# Why the leopard got its spots

October 20 2010

Patterns like the leopards rosettes evolve in cats which use forest habitats. Credit: Copyright is Cai Priestley 2008

Why do leopards have rosette shaped markings but tigers have stripes? Rudyard Kipling suggested that it was because the leopard moved to an environment "full of trees and bushes and stripy, speckly, patchy-blatchy shadows" but is there any truth in this just-so story?

Researchers at the University of Bristol investigated the flank markings of 35 species of wild cats to understand what drives the evolution of such beautiful and intriguing variation. They captured detailed differences in the visual appearance of the cats by linking them to a mathematical model of pattern development.

They found that cats living in dense habitats, in the trees, and active at low light levels, are the most likely to be patterned, especially with

particularly irregular or complex patterns. This suggests that detailed aspects of patterning evolve for camouflage. Analysis of the evolutionary history of the patterns shows they can evolve and disappear relatively quickly.

The research also explains why, for example, black leopards are common but black cheetahs unknown. Unlike cheetahs, leopards live in a wide range of habitats and have varied behavioural patterns. Having several environmental niches that different individuals of the species can exploit allows atypical colours and patterns to become stable within a population.

Although a clear link between environment and patterning was established, the study also highlighted some anomalies. For example, cheetahs have evolved or retained spotted patterns despite a strong preference for open habitats, while a number of cats, such as the bay cat and the flat-headed cat, have plain coats despite a preference for closed environments. Why this should be remains unclear.

The study also highlighted just how few species of cats have vertical stripes. Of the 35 species examined, only tigers always had vertically elongated patterns and these patterns were not associated with a grassland habitat, as might be expected. However, tigers seem to be very well camouflaged so this raises the question why vertical stripes are not more common in cats and other mammals.

Will Allen of Bristol's School of Experimental Psychology, who led the research, said: "The method we have developed offers insights into cat patterning at many levels of explanation and we are now applying it to other groups of animals."

**More information:** The research is published today in *Proceedings of the Royal Society B*.