



## Unravelling the underestimated diversity of Philippine water monitor lizards (Squamata: *Varanus salvator* complex), with the description of two new species and a new subspecies

ANDRÉ KOCH<sup>1A,3</sup>, MAREN GAULKE<sup>2</sup> & WOLFGANG BÖHME<sup>1B</sup>

<sup>1</sup>Zoologisches Forschungsmuseum A. Koenig & Leibniz Institute for Biodiversity of Animals, Department of Herpetology, Adenauerallee 160, D-53113 Bonn, Germany. E-mails: A) andrepascalkoch@web.de; B) w.boehme.zfnk@uni-bonn.de

<sup>2</sup>GeoBio-Center LMU, Richard-Wagner-Strasse 10, D-80333 Munich, Germany. E-mail: mgaulke@web.de

<sup>3</sup>Corresponding author

### Table of contents

Abstract .....	1
Introduction .....	2
Material .....	2
Methods .....	3
Results .....	7
<i>Varanus cumingi</i> Martin, 1838.....	11
<i>Varanus c. cumingi</i> Martin, 1838 .....	14
<i>Varanus cumingi samarensis</i> <b>ssp. nov.</b> .....	19
<i>Varanus marmoratus</i> (Wiegmann, 1834) .....	24
<i>Varanus rasmusseni</i> <b>sp. nov.</b> .....	28
<i>Varanus palawanensis</i> <b>sp. nov.</b> .....	33
<i>Varanus nuchalis</i> (Günther, 1872) .....	40
Discussion .....	45
Identification key to the Philippine members of the <i>Varanus salvator</i> complex .....	48
References .....	49
Appendix .....	54

### Abstract

Recently, the first part of the morphological revision of the Southeast Asian water monitor lizards of the *Varanus salvator* (Laurenti, 1768) species group provided a taxonomic overview over the members of this successful and widespread species complex (Koch *et al.* 2007). There, the Philippine taxa *marmoratus*, *nuchalis* and *cumingi* were re-elevated to species status due to diagnostic morphological characteristics, e.g. significantly enlarged scales on the neck region. In this second part of the ongoing revision, these three species are re-investigated using additional voucher specimens and advanced statistical techniques including canonical variates analysis and principal component analysis. Our new investigations indicate that *V. marmoratus* represents a composite species, comprising at least three distinct taxa. Hence, the populations of the Sulu Archipelago (Tawi–Tawi Island) and those of the Palawan region are described as new species, viz. *Varanus rasmusseni* **sp. nov.** and *V. palawanensis* **sp. nov.**, respectively. The allopatric island populations of *V. cumingi* inhabiting Samar, Leyte, and Bohol (the East Visayan subregion) show characteristic and geographically correlated colour patterns distinct from the type locality Mindanao (the second subregion of Greater Mindanao), warranting subspecific partition of this species. The new subspecies is named *V. cumingi samarensis* **ssp. nov.** In contrast, the taxonomic status of *V. nuchalis* remained unchanged, although this species shows some considerable variation in colour pattern. The systematic chapters are supplemented with notes about biology and conservation status. The hitherto underestimated diversity and zoogeography of Philippine water monitors is discussed in the light of Pleistocene sea level fluctuations. Finally, we introduce a scenario for the evolution and spread of Southeast Asian water monitor lizards and provide an identification key for the Philippine members of the *V. salvator* complex.