

## Comparative evidence for strong phylogenetic inertia in precloacal signalling glands in a species-rich lizard clade

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### ABSTRACT

**Background:** The precloacal glands of lizards are responsible for the secretion of pheromones involved in chemical-based interactions, such as male territoriality and female mate choice. However, in spite of the significance of these structures for social and sexual communication, their evolution remains poorly studied. Previous research has suggested that the number of precloacal glands may reflect adaptive variation because a higher number of these organs increases the potential rate of secretion, compensating for the impact of extreme environmental conditions on the optimal quantity of secretions smeared on the substrate. Therefore, the number of precloacal glands may be expected to exhibit convergent evolution in response to similar environments. Nevertheless, the only available evidence testing this prediction ignored potential effects of shared phylogenetic history on the evolution of this trait.

**Hypotheses:** (1) Lizard precloacal gland number evolves adaptively in response to variation in environmental conditions, experiencing convergent patterns independent of phylogenetic relationships. (2) Species with a wider geographical distribution exhibit higher variance in the number of precloacal glands as a response to variation along environmental gradients.

**Organisms:** *Liolaemus* lizards, one of the largest and most ecologically diverse vertebrate genera.

**Methods:** Phylogenetic comparative methods. Regression analyses based on phylogenetic independent contrasts, and on raw data at intra-clade level. Historical estimates based on ancestral state reconstructions from explicit phylogenetic hypotheses.

**Results:** Precloacal glands are constrained by phylogenetic relationships. In contrast to previous work, we found no evidence for independent convergent events along the phylogenetic history of this lineage. Environmental conditions failed to predict the number of glands in species of the *Liolaemus* genus in both current and reconstructed ancestral states.

**Conclusions:** Our phylogenetically controlled comparative analysis fails to support the hypothesis that the number of precloacal emitter glands in lizards is the product of adaptive evolution.

**Keywords:** chemical communication, comparative method, *Liolaemus*, lizards, phylogenetic inertia, precloacal glands.

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