A new species of karst forest-adapted Bent-toed Gecko (genus *Cyrtodactylus* Gray, 1827) belonging to the *C. sworderi* complex from a threatened karst forest in Perak, Peninsular Malaysia

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Abstract

A new species of Bent-toed Gecko *Cyrtodactylus guakanthanensis* sp. nov. of the *C. sworderi* complex is described from a limestone forest in Perak, Peninsular Malaysia whose karst formations at the type locality are within an active quarry. *Cyrtodactylus guakanthanensis* sp. nov. can be distinguished from all other Sundaland species by having the following suite of character states: adult SVL 77.7–82.2 mm; moderately sized, conical, weakly keeled, body tubercles; tubercles present on occiput, nape, and limbs, and extend posteriorly beyond base of tail; 37–44 ventral scales; no transversely enlarged, median, subcaudal scales; proximal subdigital lamellae transversely expanded; 19–21 subdigital lamellae on fourth toe; abrupt transition between posterior and ventral femoral scales; enlarged femoral scales; no femoral or precloacal pores; precloacal groove absent; wide, dark postorbital stripes from each eye extending posteriorly to the anterior margin of the shoulder region thence forming a transverse band across the anterior margin of the shoulder region; and body bearing five (rarely four) wide, bold, dark bands. Destruction of the karst microhabitat and surrounding limestone forest will extirpate this new species from the type locality and perhaps drive it to complete extinction given that it appears to be restricted to the particular microhabitat structure of the type locality and is not widely distributed throughout the karst formations. As with plants and invertebrates, limestone forests are proving to be significant areas of high herpetological endemism and should be afforded special conservation status rather than turned into cement.

Key words: new species, *Cyrtodactylus*, karst, limestone, conservation, biodiversity, Gua Kanthan, Peninsular Malaysia

Introduction

Karst forests compose some of the most unique microhabitats found in tropical ecosystems. They are generally open canopy forests surrounding formations of ancient limestone and comprised of a number of unique, small, spindly trees and spiny plants adapted to nutrient poor conditions and periodic drought (Kiew 1998). Despite the astonishing degree of floral endemism in karst forests, vertebrate systematists have generally overlooked these areas and thus, only a few specialized vertebrates are known to exploit the unique microhabitats they compose (i.e. Jenkins *et al.* 2004; Alström *et al.* 2010; Woxvold *et al.* 2009). The growing exception to this lack of scientific inquiry is the recent increase in the discovery of highly specialized, endemic species of reptiles found in Peninsular Malaysia. We have been surveying karst forests and their associated limestone formations since 2008 and have discovered seven new karst-adapted species of Rock Geckos (genus *Cnemaspis*: Grismer *et al.* 2008b, c, 2009, 2009b, 2010a, 2010b, 2010c).
The discovery of *Cyrtodactylus guakanthanensis* sp. nov. adds to a growing body of evidence that karst regions should be protected and better studied. If reptiles are an indication of the hidden diversity within these unique habitats, then limestone forests may be some of the most biotically rich habitats in Peninsular Malaysia with a level of herpetological endemism approaching that of Malaysia’s islands (see Chan et al. 2010; Grismer 2008, 2011b; Grismer et al. 2011). Terminating this species before it is discovered, described, and studied is not only illogical, it is tantamount to discarding a wrapped gift before it is opened and its value assessed.

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**References**


http://dx.doi.org/10.1186/1471-2148-7-214


http://dx.doi.org/10.11646/zootaxa.3616.3.2


http://dx.doi.org/10.1093/bioinformatics/17.8.754


http://dx.doi.org/10.1017/s1477200004001549


http://dx.doi.org/10.1093/bioinformatics/14.9.817


http://dx.doi.org/10.1016/j.ympev.2012.08.025


http://dx.doi.org/10.11646/zootaxa.3691.5.2


http://dx.doi.org/10.1017/s0960428608005106