

Stoats and the Irish question

Natália Martínková and Jeremy B. Searle
dusted off pelts from 18 natural history museums
to explore the evolutionary comings and goings
of one fierce little carnivore: the stoat.

Imposing pillar-laden entrances and grand façades have enticed generations of visitors to explore natural history museums and their wonderful displays of dinosaur skeletons, dioramas and dazzling butterflies. Behind the exhibits, in the backrooms, you will find amazing stores of biological material – the collections. Hundreds of years of passion from enthusiastic naturalists and meticulous curators have bequeathed a huge numbers of specimens that researchers in the DNA era are keen to exploit.

When it comes to mammals, much of a museum's horde is skin and bone – pelts, hides and skeletons. One mammal with a rather special pelt is the stoat, a vicious little creature, but with a beautiful coat that gets turned into ceremonial ermine. Perhaps because everyone knows the pelts are prized, many museums keep good collections.

We wanted to use DNA to study evolutionary questions involving the stoat. Rather than trying to collect new DNA, it made sense to use pelt collections held in museums – as long as we could get good enough DNA out of fur coats.

DNA could potentially tell us whether stoats managed to use those magnificent pelts to survive the coldest point of the last ice age right up close to the ice sheet that covered much of Ireland, Britain and northern Europe. The present-day geographic distributions throughout Europe of different DNA variants of a particular gene could provide the answer. We needed tiny pieces of stoat pelts from all over their European range. Europe, of course, has a formidable network of natural history museums, providing superb geographic coverage. After travelling over 7600km, criss-crossing the continent, and wandering around 18 museums in 11 countries, we amassed pieces of dried skin from 253 pelts.

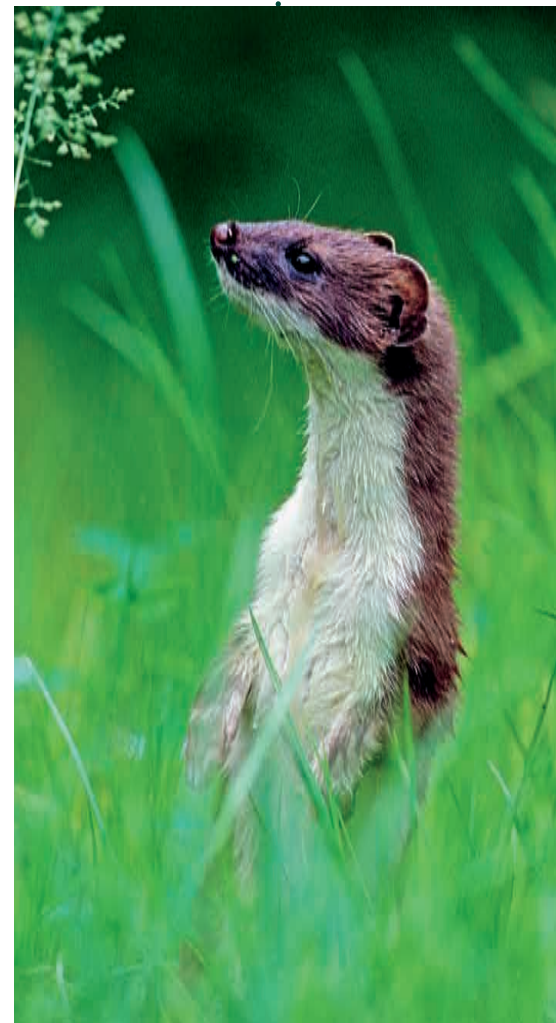
We used a method developed for extracting DNA from really old biological

material, such as permafrost-frozen mammoth flesh, and adapted it for processing museum pelt samples. What became clear is that there is not much DNA left in museum pelts. Not surprisingly, age is an important factor, with the younger pelts better for DNA. However, it didn't always work out that way. We managed to get usable DNA from a pelt dating back to 1878 while a pelt that was only ten years old failed to provide usable DNA. Clearly, storage conditions are also important. Our results indicate that museums should aim to keep their pelt collections in a cool, dry environment with limited air circulation (tight-fitting containers) to have the best chance of maintaining and preserving DNA. From the 253 pelts we recovered usable DNA from 140. Not a bad return, and indicating that museum pelt collections really are a great resource for modern evolutionary studies.

So, whenever conducting such studies involving mammal specimens from a wide geographic area, museums should be an early port of call. Even if they don't have modern samples stored to protect DNA (tissue in deep freezers or in ethanol), they are likely to have pelts or hides, and these, with a bit of care, can still provide the evolutionary data needed.

The results: we compared the DNA of Irish stoats with those of the rest of Europe. The comparison showed that stoats got to Ireland naturally, that is on their own four legs: they weren't introduced by people. This is important because of 'the Irish question' – why are there so few native animals and plants in Ireland? The answer seems to be that it was only species like the stoat, which is geared for extremely cold climates, that were able to get to Ireland overland during a narrow window of opportunity during the last ice age – when sea levels were much lower than today – or to survive there from an earlier colonisation. ❁

Why are there so few native animals and plants in Ireland?



Terry Whittaker/FLPA

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For more information about using museum pelt collections for DNA based studies see Martínková & Searle. 2006. *Mol. Ecol.* Notes 6: 1014-1017 and about stoats and the last ice age see Martínková et al. 2007. *Proc. R. Soc.* 274: 1387-1393.