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DNA barcoding of Vietnamese bent-toed geckos (Squamata: Gekkonidae: *Cyrtodactylus*) and the description of a new species

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Abstract

Species of bent-toed gecko (*Cyrtodactylus*) in Vietnam have been described at a rate of nearly four species per year since 2007 mostly based on morphological data. A tool that guides species delimitation will accelerate the rate of documentation, and at a time when the recognition of species greatly benefits conservation. We use DNA barcoding using *COI* (550 bp) to re-examine the levels of genetic divergence and taxonomic status of 21 described species of Vietnamese bent-toed geckos. Tree-based analyses resolve all sampled species and identify potential undescribed taxa. Kimura 2-parameter genetic distances between the described species average 21.0±4.2% and range from 4.3% to 28.7%. Further, our analyses discover two potentially new species from Vietnam, two from Laos and one from China. Herein we describe the new species *Cyrtodactylus puhuensis* **sp. nov.** from Vietnam on the basis of both genetics and morphology. Genetically, it differs from the remaining species by an average K2P distance of 24.0±1.8%. Morphologically, the new species is diagnosed by its medium-size (snout-vent length 79.24 mm and tail length 82.59 mm, for the single known individual), in having a series of moderately enlarged transverse subcaudals and a series of moderately enlarged femoral scales that extend from precloacal scales, in possessing femoral scales without pores, with males having five precloacal pores, and in exhibiting 8 supralabials, 10 infralabials, 23 narrow subdigital lamellae on its fourth toe, and 36 transverse ventrals.

Key words: *Cyrtodactylus puhuensis*, Indochina, Thanh Hoa, genealogy

Introduction

Recently, many new species of bent-toed geckos (Squamata: Gekkonidae: *Cyrtodactylus*) have been described from Vietnam. The descriptions have been based on newly explored localities, as opposed to analyses of variation

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APPENDIX 1. Specimens examined.

Vietnam: *Cyrtodactylus badenensis*: 708–715, type series, Ba Den Mountain, Tay Ninh Province, Vietnam; *Cyrtodactylus bidoupimontis*: ITBCZ 1536–39, topotypes, Bi Doup-Nui Ba NP., Lam Dong Province, Vietnam; *Cyrtodactylus bugiamapensis*, ITBCZ 340, 389–92, topotypes, Bu Gia Map NP., Binh Phuoc Province, Vietnam; *C. caovansungi*: ITBCZ 908, 932, and 933, topotypes, Nui Chua NP., Ninh Thuan Province, Vietnam; *Cyrtodactylus cattienensis*: ITBCZ 1367, Ma Da NR., Dong Nai Province, Vietnam; *Cyrtodactylus chauquangensis*: CQ020, holotype, CQ529, 556, and 559, topotypes, Chau Quang, Quy Hop District, Nghe An Province; *Cyrtodactylus cryptus*: PNKB 1–4, and two released adult females, topotypes, U Bo, Phong Nha-Ke Bang NP., Quang Binh Province, Vietnam**;** *Cyrtodactylus grismeri*: ITBCZ 683–686, topotypes, An Giang Province, Vietnam; *Cyrtodactylus huynhi*: ITBZ 516–22, 529, topotypes, Chua Chan Mt., Dong Nai Province, Vietnam; *Cyrtodactylus intermedius*: ITBCZ 609, 613,634, 636, and 638, An Giang Province, Vietnam; *Cyrtodactylus pseudoquadrivirgatus*: ITBCZ 3000 and 3001, topotypes, A Luoi, Thua Thien-Hue Province, Vietnam; *Cyrtodactylus nigriocularis*: ITBCZ 717–727, type series, Ba Den Mt., Tay Ninh Province, Vietnam; *Cyrtodactylus paradoxus* ITBCZ 272–277, Hon Chong, Kien Giang Province, Vietnam; *Cyrtodactylus takouensis*: ITBCZ 2527 and 2528, topotypes, Ta Kou NR., Binh Thuan Province, Vietnam; *Cyrtodactylus ziegleri*: ITBCZ 482–5, paratypes, Chu Yang Sin NP., Dak Lak Province, Vietnam.

Laos: *Cyrtodactylus wayakonei*: IEBR A.2010.01 (holotype), Kao Rao, Vieng Phoukha District, Luang Nam Tha Province; *Cyrtodactylus pageli*: IEBR A.2010.36, holotype, Ban Na Thong, Vang Vieng District, Vientiane Province; IEBR A.2010.37 paratype, Ban Phongeuan, Vang Vieng District, Vientiane Province.

China: *Cyrtodactylus* sp.: KIZ 201103, Xishuangbanna, Yunnan.