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A new alpine newt species from the Vlasina region of Serbia and Bulgaria

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Abstract

The 'alpine newt' has long been suspected to comprise multiple cryptic species. A recent phylogenomic study recognized five different species of alpine newt. For four of these species a name was already available under the Principle of Priority. We here provide a species description for the fifth species: *Mesotriton similis* **sp. nov.** The new species inhabits the Vlasina Plateau and surroundings, in southeastern Serbia and adjacent western Bulgaria. It is sister to a clade containing *M. alpestris*, *M. apuanus*, and *M. reiseri*, and differs from all its congeners, including the parapatrically occurring *M. reiseri*, by a substantial genomic divergence.

Key words: Amphibia, Caudata, *Ichthyosaura*, *Mesotriton similis* sp. nov., Salamandridae

Introduction

The alpine newt has a turbulent taxonomic history (Frost 2026). Until the early 2000s it was treated as a member of the genus *Triturus*, but molecular phylogenetic studies revealed paraphyly of this traditionally circumscribed *Triturus* (Caccone *et al.* 1994; Rancilhac *et al.* 2021; Titus & Larson 1995). Consequently, multiple newt taxa were reassigned to different genera. At the time of writing, there is an ongoing debate on whether the alpine newt should be placed in either *Mesotriton* or *Ichthyosaura* (Böhme & Mutz 2026; Gollmann & Gollmann 2026; Mutz & Böhme 2025). We use *Mesotriton* throughout this paper, but acknowledge that the matter is not settled.

The alpine newt has long been regarded as a putative complex of cryptic species. In mitochondrial DNA (mtDNA), deep genetic divergence between geographic groups has been observed (Recuero *et al.* 2014; Robbemont *et al.* 2023; Sotiropoulos *et al.* 2007). However, until recently only a limited number of nuclear DNA markers had been examined, and the extent of gene flow among mtDNA lineages remained unclear (Recuero *et al.* 2014). Although several mtDNA lineages have been proposed as species (Raffaëlli 2018), the prevailing consensus has been to await genome-wide evidence of evolutionary independence before any formal taxonomic revision (Speybroeck *et al.* 2020).

A recent study, based on genome-wide data comprising thousands of markers, has proposed the recognition of five alpine newt species that represent distinct genetic groups and exhibit geographically restricted genetic admixture (Koster *et al.* 2026). Under the Principle of Priority, four of these species have available names: 1) *Mesotriton alpestris* (Laurenti, 1768) for the northern alpine newt from Central and Western Europe, including northern Spain; 2) *Mesotriton apuanus* (Bonaparte, 1839) for the Apennine alpine newt from the Italian Peninsula; 3) *Mesotriton reiseri* (Werner, 1902) for the Reiser's alpine newt from the Balkan-Carpathian region; and 4) *Mesotriton veluchiensis* (Wolterstorff, 1935) for the southern alpine newt from the Southern Balkan Peninsula (Fig. 1). A fifth species from the Vlasina Plateau and surroundings, in southeastern Serbia and adjacent western Bulgaria, lacks an available name. Here, we describe the Vlasina alpine newt as a new species.

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Results

Description of a new alpine newt species

Mesotriton similis sp. nov.

Type material. Holotype. Collection number: G21725, adult male, collected by G. Džukić and M.L. Kalezić in April 2007 at peat bog Selišta, Ruplje village, Čemernik Mountain, southeastern Serbia (coordinates: 42°50'51.6"N, 22°12'43.5"E; elevation: 800 m a.s.l.). Preserved in 70% ethanol and deposited in the Batrachological Collection of the Institute for Biological Research "Siniša Stanković", Belgrade, Serbia. **Paratypes.** 15 females (collection numbers G21698, G21700-G21706, G21708, G21710-G21711, G21713-G21716) and 12 males (collection numbers G21717-G21724, G21726-G21728, G21730), with collection details identical to the holotype.

Diagnosis. The new species is assigned to the genus *Mesotriton* because it possesses the characteristics typical of alpine newts, namely the combination of a low, smooth-edged, barred dorsal crest in males in the breeding season, and irregularly marbled dorsum, bluish flanks in breeding males and an olive-green coloration in females, a band of dark spotting on a light background (more pronounced in males) that runs from the cloaca, along the flanks, up to the tip of the snout, and a bright orange belly and throat. Morphologically, no diagnostic character states between alpine newt species are currently known (Raffaëlli 2018).

The new species carries a highly distinct mtDNA lineage (Koster *et al.* 2026; Recuero *et al.* 2014; Robbemont *et al.* 2023; Sotiropoulos *et al.* 2007). The mitochondrial marker most extensively studied in alpine newts is a 651 bp fragment of NADH dehydrogenase subunit 4 (ND4) (Koster *et al.* 2026; Pabijan & Babik 2006; Recuero *et al.* 2014; Robbemont *et al.* 2023; Vörös *et al.* 2021). So far, a single ND4 haplotype (VLAS_1, GenBank accession number OR059085) is known for the new species, which is also carried by all specimens in the type series (see below). For unambiguous reference to nucleotide positions that distinguish the new species from the other four alpine newt species, we use the complete *M. alpestris* mitochondrial genome of Zhang *et al.* (2008) as a coordinate reference. Alignment of the ND4 haplotype database compiled by Robbemont *et al.* (2023), supplemented with additional haplotypes from Koster *et al.* (2026), identifies the following 39 nucleotide positions as diagnostic for the new species. Position 10883: T (vs. C in the other alpine newt species), 10896: C (vs. A), 10902: T (vs. C), 10904: G (vs. C/T), 10905: T (vs. A/G), 10949: C (vs. T), 10988: G (vs. A), 11039: G (vs. A/C), 11054: C (vs. T), 11072: G (vs. A), 11090: C (vs. G/T), 11105: T (vs. C), 11108: T (vs. A), 11118: G (vs. A), 11123: A (vs. C), 11135: C (vs. T), 11147: T (vs. C), 11180: G (vs. A), 11197: C (vs. T), 11207: C (vs. T), 11213: A (vs. C/T), 11220: G (vs. T), 11234: G (vs. A), 11255: G (vs. A), 11267: C (vs. A/G), 11270: A (vs. C/T), 11277: C (vs. T), 11282: A (vs. T), 11303: T (vs. A/C), 11318: A (vs. G), 11342: A (vs. C/T), 11354: A (vs. C/T), 11360: C (vs. T), 11388: C (vs. T), 11405: A (vs. C), 11457: A (vs. C/T), 11469: T (vs. A), 11498: C (vs. T), and 11499: T (vs. A/C).

Description of holotype. Morphometry. Adult male; snout-vent length 45.6 mm; interlimb distance 22.2 mm; head width 8.2 mm; head length 6.8 mm; forelimb length 15.2 mm; hindlimb length 15.8 mm; and tail length 36.7 mm. **External morphology.** Dark colour of the upper body surface and flanks, deep yellow to bright orange belly without black spots and with unspotted throat, the skin flaps of the upper jaw extend over the lower jaw, snout from the dorsal view wide and flat, moderate number of dark spots in the lower edge of tail, the flank zone with dark blotches equally wide along the trunk with no regularity in the size of the flank dark blotches, medium height dorsal crest with dark zones completely separated by the narrow lightly coloured stripes, cloaca swollen and with blotches. **MtDNA.** MtDNA barcoding from DNA extracted from a left toe, following the protocol in Robbemont *et al.* (2023), shows the specimen carries mtDNA haplotype VLAS_1.

Description of paratypes. The morphology of the paratypes resembles that of the holotype in general. Compared to adult males (such as the holotype), adult females have non-swollen cloacae and lack the dorsal crest. In Table 1 the same measurements as taken for the holotype are provided for the paratypes (all measurements taken in 2026 by T. Vukov). All individuals carry mtDNA haplotype VLAS_1.

Distribution and conservation assessment. Restricted to the Vlasina Plateau of southeastern Serbia and immediately adjacent western Bulgaria (Fig. 1). Koster *et al.* (2026) present a comprehensive overview of alpine newt records (in their Table S2) and provide 66 occurrence records for the new species in which no genetic admixture is known or suspected. Based on elevation estimates obtained using GPS Visualizer (https://www.gpsvisualizer.com), these localities range from approximately 800 to 1,630 m a.s.l. Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using the International Union for Conservation of Nature (IUCN) GeoCAT tool (Bachman

et al. 2011). The resulting EOO of 657 km² and AOO of 116 km² both meet the geographic-range thresholds for Endangered under Criterion B (B1: EOO <5,000 km²; B2: AOO <500 km²). However, classification under Criterion B additionally requires at least two of three conditions concerning severe fragmentation or number of locations (a), continuing decline (b), and extreme fluctuations (c). Whether these conditions are met remains to be established.

TABLE 1. Measurements (in millimetres) of the holotype and paratypes of the Vlasina alpine newt (*Mesotriton similis* **sp. nov.**).

collection number	Sex	snout-vent length	Inter-limb distance	head width	head length	forelimb length	hindlimb length	tail length
G21698	female	52.99	29.03	8.86	7.71	17.25	18.04	44.34
G21700	female	47.8	24.84	8.31	7.4	15.49	16.35	42.56
G21701	female	54.51	28.52	9.09	7.7	17.59	17.93	47.17
G21702	female	52.25	27.27	8.79	7.06	16.91	17.03	43.41
G21703	female	48.12	23.86	7.85	7.01	15.37	15.97	-
G21704	female	52.28	29.9	8.54	7.87	16.71	16.96	42.24
G21705	female	54.49	29.22	8.81	8.12	14.89	16.45	46.89
G21706	female	52.85	28.88	8.90	7.78	17.16	17.37	41.97
G21708	female	53.16	28.31	9.39	8.00	16.93	17.32	43.51
G21710	female	50.79	23.86	8.64	7.13	16.81	17.18	42.07
G21711	female	52.40	29.50	8.51	7.33	16.89	17.01	41.26
G21713	female	49.60	26.13	8.56	7.38	15.77	16.53	43.06
G21714	female	52.68	25.78	8.62	7.64	17.15	17.82	43.59
G21715	female	48.76	25.93	8.33	6.91	15.57	16.31	39.77
G21716	female	51.31	25.36	8.31	7.16	15.24	16.22	41.61
G21717	male	45.77	22.66	8.47	7.21	15.80	16.14	36.45
G21718	male	43.39	19.62	7.53	6.93	15.59	15.69	36.87
G21719	male	44.35	22.70	8.19	6.61	15.98	16.35	40.80
G21720	male	43.55	20.56	8.11	6.98	14.38	15.45	37.11
G21721	male	46.28	22.38	8.31	7.87	16.78	17.27	40.00
G21722	male	44.35	20.55	7.90	6.84	15.64	16.57	37.68
G21723	male	45.40	22.98	8.08	6.59	15.92	16.61	35.61
G21724	male	40.19	19.18	7.30	6.81	14.28	15.18	32.28
G21725	male	45.65	22.20	8.20	6.82	15.16	15.77	36.68
G21726	male	46.42	24.08	7.95	7.27	15.71	16.22	-
G21727	male	44.53	23.17	8.07	7.18	15.62	15.95	35.34
G21728	male	42.40	21.10	7.98	6.8	14.40	14.82	36.63
G21730	male	41.36	20.99	7.58	6.83	15.72	15.77	36.46

Snout-vent length: distance from the tip of the snout to the posterior opening of the cloaca (vent); Inter-limb distance: distance between the insertion points of the forelimbs and hindlimbs; Head width: maximum transverse measurement across the head, taken at the widest point near the angle of the jaws; Head length: distance from the tip of the snout to the posterior edge of the jaw; Forelimb length: total length of the front limb, from the insertion points of the forelimb to the tip of the longest digit; Hindlimb length: total length of the back limb, from the insertion point of the hindlimb to the tip of the longest toe; Tail length: distance from the anterior edge of the cloaca to the tip of the tail. Two individuals have no value for tail length because the tail tip is missing.

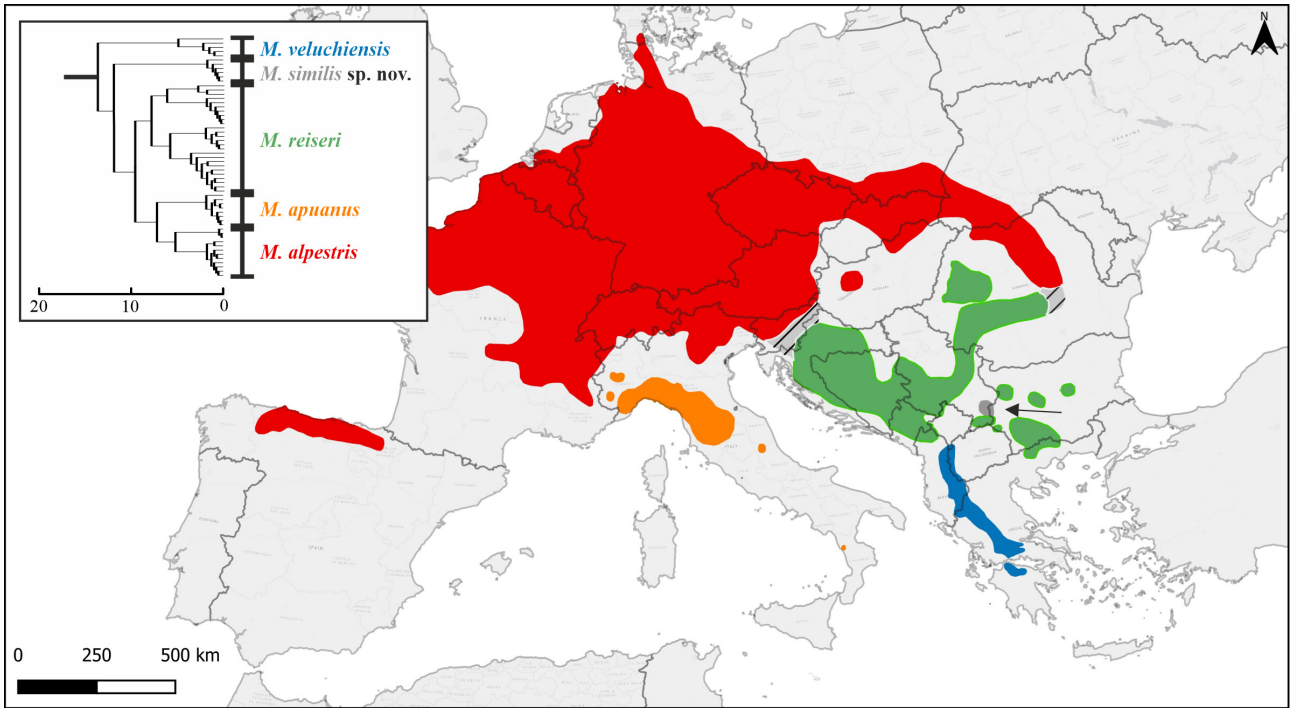


FIGURE 1. Distribution ranges of the five species of alpine newt (genus *Mesotriton*). The range of the northern alpine newt (*M. alpestris*) is shown in red, the Apennine alpine newt (*M. apuanus*) in orange, the Reiser's alpine newt (*M. reiseri*) in green, the southern alpine newt (*M. veluchiensis*) in blue and the Vlasina alpine newt (*M. similis* **sp. nov.**), distributed on the Vlasina Plateau in the southeast of Serbia and in adjacent Bulgaria (and denoted with an arrow), in grey. The inset shows a simplified, dated alpine newt phylogeny based on Koster *et al.* (2026).

Etymology. The specific epithet *similis* is derived from the Latin adjective *similis* ("similar", "resembling") and refers to the morphological similarity of the new species to other alpine newt species, despite its evolutionary distinctiveness as revealed by genomic data.

Proposed common names. We propose to use the English name Vlasina alpine newt for *Mesotriton similis* **sp. nov.** This highlights the unique distribution of the new species. As a Serbian name we propose vlasinski planinski mrmoljak.

Conclusion

Of all alpine newt species, the Vlasina alpine newt has by far the smallest distribution range (Fig. 1). Its distribution appears patchy, and its restricted range and relatively small global population size make the species particularly vulnerable to common regional threats such as habitat degradation, fish stocking or pollution. Although the species meets the geographic-range thresholds for Endangered under IUCN Red List criteria, further study is required to determine whether the additional conditions for such a classification are met.

Genetic admixture between the Vlasina alpine newt and other alpine newt taxa has been shown in several populations that appear geographically isolated from the Vlasina newt range (details in Fig. 1 and Table S1 in Koster *et al.* 2026). These localities have been interpreted as relicts of a formerly wider alpine newt distribution, when the Vlasina alpine newt range met the Reiser's alpine newt in parapatry (Koster *et al.* 2026). Surveys in the southeast of Serbia and the adjacent part of Bulgaria, to establish just how fragmentary the alpine newt range is in this region, would be of particular interest.

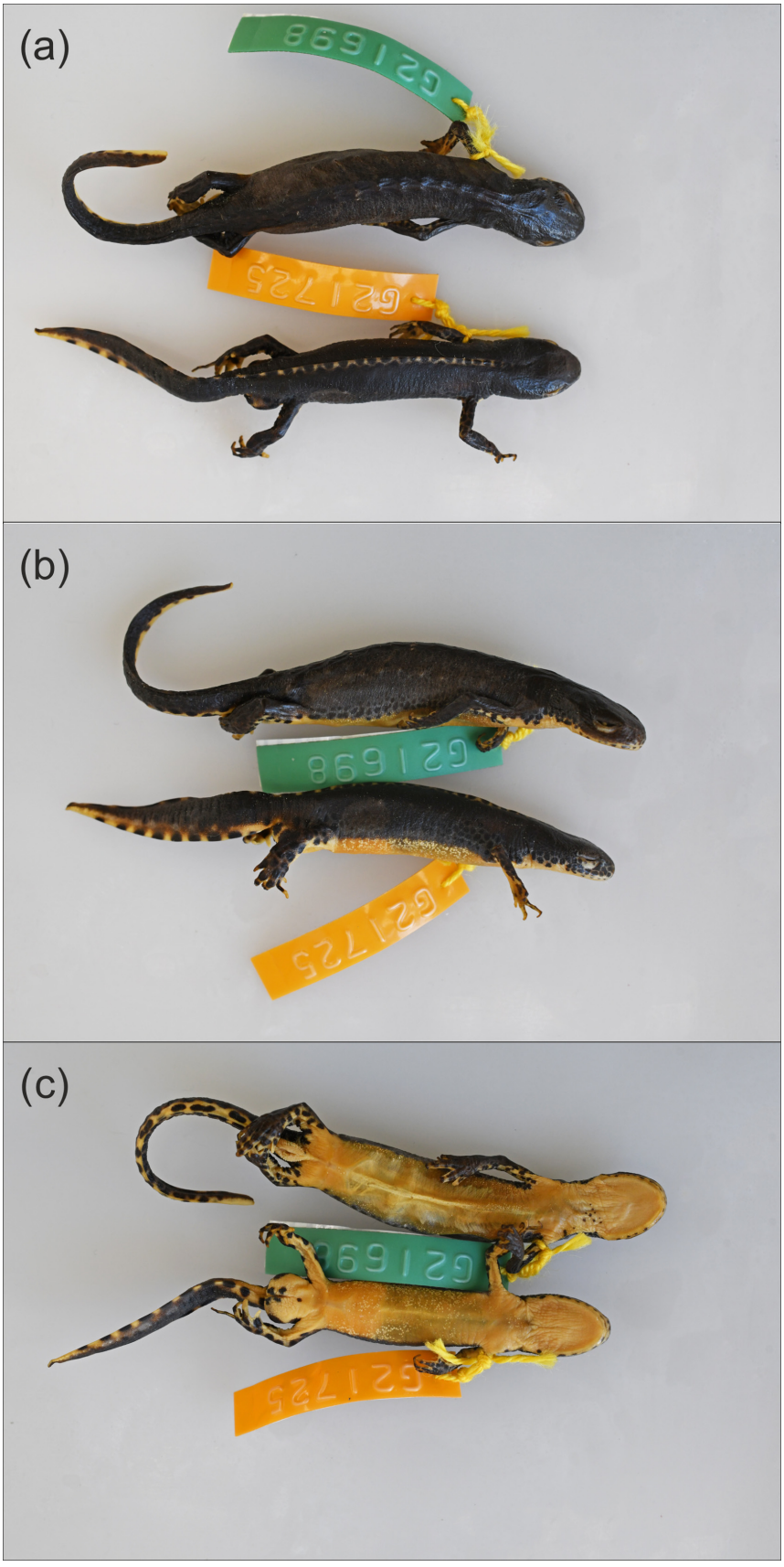


FIGURE 2. Pictures of the Vlasina alpine newt (*Mesotriton similis* **sp. nov.**). Pictures providing a dorsal (a), lateral (b) and ventral (c) view of an adult male (bottom, holotype, collection number G21725, with orange label) and an adult female (top, paratype, collection number G21698, with green label) from peat bog Selišta, Ruplje village, Čemernik Mountain, southeastern Serbia.

The alpine newt species are considered morphologically cryptic (Koster *et al.* 2026). Although some alpine newt species show suggestive differences in coloration, patterning, and body proportions, considerable variation within species and overlap among species currently preclude morphological diagnoses (Vukov *et al.* 2011; Raffaëlli 2018). Now that the alpine newt species have been genomically defined, a systematic morphological comparison may nevertheless uncover consistent morphological differences among species, as exemplified by crested newts (genus *Triturus*; Fahrbach & Gerlach 2017) and banded newts (genus *Ommatotriton*; Üzüm *et al.* 2019).

The Vlasina alpine newt is endemic to the Vlasina Plateau and its immediate surroundings. This region is recognized as an important area of endemism and a glacial refugium, harbouring numerous range-restricted and relict plants and insects (Ranđelović *et al.* 2010; Tot *et al.* 2015; Đukić *et al.* 2019). Evidence for a distinct biogeographic history of the Vlasina region also comes from other vertebrates. Brown trout (*Salmo* cf. *trutta*) show multiple localized mitochondrial haplotypes, interpreted as evidence of long-term isolation (Simonović *et al.* 2017), while phylogeographic structure in the common frog (*Rana temporaria*) suggests historical isolation from the geographically adjacent Balkan Mountain Belt (Ilić *et al.* 2024). The discovery that the Vlasina region harbours a highly restricted endemic vertebrate species representing a deeply divergent evolutionary lineage further highlights its exceptional biogeographic and conservation significance.

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