland floor. The adult's large head and shoulders narrow to smaller hind quarters and a straight, tufted tail. The long snout is distinctive, with males growing upper and lower tusks as they mature. A male boar can weigh up to 200kg and run faster than a human.

Young boar and females live in 'sounders' – small, matriarchal social groups of juveniles and sub-adults led by two or three dominant, reproductive females. Adult males

Hajotthu - Wikimedia Commons

Squeakers

Johann H Addicks Wikimedia Commons

Wild boar among apples

are more solitary, but mostly tolerate other males except when competing for females to breed with. The boar's aggressive nature is particularly obvious during male rutting displays (October-November) and, if threatened, when females are trying to protect their young.

Their diet is omnivorous; vegetation, such as roots, bulbs and fruit, makes up the bulk (80-90 per cent) of their diet, although they will also consume animal matter. As boar are mainly nocturnal in nature most foraging activity takes place at night, which may account for their poor eyesight but remarkable sense of smell and hearing. The eating of bulbs and roots from the soil makes them unpopular with some people, as their rooting to uncover these tasty morsels can churn up gardens and verges, as well as woods.

In terms of the ecological impact from rooting, there is some evidence to show this behaviour can lead to significant increases in mineral soil carbon and nitrogen concentrations, as well as microbial biomass carbon. This has the potential to improve growth conditions for plants. However, the same study, of a hardwood forest in Switzerland, showed total plant cover and sapling counts to be reduced on rooted plots[1]. Boar have preferences for areas and focus on locations where there is something worth finding, so tend not to cause comprehensive disturbance. The impact boar have is not a simple argument, but it must also be considered that disturbance has been a natural process within woodland for millennia.

Controversy and contravention

Following extinction, today the reintroduction of a species back into the UK's countryside must follow guidelines set out by the International Union for the Conservation of Nature. These were originally developed in 1998 and include advice on feasibility studies, risk assessments, release sites and monitoring. However, in Britain wild boar had already established viable populations of free-living individuals by this time.

Prior to 2010 wild boar were only listed under the Dangerous Wild Animals Act 1976, which requires people to have a licence from Trading Standards to keep them in captivity. In 2010, wild boar were added to an amended Schedule 9 of the Wildlife and Countryside Act 1981 (WCA). This is a list of species to which section 14 of the WCA applies. Section 14 "makes it illegal to release or allow to escape into the wild any animal which is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state, or is listed in Schedule 9 of the Act."[2]

"Defra policy is that primary responsibility for feral wild boar management lies with local communities and individual landowners. However, Government will help facilitate this regional management through the provision of advice and guidance." [3]

Boar rooting at Brede

A social focus

The Forest of Dean boar population is perhaps the most well-known and publicised in the country. The Institute of Science and the Environment at the University of Worcester conducted a Forestry Commission-funded project that looked at *The Social Aspects of Wild Boar in the Forest Of Dean.* "The presence of wild boar in the Forest of Dean frequently causes highly polarised, conflicting and emotive opinions and attitudes" and their subsequent report (2015) outlines some of the impacts of boar on local residents.[4]

The report focuses heavily on the economic costs and benefits of wild boar, looking at areas such as the tourist industry, meat sales and boar-vehicle collisions, as well as impacts on gardens, crops and amenity land. The report found the economic losses outweighed the gains, but admitted not all the data was available to give the full picture. However, lack of information on and communication around wild boar was highlighted as the main issue for residents, with local media also identified as sensationalising often contradicting reports.

In the Netherlands boar are allowed to roam freely, but growing numbers mean they are increasingly coming into urban areas and into contact with people. As in the UK, there are concerns over lack of information/ communication and some people are happy to live alongside boar while others call for fencing and active culling.

Boar at Brede

The Woodland Trust's Brede High Woods in East Sussex is a mosaic of several different habitats made up of a number of separate woods. Two of these, Conneyburrow Wood and Rafters Wood, were included in a study by Ralph Harmer, Nigel Straw and Dave Williams of Forest Research entitled ***Developing approaches to evaluate and mitigate the environmental impact of wild boar – WM0318***. The study was carried out in 2010 and focused on the impact of boar on bluebells and beetles in 12 sites in East Sussex.

The researchers found much variation in the level and distribution of rooting within and between the sites, with boar tending to repeatedly root in the same areas. They reason that bluebells are not being seriously impacted as there is still an abundance of them in the woods despite 20 years of boar activity. The argument is therefore proposed that if boar numbers and levels of rooting remain similar, then bluebells are not at risk in the short-term. Rooting also appeared to have no adverse effect on ground beetle or other ground-dwelling invertebrate communities.[5]

Anecdotally, Site Manager Dave Bonsall believes that at their current level the boar look to be having an overall positive effect at Brede. There is some control taking place alongside deer management, but this is limited due to a current lack of baseline population figures. One consideration is that, due to higher levels of culling outside the woodland complex, Brede could become a local haven for boar. Along with lack of predation, successful breeding and early-onset sexual maturity, as well as mild winters, Brede's population may increase and require further management.

Safe or wild?

In the UK we have been devoid of species that pose us any serious threat for hundreds of years, so our countryside and way of life has changed in response. The current debate around rewilding, and in particular the focus on reintroduction of species such as wolf, ***Canis lupus***, and lynx, ***Lynx lynx***, creates polarised positions. Some relish the idea of these iconic animals populating our landscapes once more, while others focus on the possible threats to human livelihoods and wellbeing.

Can we really not live in a slightly wilder world and find a balance between human and wildlife needs? One in which we accept nature in all its forms, even if this sometimes creates conflicts for us. Or, as Aldo Leopold states in his ***A Sand County Almanac***, should "we all strive for safety, prosperity, comfort, long life and dullness"?[6]

Wild boar, ***Sus scrofa***

Wild boar female with juveniles

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