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**A revision of the *Trimeresurus puniceus*-complex (Serpentes: Viperidae: Crotalinae) based on morphological and molecular data**

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## A revision of the *Trimeresurus puniceus*-complex (Serpentes: Viperidae: Crotalinae) based on morphological and molecular data

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### Table of contents

Abstract .....	4
Introduction .....	4
Material and methods .....	6
Results .....	11
<i>Trimeresurus puniceus</i> group .....	19
<i>Trimeresurus puniceus</i> (Kuhl, 1824) .....	22
<i>Trimeresurus</i> cf. <i>puniceus</i> .....	33
<i>Trimeresurus borneensis</i> group .....	38
<i>Trimeresurus borneensis</i> (Peters, 1872) .....	38
<i>Trimeresurus wiroti</i> Trutnau, 1981 .....	45
<i>Trimeresurus andalasensis</i> <b>spec. nov.</b> .....	55
<i>Trimeresurus brongersmai</i> Hoge, 1969 .....	64
Discussion .....	70
Conclusion .....	72
Acknowledgments .....	73
Literature cited .....	73

## Abstract

The brown Asian pitvipers of the genus *Trimeresurus* related to *Trimeresurus puniceus* (informal *Trimeresurus puniceus*-complex) are revised on the basis of morphological and molecular analyses. Variation in morphological characters were investigated among 119 specimens from 62 populations of the whole range of the pitvipers currently known as *Trimeresurus puniceus* (Boie, 1827), *Trimeresurus borneensis* (Peters, 1872) and *Trimeresurus brongersmai* Hoge, 1969. Molecular and morphological analyses clearly differentiate two groups of taxa, referable to the informal *Trimeresurus puniceus*-group and *Trimeresurus borneensis*-group, and confirm the distinct specific status of *T. puniceus* and *T. borneensis*. Morphological univariate and multivariate analyses differentiate six clusters of populations that are morphologically diagnosable, of which five are here considered to represent independent lineages and one is placed *incertae sedis* pending the availability of further specimens. These clusters are considered to be distinct species following the Biological Species Concept and the Phylogenetic Species Concept. One of them is described as a new species, *Trimeresurus andalasensis* **spec. nov.** (*T. borneensis*-group), which includes populations from northern Sumatra. *Trimeresurus wiroti* Trutnau, 1981 is revalidated to accommodate populations from Thailand and West Malaysia. *Trimeresurus borneensis* is here considered endemic to Borneo. *Trimeresurus puniceus* is known from Java and from South Sumatra, but the taxonomy of this species in Sumatra is left unresolved. Also left unresolved is the taxonomic position of specimens from western Sumatra and the Mentawai Archipelago, and from the Natuna Islands and Anamba Islands. Although belonging to the *T. puniceus*-group, they show some differences to other specimens of the group. They are not referred to any taxon pending the collection of additional specimens. Lastly, *Trimeresurus brongersmai* is confirmed as a valid species from the Mentawai Archipelago. A key to these taxa is provided.

**Key words:** Indonesia, West Malaysia, Sumatra, Borneo, Serpentes, Viperidae, *Trimeresurus*, *Trimeresurus puniceus*, *Trimeresurus borneensis*, *Trimeresurus wiroti*, *T. andalasensis* **spec. nov.**, *Trimeresurus brongersmai*

## Introduction

While the phylogeny of the genus *Trimeresurus* and the taxonomy of the green species of the genus have been the subject of several investigations during the last ten years (Malhotra & Thorpe, 2000, 2004; David *et al.*, 2001, 2002; Vogel *et al.*, 2004), the systematics of the “brown” members of the genus *Trimeresurus* sensu stricto has been neglected. Currently, three species are recognized: *Trimeresurus puniceus* (Kuhl, 1824), *Trimeresurus borneensis* (Peters, 1872) and *Trimeresurus brongersmai* Hoge, 1969 (David & Ineich, 1999; Gumprecht *et al.*, 2004). This group, that we will refer to below as the “*Trimeresurus puniceus*-complex” among the genus *Trimeresurus* (Malhotra & Thorpe, 2004), is known from western Indonesia (Borneo, Sumatra, Mentawai Archipelago, Java, Anamba and Natuna Islands), Malaysia (West Malaysia and states of Borneo) and southern Thailand.

As in other groups of the genus *Trimeresurus*, the taxonomy of this group has been