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Taxonomic position of *Eothenomys wardi* (Arvicolinae: Cricetidae) based on morphological and molecular analyses with a detailed description of the species

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Abstract

Ward's Red-backed Vole (*Eothenomys wardi*) is a rodent from the family Cricetidae. This endemic species occurs only in extreme northwestern Yunnan province, China in the Mekong and Salween river divide. It occupies steep cliffs at 2,800 to 4,250 m above sea level on the remote Qinghai-Tibetan plateau. The validity of *E. wardi* is controversial and no specimens exist apart from the nominal series. In 2010, we collected 38 topotypes of *E. wardi* from Meri Snow Mountain. The results of our phylogenetic analyses based on nucleotide sequences of the mitochondrial genes cytochrome *b* (*cytb*) and cytochrome c oxidase subunit one (*COI*) suggest that *E. wardi* is the sister group of *E. custos*, against its previously presumed sister species or conspecific species *E. chinensis*. In addition, seven out of 34 morphological characters differentiate *E. wardi* from other members of the genus *Eothenomys*. Therefore, we consider *E. wardi* to be a valid species and we provide its detailed morphological description.

Key words: *Eothenomys wardi*, *COI*, *cytb*, Morphology, Glans penis

Introduction

Oriental voles (including *Eothenomys* and *Caryomys*) mainly occur in the Hengduan Mountains of southwestern China, northeastern Myanmar, and Assam, India. The intra- and inter-generic taxonomies of these voles are fraught with uncertainty. Historically, 25 nominal species have been included at least once in these genera, yet today only five to 12 species are recognized. Most species reside as synonyms or subspecies of other species, or in other genera. Liu *et al.* (2012) surveyed most species of Oriental voles, except for *E. wardi*, using morphology and mitochondrial DNA (mtDNA) sequences encoding cytochrome *b* (*cytb*) and the standard DNA barcoding gene cytochrome c oxidase subunit I (*COI*). They affirmed monophyly of both *Caryomys*, which contains *C. inez* and *C. eva*, and *Eothenomys*, which is comprised of the subgenera *Eothenomys*, *Anteliomys*, and *Ermites*. Subgenus *Eothenomys* contains the valid species *E. melanogaster*; the species *E. cachinus*, *E. eleusis*, *E. fidelis*, and *E. miletus* intermix with each other in the mtDNA trees suggesting introgressive hybridization, incomplete lineage sorting, or taxonomic invalidity owing to continuous gene flow. In subgenus *Anteliomys*, *E. chinensis*, *E. custos*, *E. olitor*, and *E. proditor* appear to be valid. The status of *E. wardi* is uncertain because of the lack of specimens. In subgenus *Ermites*, Liu *et al.* (2012) elevated *E. custos hintoni* and *E. chinensis tarquinius* to the species level as *E. hintoni* and *E. tarquinius*. Two new species are awaiting description in this subgenus.

In 1910, F. Kingdon Ward collected 19 specimens of voles from Chamutong (Meri Snow Mountain), west of