

Unwrapping broken tails: Biological and environmental correlates of predation pressure in limbless reptiles

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Abstract

1. Studying species interactions in nature often requires elaborated logistics and intense fieldwork. The difficulties in such task might hinder our ability to answer questions on how biotic interactions change with the environment. Fortunately, a workaround to this problem lies within scientific collections.

2. For some animals, the inspection of preserved specimens can reveal the scars of past antagonistic encounters, such as predation attempts. A common defensive behaviour that leaves scars on animals is autotomy, the loss of a body appendage to escape predation. By knowing the collection site of preserved specimens, it is possible to assess the influence of organismal biology and the surrounding environment in the occurrence of autotomy.

3. We gathered data on tail loss for 8189 preserved specimens of 33 snake and 11 amphisbaenian species to investigate biological and environmental correlates of autotomy in reptiles. We applied generalized linear mixed effect models to evaluate whether body size, sex, life-stage, habitat use, activity pattern, biome, tropicality, temperature and precipitation affect the probability of tail loss in limbless reptiles.

4. We observed autotomy in 23.6% of examined specimens, with 18.7% of amphisbaenian and 33.4% of snake specimens showing tail loss. The probability of tail loss did not differ between snakes and amphisbaenians, but it was higher among large-sized specimens, particularly in adults and females. Chance of tail loss was higher for diurnal and arboreal species, and among specimens collected in warmer regions, but it was unaffected by biome, precipitation, and tropicality.

5. Autotomy in limbless reptiles was affected by size-dependent factors that interplay with ontogeny and sexual dimorphism, although size-independent effects of life-stage and sex also shaped behavioural responses to predators. The increase in probability of tail loss with verticality and diurnality suggests a risk-balance mechanism between species habitat use and activity pattern. Although autotomy is more likely in warmer regions, it seems unrelated to seasonal differences in snakes and amphisbaenians activity. Our findings reveal several processes related to predator–prey interactions involving limbless reptiles, demonstrating the importance of scientific collections to unveil ecological mechanisms at different spatio-temporal scales.