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**A review of morphological variation in *Trimeresurus popeiorum*
(Serpentes: Viperidae: Crotalinae),
with the description of two new species**

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A review of morphological variation in *Trimeresurus popeiorum* (Serpentes: Viperidae: Crotalinae), with the description of two new species

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ABSTRACT

Variation in morphological characters were investigated among 136 specimens (128 specimens examined by us and eight specimens described in the literature) from 44 populations of the whole range of the pitviper currently known as *Trimeresurus popeiorum* Smith, 1937. Univariate and mul-

tivariate analyses of these morphological characters allowed us to recognize six clusters of populations that are morphologically diagnosable, and that are here considered to represent independent lineages. Five of these clusters are considered to be distinct species following the Biological Species Concept and the Phylogenetic Species Concept. Two of them are described as new. *Trimeresurus fucatus* spec. nov. includes populations from southern Thailand and most of West Malaysia. *Trimeresurus nebularis* spec. nov. is described for populations from Cameron Highlands of West Malaysia. A population from Toba Massif, northern Sumatra, is referred to this complex, but cannot be assigned to a species at the present time. *Trimeresurus popeiorum sabahi* is raised to specific status, *Trimeresurus sabahi* new comb., to accommodate the populations from Borneo, whereas *Trimeresurus barati* new comb. includes the populations from western Sumatra and the Mentawai Archipelago. Separate keys to the two sexes of the recognised species of the *T. popeiorum* complex are provided.

KEY WORDS: Thailand, West Malaysia, Sumatra, Borneo, Serpentes, Viperidae, *Trimeresurus*, *Trimeresurus popeiorum*, *Trimeresurus fucatus* spec. nov., *Trimeresurus nebularis* spec. nov., *Trimeresurus sabahi*, *Trimeresurus barati*

INTRODUCTION

Before the paper by Pope & Pope (1933), all green *Trimeresurus* species were gathered under the name *Trimeresurus gramineus* (Shaw, 1802). In a first step towards understanding the systematics of the genus, these authors split the nominal taxon *gramineus* into six species. The specific nomen *gramineus* was applied to a widespread species, ranging from northeastern India to western Indonesia. Indian populations were referred to a new species described as *Trimeresurus occidentalis*. Subsequently, Smith (1937) correctly showed that Pope & Pope (1933) misunderstood the type locality of *gramineus*, and showed that the type locality for *T. gramineus* was within the range of *T. occidentalis*. Therefore, *Trimeresurus occidentalis* Pope & Pope 1933 became a subjective junior synonym of *T. gramineus* (Shaw, 1802), leaving unnamed the distinct eastern taxon. Smith (1937) named it as *Trimeresurus popeiorum*. Unfortunately, he failed to designate a type specimen and a type locality for this new taxon. This interpretation was accepted by most subsequent authors except Hoge & Romano Hoge (1981) and Welch (1988). Another issue affecting the specific nomen is its spelling. Smith (1943) corrected the original spelling as *popeiorum* on the basis that it was indeed a clerical error. This spelling was largely accepted, and was the subject of recent controversies. This problem will be addressed in another paper (David & Vogel, submitted). We consider that the correct spelling is indeed *popeiorum*. Eventually, Taylor & Elbel (1958), regarded as syntypes of *Trimeresurus popeiorum* Smith, 1937 all specimens referred by Pope & Pope (1933) to as *T. gramineus*, and designated the specimen BMNH 72.4.17.137 as the lectotype of the species. Consequently, the type locality was restricted to "Khasi Hills, Assam", now in the State of Meghalaya, India.