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Species delimitation in an Austrian endemic land snail: The case of *Trochulus oreinos* (Pulmonata: Hy)

Authors: Arial 12 pt; 1.5 line spacing

identical affiliations should be merged

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Main text: Arial 10 pt; 1.5 line spacing

all species-level taxa in italics

use abbreviations when mentioning genera repeatedly (except at the beginning of sentences)

*Trochulus oreinos** is an Austrian endemic land snail species stern Calcareous Alps at high elevations. Within *T. oreinos*, two morphologically highly similar subspecies have been distinguished: The westerly distributed subspecies *T. o. scheerpeltzi* is characterized by a groove beneath the shell keel, whereas the eastern *T. o. oreinos* features an additional penial fold. First molecular genetic analyses of mitochondrial (*COI*, *16S*, *12S*) as well as nuclear marker sequences (*ITS2*) indicated a high genetic divergence between the subspecies. A clear geographic break was found within the potential contact zone, the Haller Mauern mountain range (Ennstal Alps). Samples of all western sites were part of the clade representing *T. o. scheerpeltzi* and almost all samples from the eastern sites clustered with *T. o. oreinos*. However, within two sampling sites of the eastern Haller Mauern, a few individuals possessed a *COI* sequence matching the *T. o. oreinos* clade, whereas at the *ITS2* locus they were heterozygous possessing the alleles of both taxa. Based on these striking results, indicating historical and/or ongoing hybridization, no decision could be made on whether to consider the two taxa as separate species. Therefore, we used Amplified Fragment Length Polymorphism (AFLP), a DNA fingerprinting technique, to investigate the extent of gene flow between the two subspecies within the Haller Mauern contact zone. The AFLP results of 200 individuals confirmed a clear separation of the two taxa congruent with the mitochondrial data. Although they occur on the same mountain range without any physical barrier, no indication of ongoing gene flow between the two taxa was found.

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*In the revision of the family Hygromiidae, Neiber et al. (2017) suggested the genus name *Noricella* for *T. oreinos*.

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Phylogenetic analyses of the Goshawk *Accipiter* [*gentilis*] superspecies using mitochondrial DNA sequences

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[†] During the final work on this study Anita Gamauf sadly passed away. We dedicate this work to her memory.

The Northern goshawk *Accipiter gentilis* is a medium-sized bird of prey inhabiting boreal and temperate forests. It has a Holarctic distribution with ten recognized subspecies following del Hoyo and Collar (2014). Traditionally, it has been placed within the *Accipiter* [*gentilis*] superspecies, together with Henst's goshawk *Accipiter henstii*, the Black sparrowhawk *Accipiter melanoleucus* and Meyer's ...shawk *Accipiter meyerianus* (Amadon 1966). While those four taxa are geographically separated from each other, hence referred to as allospecies, phylogenetic relationships are still unknown.

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In the present study, we performed phylogenetic analyses on the *Accipiter* [*gentilis*] superspecies, including all recognised subspecies of all four allospecies, using partial sequences of two marker sequences of the mitochondrial genome, the *control region* and the *cytochrome B* gene.

We found a major split of *A. gentilis* into two reciprocally monophyletic groups, a Nearctic clade (3 subspecies) and a Palearctic clade (7 subspecies). *Accipiter meyerianus* nested within the clade together with Palearctic *A. gentilis*; therefore, *A. gentilis* appears to be paraphyletic. Although comprising seven subspecies distributed from the Atlantic coast in Western Europe continuously to Eastern Siberia, we found a strong genetic homogeneity within Palearctic *A. gentilis*. Individuals of *A. henstii* and *A. melanoleucus* form distinct clades. Relationships between the four clades could not be resolved without uncertainty. We discuss phylogenetic and taxonomic implications.

References: Arial 9 pt

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References

Amadon, D. 1966. The superspecies concept. Syst. Zool., 15, 245–249.

del Hoyo, J., Collar, N.J. 2014. HBW and BirdLife International Illustrated Checklist of the Birds of the World, Vol. 1: Non-passerines. Lynx Edicions, Barcelona.

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