Scottish Wildlife Trust
Policy

The Scottish wildcat (*Felis silvestris*)

Scope of this policy

1. This policy (2011) sets out the Scottish Wildlife Trust's position on the conservation of the Scottish wildcat. It outlines how the Scottish Wildlife Trust will contribute to the protection of the Scottish wildcat through advocacy work, practical conservation measures and delivery of overarching policies such as the Scottish Wildlife Trust's *vision*[1] and Living Landscapes policy[2].

2. The policy should be read in conjunction with the appendices which contain a summary of Scottish wildcat ecology, conservation and research.

Context

3. The Scottish wildcat (*Felis silvestris*) is the only native member of the cat family (*Felidae*) living in Britain today and is now found only in Scotland. By the mid-19 Century the wildcat had totally disappeared from both England and Wales; its eradication was mainly due to historical persecution and habitat loss (deforestation) (Beaumont et al. 2001). Another threat to the Scottish wildcat has been from interbreeding (hybridisation or genetic mixing) with the domestic cat which was introduced to Britain by the Romans over 2000 years ago (Kilshaw et al. 2010).

4. Scottish Natural Heritage's 2006-2008 survey found wildcat 'strongholds' in Aberdeenshire, Caithness and Sutherland, the Ardnamurchan Peninsular and Morven; there were also recorded sitings and historical records for Perthshire, Cairngorms and the Central Highlands (Davis and Gray 2010; Dr. Mairi Cole pers. comm.). As it has been recently estimated that there may be as few as 400 'pure' wildcats remaining in Scotland (Yamagushi et al. 2004[3]) it is clear that the wildcat is vulnerable to extinction.

5. The Scottish wildcat's territory is composed of large mosaics of connected habitats including wooded areas, riparian borders, meadows and open hillsides. The current main threats to Scottish wildcats are: interbreeding with feral and domestic cats (which can lead to the loss of 'pure' wildcats); habitat loss, fragmentation and degradation (causing loss of shelters, dens, hunting cover and prey); predator control and incidental capture (e.g. by gamekeepers mistaking wildcats for feral cats) and disease transmission from domestic cats.

Policy statement

6. The Scottish Wildlife Trust believes that there is a moral and ecological imperative for reversing the decline of the Scottish wildcat, a decline caused by human persecution and

[1] See: Natural Connections- a vision for re-building Scotland's wildlife. Available at: http://www.swt.org.uk/docs/002_003_publications_NaturalConnections_1249632118.pdf
[2] See: Hughes J., and Brooks S. (2009) Living landscapes: towards ecosystem-based conservation in Scotland. Scottish Wildlife Trust, Edinburgh. Available at: http://www.swt.org.uk/about-us/policy/ecosystem-scale-conservation/
[3] This estimate may be biased because it was based on an extrapolation of examined samples of wild cat pelts which were not collected randomly (e.g. many may have been road kills or what were thought to be wildcats).

anthropogenic habitat loss. Conservation action should be targeted in Scottish wildcat strongholds with the principal aim of recovering genetically healthy and viable populations.

7. The Scottish Wildlife Trust acknowledges that the 'genetic integrity' of the Scottish wildcat may have already have been diluted through interbreeding with feral cats, though the level of interbreeding appears to vary across its natural range in Scotland and some 'purebreds' may well remain. The Scottish Wildlife Trust believes that current conservation efforts should be concentrated in those areas which contain wildcats that show the greatest morphological, ecological and genetic divergence from the domestic cat (i.e. the Scottish wildcat strongholds).

8. The Scottish Wildlife Trust believes an ecosystem based approach[2] to Scottish wildcat conservation is needed. This means, *inter alia*, land owners and managers (in areas of Scottish wildcat strongholds[4] and territories[5]) must consider the effects of their activities on the Scottish wildcat within and beyond the confines of their own land (i.e. at the ecosystem scale).

9. The Scottish Wildlife Trust's Coigach Assynt Living Landscapes (CALL) initiative will be a practical demonstration of our Living Landscapes Policy. One of the goals is to transform this area into *a nature rich landscape* which will bring benefits to the local community and wildlife. By increasing the amount of woodland cover and creating more connected and species rich habitats the Scottish Wildlife Trust will help make the landscape more attractive to the Scottish wildcat.

10. Beyond the CALL initiative, the Scottish Wildlife Trust manages several wildlife reserves which hold historical records and/or overlap with Scottish wildcat territories: Knapdale Habitats Partnership, Loch Fleet, Loch of the Lowes and Rahoy Hills. The Scottish Wildlife Trust will continue to take into consideration how the management of these reserves can be carried out for the benefit of the Scottish wildcat e.g. considering how habitat enhancement measures can be carried out for the benefit of the Scottish wildcat.

11. The Scottish Wildlife Trust believes that the planning system should be used to protect the Scottish wildcat by ensuring that developments that would have a significant detrimental effect on the Scottish wildcat are refused. Development permitted in areas containing Scottish wildcats must provide effective and enforceable mitigation to protect and enhance the wildcat population. The Scottish Wildlife Trust will object to developments that will have a significant detrimental effect on the Scottish wildcat population. Where land use change is necessary this must be offset by suitable habitat enhancement and retention of some cover to conserve the existing wildcat population.

12. The Scottish Wildlife Trust strongly supports the neutering of domestic and farm cats in areas likely to contain wildcats (to prevent interbreeding) and advocates that this is enforced in known Scottish wildcat territories and stronghold areas.

13. The Scottish Wildlife Trust is supportive of Cairngorms Wildcat project which is researching, *inter alia*, effective feral cat management. The study includes working with landowners and gamekeepers to enable them to distinguish between hybrid/feral and 'true' wildcats.

14. The Scottish Wildlife Trust is supportive of pet owners having their cats vaccinated against diseases that can be passed on to wildcats. Scottish Wildlife Trust advocates 'responsible cat ownership' in Scottish wildcat strongholds and will disseminate this information to our members and a wider audience. We strongly support the work of the Cats Protection in the promotion of neutering and vaccination of domestic cats.

[4] Strongholds are those areas of Scotland where Scottish wildcats are known to be present either from historical records or data collected from the 2006-2008 SNH Scottish wildcat sightings survey – they cover large areas and contain more than one set of wildcats
[5] A Scottish wildcat territory is an area of land that has been specifically surveyed for wildcats and there is evidence that they are present and holding a territory

15. The Scottish Wildlife Trust supports the ongoing research to find genetic markers to distinguish the Scottish wildcat from 'wild-living' cats. Once these markers have been identified it should be possible to determine (by collecting and analysing wild-living cats faecal samples) if there are any 'pure' wildcats left in Scotland.

16. The Scottish Wildlife Trust believes that educating gamekeepers who control feral cats on sporting estates in Scottish wildcat strongholds is a key conservation measure. Gamekeepers should become familiar with Kitchener et al. (2005) wildcat pelage characteristics and the control of feral cats must be carried out by live trapping to prevent wildcats being accidently shot. The Scottish Wildlife Trust will promote a best practice approach to controlling feral cats on sporting estates in those areas that are known wildcat strongholds.

17. The Scottish Wildlife Trust could foresee the translocation of wildcats becoming a viable option in ecologically connected and 'restored' landscapes which would then provide suitable wildcat habitat (with the caveat that the other 'identified threats' to wildcats would have been eliminated). The ongoing work to restore the mosaic of ecosystems within the Coigach Assynt Living Landscape Project area would in the future provide such an opportunity.

The Scottish Wildlife Trust's priorities for action

18. The Scottish Wildlife Trust will take action to further the principles set out in this policy by:

- Campaigning for 'responsible cat ownership' in Scottish wildcat strongholds, including supporting the work of the Cats Protection in the promotion of neutering and vaccination of domestic cats
- Advocating our 25-year *vision* for Scotland's ecosystems – this will create healthy ecosystems that are beneficial to the Scottish wildcat
- Advocating an ecosystem based approach to Scottish wildcat conservation
- Demonstrating how to enhance wildcat habitat through the Coigach Assynt Living Landscapes project
- Promoting a best practice approach to controlling feral cats, positively identified by live trapping, on sporting estates in those areas that are known wildcat strongholds
- Continuing to support the Cairngorms Wildcat Project
- Supporting the current genetic research into finding a genetic tool to identify Scottish wildcats
- Objecting to planning applications that will have a significant detrimental effect on the Scottish wildcat population

Cross reference to other related Scottish Wildlife Trust policies:

1. Policy Futures 1: Living Landscapes - towards ecosystem-based conservation in Scotland (2009)
2. The Planning System (2007)
3. Woodland Policy (2008)

Appendix 1 – Wildcat ecology and conservation in Scotland

Conservation status

The Scottish wildcat is fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). It is also a European protected species (listed on Annex IV of the European Union Habitats Directive[6]); the Directive is transposed into UK legislation under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)**.** Because of its rarity and vulnerability, it has been identified as one of the 31 species in need of priority action under Scottish Natural Heritage's Species Action Framework[7]. It is also listed on the Scottish Biodiversity List and is a UK Biodiversity Action Plan Species.

The Nature Conservation (Scotland) Act 2004 places a duty ('biodiversity duty') on all public bodies to further the conservation of biodiversity. It could be argued (though there is currently no case law) that developments that would have a significant adverse affect on the Scottish wildcat population would contravene this Act.

World wildcat distribution

The wildcat has evolved into three wild subspecies which are found in: Europe (*Felis silvestris silvestris*), Africa (*Felis silvestris libyca*) and Asia (*Felis silvestris ornata*) (Pierpaoli et al. 2003). It is believed that the African and European wildcats are closely related and split as recently as 20,000 years ago at the end of the Last Glacial Maximum (Pierpaoli et al. 2003). The domestic cat (*Felis catus*) was domesticated by the Egyptians from the African wildcat between 8000 - 4000 BP. Therefore, across mainland Europe, wildcats and domestic cats have co-existed (and potentially interbred) for at least 4000 years.

Wildcats in Britain

It is believed that the Scottish wildcat has existed in Britain from the early Holocene period (approximately 11,700 BP) (Langley and Yarden 1977) and was once widespread throughout the country. After, the British Isles became separated from mainland Europe, between 9500-8000BP, wildcats in Britain became isolated from the European wildcat. It is considered by some to be morphologically distinct from the European populations (e.g. darker colouration and bolder stripes on the legs and flanks). Miller (1912; cited in Beaumont et al. 2001) recognises this taxonomic difference and describes the Scottish subspecies as *Felis silvestris grampia.*

As there is currently no genetic evidence to confirm this differentiation, the Scottish Wildlife Trust will continue to use the scientific name *Felis silvestris* to describe the Scottish wildcat which is the conventional way it is described in most of the scientific literature.

By the mid-19 Century, the once widespread wildcat, had disappeared from England and Wales and southern Scotland; its demise being mainly brought about by hunting, persecution and habitat loss (e.g. loss of woodland cover) (Beaumont et al. 2001).

By the end of the 19 Century, the Scottish wildcat was becoming rare in Scotland and its decline coincided with the rise in the number of gamekeepers who would have considered wildcats as 'vermin' which needed to be controlled on sporting estates (Davis and Gray 2010). By the early 20 Century, the wildcat's range in Scotland was confined to the north and north-east. Following the end of the First World War and the establishment of the Forestry Commission which had a remit to

[6] European Directive 92/43/EEC
[7] A five year programme to provide a strategic approach to species management in Scotland - see: http://www.snh.gov.uk/protecting-scotlands-nature/species-action-framework/

plant new forests, the wildcat population recovered slightly and its range expanded to some extent, which reflected the increasing forest cover.

Ecology

Habitat requirements

Scottish wildcats live in a habitat 'mosaic' composed of wooded areas (in which they rest up and shelter - they can use both broad-leaved and coniferous forests); scrub (mainly to provide cover from prey); riparian edges, long grass and open hill (e.g. grouse moors) that contains an abundance of their preferred prey (e.g. small mammals such as voles, mice and rabbits) (Daniels et al. 2001).

Forestry has been shown to be a critical part of the wildcats' territory (Klar et al. 2008). The forest must be close to prey habitats such as meadows, riparian edges or long grass and it is important that there is a natural and gradual transition zone (ecotone) between the forest edge and the open ground.

Wildcats are mainly nocturnal, although they can also be active during the day. Their dens can take a variety of forms and may include dead wood, hollow trees, rabbit burrows, and holes in rocky outcrops and crevices (Macdonald and Barrett 1993). They usually avoid areas of human habitation probably because of disturbance caused by noise, light and dog walkers.

The Scottish Wildlife Trust's Woodland Policy (2008), called for a significant increase in the quantity and improvement in the quality of Scotland native woodlands – this may also increase the quality of habitats in wildcat strongholds and may assist in the expansion of the Scottish wildcat out with these areas.

Territory size

Wildcats are solitary out with the breeding season[8]. The male wildcat has a much larger territory size than the sedentary female (research has shown territory sizes can be up to c. 500 ha and c. 180 ha respectively) (Daniels et al. 2001) although territory size varies depending on prey availability. Adult cats of the same sex do not overlap their territories, but a male wildcat may have a territory that contains several females.

Breeding

After mating, in late winter early spring, the female produces a litter of up to four kits - births occurring from April-September (Macdonald and Barrett 1993). Research has shown reproduction is not strictly seasonal but there are fewer births in winter (Daniels et al. 2002). Only the mother cares for the young; the family splits up after approximately five months. Males are sexually mature after one year, females after approximately nine months.

Current threats to the Scottish wildcat

The main threats to Scottish wildcats are: interbreeding (hybridisation) with feral and domestic cats (which can lead to the loss of 'pure' wildcats); habitat loss, fragmentation and degradation (leading to loss of shelter, dens, hunting cover and prey); predator control and incidental capture (e.g. by gamekeepers mistaking wildcats for feral cats) and disease transmission from domestic cats.

Wildcat interbreeding with domestic and feral cats

[8] The main Scottish wildcat breeding season is in spring (usually one litter is produced in May)

It is thought that wildcats in Britain and domestic cats have been potentially interbreeding for at least 2000 years (Kilshaw et al. 2010) after the Romans introduced the domestic cat to Britain. Domestic and wildcats can interbreed and produce fertile offspring both in captivity and in the wild. The protracted co-existence has led to fears that there may only be few 'pure' wildcats left in Scotland (Daniels et al. 1998). Genetic mixing is not confined to Scotland, as 'hybrid' wildcats also occur in other European countries such as Hungary, Bulgaria and Portugal (Randi 2008).

Differentiating between hybrids and 'pure' wildcats

Because the Scottish wildcat and domestic cat have co-existed for so long, it is likely that there are 'hybrids' existing in the wild which are difficult to distinguish from true wildcats. This makes targeted conservation effort and enforcing legislation difficult (Balharry and Daniels 1998).

Estimating the Scottish wildcat population is difficult due to the secretive nature of wildcats and is exacerbated by the fact that when conducting surveys involving the public it is difficult to reliably separate sightings of true wildcats from those of feral and hybrid wildcats. Furthermore developing genetic tools to differentiate between wildcats and hybrids is not easy because: (i) the domestic cat and wildcat are closely related; (ii) the potential of past genetic mixing means there may be only a few genes that are 'unique' to the wildcat that are not found also in the domestic cat (Daniels and Corbett 2003) .

Kitchener et al. (2005) has developed an identification tool based on seven pelage[9] characteristics (see Appendix 2 for figure and definition of characters) which can be used to separate the domestic, hybrid and wildcat. The main features which distinguish a wildcat and are easily identified in the field are the distinct tail (a large blunt and banded tail) and the striped flanks and hindquarters (Davis and Gray 2010). Features such as white paws, spots on the flanks and hindquarters and a tapered tail, rule out the animal being a wildcat.

In terms of genetic characteristics the strict pelage characteristics proposed by Kitchener et al. (2005) is deemed presently to be sufficiently accurate to identify individuals that are genetically different from domestic cats (Kilshaw et al. 2010). Research by the Wildlife Conservation Research Unit (Oxford University's Zoology Department) and Chester University/ Royal Zoological Society of Scotland is ongoing to develop 'genetic markers' than can differentiate between feral, hybrid and true wildcats (Kelshaw pers comm.; Ross McEwing pers. comm.) (See also Appendix 2).

Regarding conservation of 'pure' Scottish wildcats, it is widely acknowledged that the 'genetic integrity' of the Scottish wildcat may have already been diluted to some extent. However the significance of this maybe a moot point as the possible 'mixed' genes have originated from a domesticated form of a species of wildcat (*Felis silvestris libyca)*. Daniels and Corbett (2003) recommended that conservation efforts should be concentrated in those areas which contain the greatest morphological, ecological and genetic divergence from the domestic cat (i.e. the Scottish wildcat strongholds identified by Davis and Gray 2010).

Habitat loss, fragmentation and degradation

The Scottish wildcat requires a connected mosaic of habitats in which to rest-up, hunt and breed. New development, encroaching human habitation and changing land use may be a threat to Scottish wildcats in some areas, especially where there are known wildcat strongholds.

Predator control and incidental capture

One of the potential and ongoing threats to the Scottish wildcat is that it can be mistakenly identified by gamekeepers as a feral cat. Shooting is used to control feral cats on sporting estates

[9] A mammal's coat

and as this is often conducted at night (e.g. lamping) it will be difficult for the gamekeeper to differentiate between a feral and wildcat.

Disease transmission from domestic cats

Scottish wildcats that come into contact with domestic cats (or their faeces) may become infected with a number of cat viruses such as Feline Leukaemia Virus, Feline Infectious Enteritis, Cat Flu Complex, Chlamydia (all of which can be vaccinated against) which may cause fatality in the wildcat (Daniels et al. 1999).

Appendix 2: Kitchener et al. (2005) pelage characteristics of the Scottish wildcat.

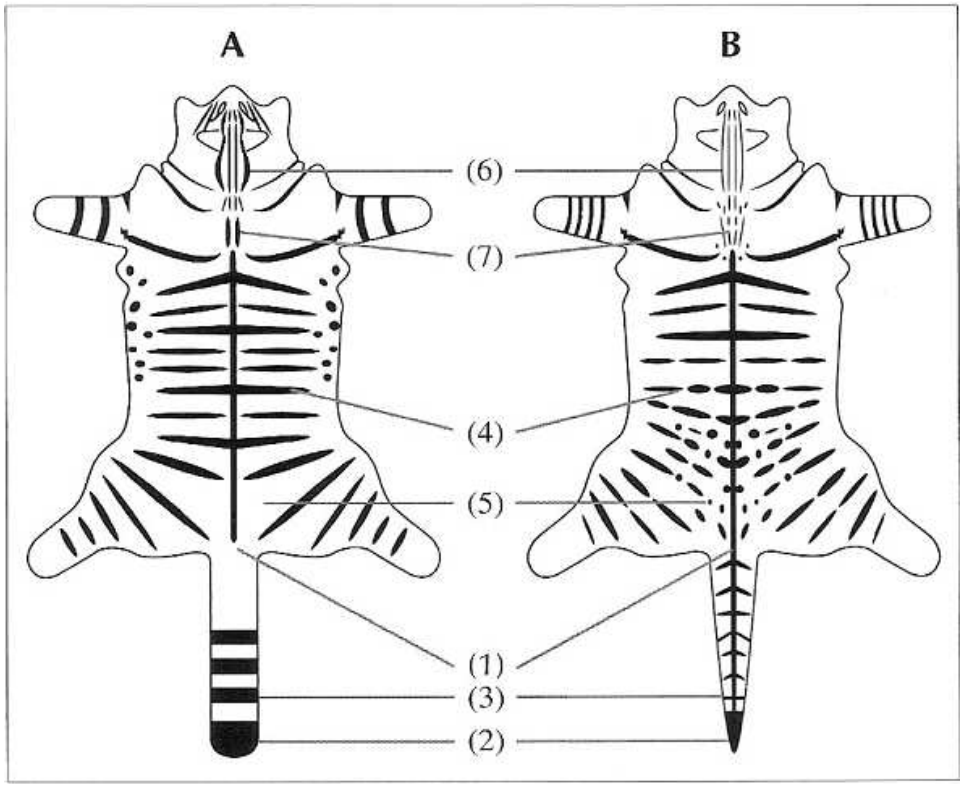
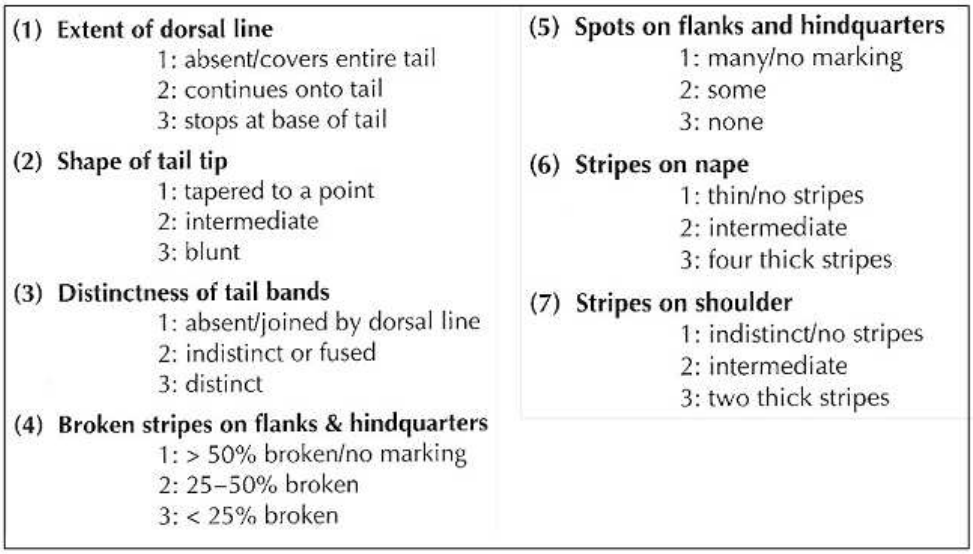


Figure 1: A comparison of the seven key pelage characters that distinguish a striped-tabby domestic cat (B) from a Scottish wildcat (A) (Adapted from Kitchener et al. 2005 in Davis and Gray 2010)

Table 1: Key to Key to the seven pelage characteristics (Adapted from Kitchener et al. 2005 in Davis and Gray 2010). For each character (3) is the character found in wildcats and (1) is found in domestic cats.



Appendix 3: Current research

The Cairngorms wildcat project (text extracted from the Highland Tiger Website see: http://www.highlandtiger.com/index.asp

A partnership of organisations including the Cairngorms National Park Authority, Forestry Commission Scotland, Royal Zoological Society of Scotland, Scottish Gamekeepers Association and Scottish Natural Heritage, bolstered by a wider circle of supporting organisations (including the Scottish Wildlife Trust), came together to design a conservation project for wildcats in the Cairngorms. The Project aims to tackle the threats facing wildcats by:

- raising awareness of the plight of the Scottish wildcat
- encouraging responsible domestic cat ownership (i.e. increased neutering and vaccination) in the CNP
- supporting the work of cat welfare organisations which neuter feral cats around towns, villages and farms
- working with land managers to ensure that predator control is wildcat-friendly.
- monitoring the wildcat population and the extent of both hybridisation and disease with the input of land managers and the public

This project will work with a range of partners and interest groups to safeguard surviving wildcat populations and create favourable conditions for the species to thrive in the Cairngorms National Park, and beyond, in the future.

Dr David Hetherington is the Cairngorms Wildcat Project Manager.

Past and ongoing research conducted by the Wildlife Conservation Research Unit and various partners (information supplied by Kerry Kelshaw)

The Wildlife Conservation Research Unit (WildCRU), part of Oxford University's Zoology Department has been carrying out research on the Scottish wildcat for almost 20 years. The work was initially carried out by Mike Daniels who carried out a PhD on the Scottish wildcat in the 1990's. His work involved, amongst other things, extensive radio tracking of the Scottish wildcat in the Cairngorms National Park which provided much of the background information on the wildcat,

including details of habitat preferences, home range size and behaviour, parasites and virus's, dietary preferences and the first evidence that introgression was occurring as a result of hybridization between the Scottish wildcat and the feral domestic cat.

In 2004 WildCRU produced the Scottish Wildcat Conservation Action plan which highlighted the seriousness of the wildcat's situation.

This was followed in 2005 by Andrew Kitchener's work on pelage, which identified the seven key pelage characteristics now commonly used to distinguish wildcats from hybrids and feral domestic cats. This work generated the estimate of 400 wildcats left in the wild based on extrapolation of museum data - this is a 'best guess' but not necessarily the most accurate.

In 2007, another PhD student at WildCRU, Carlos Driscoll identified that a unique diagnostic marker existed on the mitochondrial DNA which was different in the Scottish wildcat and domestic cat. This combined with microsatellite data has helped start the process of identifying wildcats from domestic cats and hybrids using genetic data.

The genetic research on the Scottish wildcat is being continued by the Wildcat Genetics Group, collaboration established in 2010 between WildCRU, Royal Zoological Society of Scotland, National Museums of Scotland and Chester University. Ross McKewing is conducted the research. He is processing thousands of genetic markers – single nucleotide polymorphisms ('SNPs') to find a 'diagnostic tool' that can differentiate between 'pure' Scottish wildcats and other wild-living cats. He is hoping to have a suitable marker identified within the next three months (R. McKewing pers. comm.) Once the 'marker' snips have been identified, research will continue - the aim being to collect faecal samples of 'wildcats' in the wild to determine the extent of hybridisation amongst Scottish wildcats.

Kerry Kilshaw of the WildCRU started research on the wildcat in 2008 she studied the feasibility of feral cat control in the Cairngorms National Park, the results of which helped lead to the establishment of the Highland Tiger Project managed by Dr. David Hetherington. She also completed a small study for SNH comparing the pelage data with the genetic data available. Although the study was small (and needs to be expanded) the initial results indicated that cats with the wildcat pelage were genetically different from domestic cats.

She recently started a PhD to look at the current status of the wildcat across Scotland. For the next three years she will be camera trapping various sites across Scotland, north of the Central Belt in order to get a better idea of the current densities and distributions of wildcats and hopefully generate a better population estimate. This will also highlight areas for future conservation efforts. In addition, she will be testing a variety of different monitoring techniques to try and increase the efficiency of the current methods being used. The study will also be collecting genetic data which will be used to examine the current state of hybridization in the Scottish wildcat population (using SNPs).

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