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Abstract

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Get a grip—claws of intertidal oribatid mites and their ecological relevance*

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Claws may be the most common biological attachment devices in the animal kingdom but relatively few studies have investigated the ecological and evolutionary significance of their specific morphology. Mites are the most diverse arachnid taxon and they show a huge diversity in claw shape, nevertheless, the functional and ecological aspects of these morphological structures were mostly neglected. We investigated the claw shapes of numerous intertidal oribatid mites from various different habitats by means of geometric morphometrics and our results demonstrate that claw shape is strongly correlated with the microhabitat. Species living on rocky shores show remarkably high and strongly curved claws while species from mangrove habitats show significantly lower and less curved claws. Euryoecious species are able to dwell in a wide range of habitats and show an intermediate claw type. An additional molecular genetic investigation of the respective species even showed that there is no phylogenetic signal in the claw shape, which indicates that ecology has acted as one of the primary selective forces in the diversification of claw shapes. Tidal flooding causes strong selection in terms of movement and attachment resulting in this remarkable correlation between claw shape and microhabitat. We also studied the ontogenetic development of claw shapes in all these taxa and revealed that claw shapes of early juvenile stages are already classifiable into ecological categories, whereas their shapes slightly change during development to become more ‘rock’, ‘mix’ or ‘mangrove’-like, respectively. The developmental changes in body size and weight are only compensated by a simple relative growth in size. Although we only investigated the claws of intertidal oribatid mites yet, it is assumable that other groups of mites may also show specific correlations between claw morphology and ecology.

Keywords: geometric morphometrics, phylogenetic signal, development, ecomorphology, selection

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