

Phylogeography and Systematics of Sulawesi water monitors (Squamata: *Varanus salvator* Complex)

André Koch¹, Fabian Herder¹, Bernhard Misof¹, Evy Ayu Arida^{1,2} & Wolfgang Böhme¹

¹ *Zoologisches Forschungsmuseum Alexander Koenig, 53113 Bonn, Germany;*

² *Museum Zoologicum Bogoriense, Cibinong, Indonesia*

Sulawesi lies right in the centre of the Malay Archipelago, comprising the transitional zone between the Asian and Australian zoogeographic regions. Due to its complicated geological evolution in combination with a long geographic isolation, Sulawesi shows a high degree of faunal endemism. Moreover, Pleistocene changes in sea level resulting in temporarily fragmentations of the island and subsequent independent development of single populations had a large influence on the evolution of different taxa. These observations have led to the definition of areas of endemism (AOE) representing genetically distinct units that additionally increased the diversity of Sulawesi organisms. In contrast, colonization of Sulawesi was favoured during periods of low sea levels.

We investigated morphologically different populations of water monitor lizards (*Varanus salvator* complex) representing 14 operational taxonomic units (OTUs) that inhabit Sulawesi and its smaller off-shore islands to elucidate the taxonomic diversity and evolution of these giant reptiles. Statistical analyses were run using univariate (ANOVA) and multivariate (cluster analysis, neighbour-joining, PCA, and CVA) procedures. Additionally, AFLP methodology was used to generate DNA-fingerprintings of anonymous markers spread throughout the *Varanus* genome.

Our results strongly indicate that past sea level oscillations caused by world climate changes also affected the evolution of formerly isolated monitor lizard populations despite their well-known ability to cross marine barriers – possibly due to strong sea currents. Today, the four peninsulas of Sulawesi are populated by an equal number of differently coloured phenotypes of monitor lizards that live in parapatry. The surrounding islands are each inhabited by further endemic phenotypes which are even more distinct in colour pattern. Morphological (and genetic) analyses revealed that particularly these off-shore populations are significantly different from the Sulawesi mainland populations due to ongoing geographic isolation. Currently, only one of the recognized OTUs represents a valid taxon, viz. *V. togianus* Peters, 1872, while another Sulawesi taxon, viz. *celebensis* Schlegel, 1844, still needs to be revalidated. The remaining OTUs await their taxonomic evaluation.

Finally, our results shall support future efforts to protect locally restricted and endemic taxa of Sulawesi water monitors which are exploited for the international reptile leather and pet trade.