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Wild cats forensics:

Multi-isotope fingerprinting as a tool to trace the geographic origin of North American felids

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Over-exploitation through illegal wildlife trade is a major threat to a wide range of endangered mammal species around the world, particularly to the Felidae. Their bones, meat, skulls, claws, and skins are often subject of illegal trade. Knowing the geographic origin of an animal sample is crucial for wildlife crime investigations, particularly if legislation varies between regions. Collection and trade may be permitted in certain areas, but prohibited in others. Wild cat parts and derivatives (e.g. skulls, bones, and skins) are often smuggled across multiple international borders making poaching hotspots and potential trade routes difficult to identify. Provenance determination of felid tissue samples and hence identification if the respective species is endangered, protected or a matter of illegal wildlife trade is a significant problem for law enforcement or border control. The development of rapid, accurate and cost-effective methods for forensic geolocation of free-ranging carnivorous mammals is thus important.

Stable isotope analysis has been widely applied to infer the provenance and mobility of birds, herbivorous and omnivorous mammals, however, carnivorous mammals have been rarely investigated with these techniques. While empirical relations between isotope compositions of environmental water or food and body tissues do exist for different mammal taxa none is established for any strict carnivore.

In a case study we tried to validate multi-isotopic fingerprinting of felid specimens with known provenance from museum collections. For this purpose we analyzed stable isotopes (oxygen, hydrogen and strontium) on different tissue types like keratins (hair, claw) and biogenic apatite (bone, teeth) from two felid species: bobcat (*Lynx rufus*) and puma (*Puma concolor*) from North America. While H/O isotope studies conducted on herbivores and omnivores display a good correlation between tissue δD and δ^{18}O and precipitation δD and δ^{18}O, we observed a deviation from this relationship in both studied felid species. We conclude that strict carnivores exhibit several unique nutritional and physiological features which cause the observed deviation in the H/O isotope systematics of carnivore tissues. Preliminary isotope data will be presented and their implications for provenance determination of felids will be discussed.