

New considerations on the systematics of the genus *Montivipera* Nilson, Tuniyev, Andrén, Orlov, Joger et Herrmann, 1999 (Serpentes Viperidae)

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ABSTRACT Within the genus *Montivipera* Nilson, Tuniyev, Andrén, Orlov, Joger et Herrmann, 1999 (Serpentes Viperidae), the *raddei* complex shows deep genetic and morphological differences with respect to the *xanthina* complex. On this ground, it is proposed to consider it as belonging to the new subgenus *Oculocircumcincta*.

KEY WORDS *raddei* complex; new subgenus; *xanthina* complex; lowland populations.

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INTRODUCTION

Nilson et al. (1999) described the subgenus *Montivipera* for a species-group that shares some ecological characteristics linked to mountain areas. *Montivipera xanthina* (Gray, 1849) was fixed as the type species of the new subgenus.

The conclusions of Nilson et al. (1999) are acceptable, but subsequent studies have shown how the type species of the new subgenus, *Montivipera xanthina*, is essentially linked to coastal habitats. Moreover, additional morphological and genetic differences have been found for all other species (*bornmuelleri* and *raddei* groups) (Freitas et al., 2020).

This new situation has been the basis of my recent paper (Cattaneo, 2022) in which I separated the lowland populations, assigning them to a different subgenus. However, the position of *Montivipera xanthina* is crucial. Exclusive to the new subgenus *Planivipera*, it is however the type species of the subgenus *Montivipera*, thus making *Planivipera* its junior synonym.

In order to simplify and make the taxonomy of this group of vipers more congruous and up to date with new studies, it is advisable to consider *Montivipera* as a subgenus the genus *Vipera* with type species *Montivipera xanthina* and describe a new subgenus for the species of the *raddei* group, which are morphologically and genetically distinct.

RESULTS

Genus *Vipera* Laurenti, 1768

Oculocircumcincta subgenus novum

<https://zoobank.org/D759EE5A-5AAF-4167-BBAF-9DAE4A19DFE4>

TYPE SPECIES. *Vipera raddei* Boettger, 1890 (= *Montivipera raddei*).

ETIMOLOGY. The name originates from the fact that the eye of the members of this subgenus is completely surrounded by scales.

DIAGNOSIS. The snakes included in this taxon

(*Montivipera raddei* Boettger, 1890; *M. albicornuta* Nilson et Andr n, 1985; *M. kuhrangica* Rajabizadeh, Nilson et Kami, 2011; *M. latifii* Mertens, Darevsky et Klemmer, 1967) essentially differ from the sub genus *Montivipera* because their supraocular scale is separated from the eye by a circumocular ring of scales, and they have two or more canthal scales on each side of the head (instead of one).

DISTRIBUTION. Extreme eastern Turkish regions, Armenia, Azerbaijan, Northern Iran.

BIOLOGY. The *raddei* complex vipers live at high altitudes (between 1500 and 3000 m a.s.l.), where the prevailing environment is essentially made up of rocks and more or less bushy grasslands. The vipers seek shelter in crevices between rocks and in piles of stones and pebbles, but the environment is generally bare and open. The extreme climatic conditions induce these vipers to a diurnal lifestyle. This environmental situation is also reflected in their reproduction type: members of the *raddei* complex have a “*berus*” reproductive cycle, with sperm that do not fully develop until just before the start of spring mating, which, in turn, is triggered by the spring moult (Nilson, 1980; Nilson et al., 1999). In females, ovulation generally occurs every two or three years (for the relative eco-biological divergences of the lowland

populations of the *xanthina* complex see Cattaneo, 2022).

CONSIDERATIONS AND CONCLUSIONS

In conclusion, the species of the *raddei* complex constitute an evolutionary lineage that is quite distinct from the species of the *xanthina* complex, being morphologically and genetically well differentiated (Freitas et al., 2020) from the other related species, in that they are better adapted to life in the high mountains and are distributed further north-east than the species of the *xanthina-bornmuelleri* group.

It is plausible that the lowland populations of the *xanthina* complex represent an evolutionary line in active diversification (see Cattaneo 2022 and the following table). When populations diverge, it is difficult to find objective criteria for species delimitation (Hey, 2009) as the lineage may not yet have developed distinctive properties; however, the presence of an unique property (in this case the tendency to colonize only coastal environments) could constitute evidence for lineage separation (De Queiroz, 2007).

The articulation of the various entities of the *Montivipera* genus is summarized below (for morphometric and pholidosis data see Cattaneo, 2022).

1. A series of small scales between the eye and the supraocular; two or more canthals between the supraocular and the supranasal.

2. Eye in contact with the supraocular; a canthal between the supraocular and the supranasal.

2a. Smaller size (maximum total length 50-85 cm); low pholidosis values (usually around 150 ventral and 27 subcaudal pairs). Higher ventral scale values can be found in *Montivipera wagneri**.

2b. Large size [up to 140 cm in total length and almost 1300 g in weight (corresponding values) in Chios population (eastern Aegean); usually 90-100 cm in total length and 300-500 g in weight; high pholidosis values: 156-175 (165.5) ventral scales and 26-37 (31.5) subcaudal pairs].

2c. Morphometric and pholidosis characters similar to those indicated for the *bornmuelleri* group.

raddei complex (subgenus *Oculocircumcincta*): *Montivipera raddei*, *M. albicornuta*, *M. kuhrangica*, *M. latifii*. Armenia, Azerbaijan, Iran.

xanthina complex (subgenus *Montivipera*).

bornmuelleri group (subgenus *Montivipera*): *Montivipera albizona*, *M. bornmuelleri*, *M. bulgardaghica*, *M. wagneri*. Central-Eastern Turkey, Syria, Lebanon.

xanthina group, lowland forms (subgenus *Montivipera*): *Montivipera xanthina* single species. Western coastal Turkey, Northeastern Greece.

xanthina group, mountain forms (subgenus *Montivipera*): *Montivipera xanthina* single species. Inland regions of western Turkey up to the Konya province.

According to Hubbs' rule, in heterotherms of the same or similar species, the number of scales tends to increase with increases in latitude and altitude and the resulting decrease in temperatures. In the *bornmuelleri* group, *M. wagneri* is the species with the northeasternmost distribution.

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REFERENCES

- Cattaneo A., 2022. Effects of ecological divergence in the westernmost Anatolian populations of *Montivipera xanthina* (Gray, 1849) (Serpentes Viperidae). *Biodiversity Journal*, 13: 785–798. <https://doi.org/10.31396/Biodiv.Jour.2022.13.4.785.798>
- De Queiroz K., 2007. Species concepts and species delimitation. *Systematic Biology*, 56: 879–886. <http://dx.doi.org/10.1080/10635150701701083>.
- Freitas I., Ursenbacher S., Mebert K., Zinenko O., Schweiger S., Wüster W., Brito J.C., Crnobrnja-Isailović J., Halpern B., Fahd S., Santos X., Pleguezuelos J.M., Joger U., Orlov N., Mizsei E., Lourdais O., Zuffi M.A.L., Strugariu A., Zamfirescu S.R., Martínez-Solano I., Velo-Antón G., Kaliontzopoulou A. & Martínez-Freiría F., 2020. Evaluating taxonomic inflation: towards evidence-based species delimitation in Eurasian vipers (Serpentes: Viperinae). *Amphibia-Reptilia*, 28 pp. <https://doi.org/10.1163/15685381-bja10007>.
- Hey J., 2009. On the arbitrary identification of real species. In: Butlin R.K., Bridle J., Schluter D. (Eds.), *Speciation and Patterns of Diversity*. Cambridge Univ. Press, Cambridge, UK, pp 15–28.
- Nilson G., 1980. Male reproductive cycle of the European adder, *Vipera berus* and its relation to annual activity periods. *Copeia*, 1980 (4): 729–737. <https://doi.org/10.2307/1444451>.
- Nilson G., Tuniyev B., Andrén C., Orlov N., Joger U. & Herrmann H.W., 1999. Taxonomic position of the *Vipera xanthina* complex. *Kaupia*, 8: 99–102.