

## Publication

## A Home for Three: analyzing ecological correlates of body traits in a triple contact zone of alpine vipers

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The medium-sized vipers of the genus *Vipera* are mainly parapatric in Europe and only a few contact zones (syntopies) are known between two species. The partial syntopy of three viper species (*V. ammodytes*, *V. aspis*, and *V. berus*) is exceptional and has become known only from two neighbouring valleys in the southern Julian Pre-Alps along the Italian-Slovenian border (Valle Mea and Nadiza Valley). This unique situation puts forward questions concerning their co-existence, particularly when considering that natural hybrids are known among all three species. Our principal goals for this article were therefore to evaluate variation and integrity of key dorsal colour pattern and body size among *V. berus*, *V. ammodytes*, and *V. aspis* from Mount Stol, Nadiza Valley in Slovenia. We discuss these variations in the context of potential hybridization, interspecific competition, and local to regional synecological properties including diet, habitat, and climate. Despite the fact that a pre-study specimen showed intermediate colour pattern, suggesting a hybrid between *V. ammodytes* and *V. aspis*, no further intermediate specimens ( $n > 100$ ) were detected based on external features. Comparison of body length and mass shows equal sizes between *V. ammodytes* and *V. aspis*, whereas *V. berus* is approximately 30% smaller. Furthermore, *V. berus* on Mount Stol is also much smaller and lacks melanism, unlike *V. berus* from a close population in Italy ( $< 15$  km), where they are larger and melanism is relatively frequent. These local character expressions presumably are the result of environmental constraints at high elevations ( $> 1200$  m asl.), such as a harsh climate of open, non-forested habitat and possibly a regionally different predation pressure and diet composition. At mid-elevation  $< 1200$  m asl., syntopic *V. ammodytes* and *V. aspis* may compete for food, yet, the previously evaluated microhabitat differences appear sufficient to maintain species integrity for these two viper populations.

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