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Biology of mustelids: reviews and future directions

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EDITORIAL

The Mustelidae is the largest and most diverse family of the Carnivora. The family is unified by an ancestral long-thin body plan, and the physical, physiological and ecological consequences this has for them. Yet within the family, even within species, life history patterns can be surprisingly variable. From the world's smallest carnivore, the Weasel (*Mustela nivalis*), the family ranges almost a thousand-fold in weight to the Sea Otter (*Enhydra lutris*). Whereas Stoats (*Mustela erminea*) rank among the most numerous of carnivores and are common throughout the northern Holarctic, Black-footed Ferrets (*M. nigripes*) live at the brink of extinction, supported only by high-profile reintroductions.

The grave problems that mustelids can cause for conservation and animal health, and the dire prospects of certain threatened species, have stimulated research that has had enormous benefits for our understanding of mustelid biology. It is a fortunate irony that applied projects, aimed at resolving issues as disparate as the transmission of bovine tuberculosis from Badgers (*Meles meles*) to cattle and the reproductive biology of Black-footed Ferrets, have fed directly into theoretical debates surrounding the biology of an often challenging family of the Carnivora.

We convened the Biology of Mustelids symposium at the Third European Congress of Mammalogy, Jyväskylä, Finland in May 1999 to provide a unified forum for the diverse group of scientists interested in the biology of the Mustelidae. The seven talks, five of which are published here, dealt with the role of mustelids in rodent population dynamics, competition in mustelid guilds, sociobiology, scent-marking behaviour, landscape ecology and conservation biology. Discussions also benefited from a diverse range of poster presentations, the abstracts of which are featured here. Given the broad interests of those present, we concentrated on review papers that summarized recent work, but had a tendency towards providing challenging, even controversial, hypotheses and directions for the next phase of mustelid research.

The most pressing challenge for future work is reflected by the frequent disagreement as to how many mustelids there actually are and how many subfamilies they should be cast into. The five subfamilies, Mustelinae, Melinae, Lutrinae, Mephitinae and Mellivorinae (Simpson, 1945), are still the industry standard. However, they have been challenged repeatedly (e.g. Wozencraft, 1989) by evidence for the polyphyly of the Melinae, the possible monophyly of *Taxidea* in the Taxidiinae and the affiliation of *Mellivora* to the Mustelinae. The proximity of the Lutrinae to the other subfamilies has also been the subject of recent debate (Koepfli & Wayne, 1998). There is no agreement on the status of Least Weasels, whether they constitute a single circumboreal *M. nivalis* or an Old World *M. nivalis* and a New World *M. rixosa*

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(Reig, 1997). A recent attempt to provide consensus in the phylogeny of the Carnivora by Bininda-Emonds, Gittleman & Purvis (1999) has provided the strongest case for an authoritative review of mustelid systematics, by suggesting that even the entire family may be polyphyletic.

Armed with a new paradigm for mustelid phylogeny, there is potential for review of the apparently erratic appearance of delayed implantation in the family. Closely related pairs of species suggest that this trait was once present throughout the taxon and has been lost repeatedly rather than arising independently on several occasions. This may be an indication that the use of the Mustelidae as models for evolutionary theory is, as yet, underdeveloped. Dayan & Simberloff (1994) have emphasized the importance of competition within the guild in providing an incentive for morphological radiation and the selective importance of character size. Powell & King (1997) have highlighted the extraordinary variability in time and space that mustelids can exhibit in factors as crucial as body size. Indeed, the work of Bininda-Emonds *et al.* (1999) further suggests that evolution in this family has progressed unusually rapidly in the period since its origin. Clearly, a comprehensive examination of the evolution of the crowded guilds of mustelids found on five continents would prove a fertile area for future work.

As long as introduced mustelids are implicated in the decline of native birds, and the evidence for their status as reservoirs for wildlife disease is seen as compelling, applied projects will still provide the strongest impetus for future work. However, although modelling studies now proliferate, the unfortunate truth is that we know perilously little of the basic demography of many members of this family. Alongside the technical advances of virtual science, there is a definite and urgent demand for fundamental ecological studies to be undertaken on most mustelids, so that well-informed decisions may be taken by future managers.

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