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Two new species of *Cyrtodactylus* (Reptilia: Squamata: Gekkonidae) from Thailand

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Abstract

Two new species of the gekkonid lizard genus *Cyrtodactylus* Gray, *C. tigroides*, sp. nov. and *C. chanhomeae*, sp. nov. are described on the basis of material collected in Kanchanaburi and Saraburi provinces, bringing the number of species of this genus in Thailand to 14. Both species have relatively slender bodies and elongate tails, limbs and digits. They differ significantly, however, with respect to precloacal and femoral pore arrangement and color pattern. They share a common habitus with the recently described *C. sumonthai* Bauer *et al.*, which may reflect a close relationship or a similar limestone outcrop and cave dwelling ecology.

Key words: *Cyrtodactylus*, Gekkonidae, new species, description, Thailand, cave-dwelling

Introduction

The genus *Cyrtodactylus* Gray is one of the most speciose groups of geckos. Despite the removal of most Palearctic bent-toed geckos to the genera *Tenuidactylus* Szczerbak and Golubev, *Cyrtopodion* Fitzinger, and *Mediodactylus* Szczerbak and Golubev (Szczerbak & Golubev 1977, 1984, 1986), and the segregation of the Pacific and Indian Ocean insular species to *Nactus* Kluge (Kluge 1983; Ulber & Gericke 1988), there remain more than 70 species in *Cyrtodactylus* (Rösler 2000, 2001; Das & Lim 2000; Kluge 2001; Wells 2002; Bauer 2002, 2003; Bauer *et al.* 2002; Günther & Rösler 2003). The composition of the genus remains somewhat questionable, however, as certain taxa of uncertain affinities occurring in northern India and adjacent regions, including *Gonydactylus martinstollii* Darevsky *et al.*, 1997, *G. markuscombaii* Darevsky *et al.*, 1997, *G. nepalensis* Schleich & Kästle, 1998, and *Cyrtodactylus mansarulus* Duda & Sahi, 1978 have been assigned to dif-

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ferent genera by different authors (e.g., Kluge 1993, 2001; Bauer & Henle 1994; Khan & Rösler 1999; Rösler 2000). These taxa of questionable assignment aside, *Cyrtodactylus* is distributed across the whole of tropical Asia from India eastwards to the Philippines, and through the Indoaustralian Archipelago to northeastern Australia, New Guinea, and the Solomon Islands. The only formal infrageneric grouping that is currently recognized is *Geckoella* Gray, a putatively monophyletic group of taxa from Peninsular India and Sri Lanka, which has been treated as generically distinct by some authors (Kluge 1991, 1993, 2001), and subgenerically so by others (Ulber & Gericke 1988; Rösler 2000). Although other generic subdivisions have been proposed (e.g., Wells & Wellington 1985; Wells 2002) the sheer size of the genus has thus far hampered any comprehensive phylogenetic analysis that might reveal monophyletic subunits and their interrelationships.

Species of *Cyrtodactylus* continue to be discovered throughout the range of the genus, but particularly in New Guinea (e.g., Rösler 2001; Günther & Rösler 2003), Vietnam (Darevsky & Szczerbak 1997; Ziegler *et al.* 2002 [2003]), Myanmar (Bauer 2002, 2003), and Thailand (Ulber & Grossmann 1991; Ulber 1993; Bauer *et al.* 2002). While most of these areas have traditionally been understudied, Thailand has long been a center of herpetological investigation (e.g., Smith 1916, 1935; Taylor & Elbel 1958; Taylor 1963; Chan-Ard *et al.* 1999). The number of *Cyrtodactylus* species known from Thailand has increased from four (Smith 1916) to seven (Suvatti 1950; Taylor 1963) to eleven (Chan-Ard *et al.* 1999). The recent description of a cave-dwelling species from Rayong Province (Bauer *et al.* 2002) brings the current number of recognized species to 12: *C. angularis* (Smith), *C. brevipalmatus* (Smith), *C. interdigitalis* Ulber, *C. intermedius* (Smith), *C. jarujini* Ulber, *C. oldhami* (Theobald), *C. papilionoides* Ulber & Grossmann, *C. peguensis* (Boulenger) (represented by two subspecies), *C. pulchellus* Gray, *C. quadrivirgatus* Taylor, *C. sumonthai* Bauer *et al.*, and *C. variegatus* (Blyth). Recent field research in areas of limestone caves and outcrops throughout Thailand has revealed two additional species from the provinces of Kanchanaburi and Saraburi, which we describe here.

Materials and methods

The following measurements (to the nearest 0.01 mm) were taken with digital calipers: snout-vent length (SVL; from tip of snout to vent), trunk length (TrunkL; distance from axilla to groin measured from posterior edge of forelimb insertion to anterior edge of hindlimb insertion), crus length (CrusL; from base of heel to knee); tail length (TailL; from vent to tip of tail), tail width (TailW; measured at widest point of tail); head length (HeadL; distance between retroarticular process of jaw and snout-tip), head width (HeadW; maximum width of head), head height (HeadH; maximum height of head, from occiput to underside of jaws), ear length (EarL; longest dimension of ear); forearm length (ForeaL; from base of palm to elbow); orbital diameter (OrbD; greatest diameter of orbit), nares to eye distance (NarEye; distance between anteriormost point of eye and nostril),

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snout to eye distance (SnEye; distance between anteriormost point of eye and tip of snout), eye to ear distance (EyeEar; distance from anterior edge of ear opening to posterior corner of eye), internarial distance (Internar; distance between nares), and interorbital distance (Interorb; shortest distance between left and right supraciliary scale rows). Measurements and scale counts based on right side of animals unless otherwise noted.

Scale counts and external observations of morphology were made using a stereo dissecting microscope. Radiographs were prepared using a closed cabinet x-ray unit. Specimens were x-rayed at 35-45 kV for 30-45 sec and imaged on Polaroid type 55 film.

Comparisons were made with museum material in the collections of the California Academy of Sciences (CAS), Institut Royal des Sciences Naturelles de Belgique (IRSNB), Chulalongkorn University Museum of Zoology (CUMZ), United States National Museum (USNM), and the Museum of Comparative Zoology (MCZ), as well as original published descriptions and descriptions provided in broader faunal and taxonomic treatments (e.g., Smith 1935; Taylor 1963; Szczerbak & Golubev 1986; Hikida 1990; Ulber 1993; Darevsky & Szczerbak 1997; Das 1997; Das & Lim 2000; Bauer 2002, 2003).

***Cyrtodactylus tigroides* sp. nov.**
Figures 1–3.

Holotype.—Chulalongkorn University Museum of Zoology (CUMZ) R 2002.296C, adult male; Thailand, Kanchanaburi Province, Sai-Yok District, Ban Tha Sao, 14°06'N 99°25'E; collected by Montri Sumontha, July 2002.

Paratype. – Institut Royal des Sciences Naturelles de Belgique (IRSNB) 2586 (Field number OP 11), adult female; same data as for holotype.

Etymology.**—**The specific epithet is derived from the Latin *tigris* (tiger) and the suffix *–oides* (resembling) and is in reference to the bold banding pattern of this species. The epithet *tigris* is preoccupied in *Cyrtodactylus* by *Gecko tigris* Tytler a subjective synonym of *C. rubidus* (Blyth).

Definition.**—**A moderately sized *Cyrtodactylus*, snout-vent length to at least 83 mm; body slender, limbs and digits long, slender, original tail very long; one pair of enlarged postmental scales in broad contact with one another; dorsal scalation with 13 rows of keeled tubercles; 34 ventral scales across belly between ventrolateral folds; no precloacal groove, 8–9 precloacal pores separated by a diastema of 7–9 poreless scales from a series of 5–7 femoral pores on each thigh, pores present in both males and females. 7–8 broad basal lamellae and 12–15 narrow distal lamellae beneath 4th toe of pes. Median subcaudal scales enlarged to form broad transverse plates. Dorsal pattern of yellowish-cream bands on a brown background, dorsum of head yellowish with symmetrical brown markings.

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FIGURE 1. Adult male holotype of *Cyrtodactylus tigroides*, sp. nov. (CUMZ R 2002.296C) from Ban Tha Sao, Sai-Yok District, Kanchanaburi Province, Thailand. Photo by Aaron M. Bauer.

Description (based on holotype, CUMZ R 2002.296C).—Adult male. Snout-vent length 83.22 mm. Head relatively long (HeadL/SVL ratio 0.28), wide (HeadW/HeadL ratio 0.67), not markedly depressed (HeadH/HL ratio 0.43), distinct from slender neck. Lores and interorbital region weakly inflated, canthus rostralis not especially prominent, frontonasal region strongly concave. Snout elongate (SnEye/HeadL ratio 0.43), pointed; longer than eye diameter (OrbD/SnEye ratio 0.63); scales on snout and forehead small, rounded, granular, homogeneous; scales on snout larger than those on occipital region. Eye

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large (OrbD/HeadL ratio 0.27); pupil vertical with crenelated margins; supraciliaries short, bearing tiny conical spines posteriorly. Ear opening rounded, relatively large (EarL/HeadL ratio 0.07); eye to ear distance less than diameter of eye (EyeEar/OrbD ratio 0.97). Rostral 63% deep (2.11 mm) as wide (3.34 mm), incompletely divided (50%) dorsally by rostral groove; two enlarged supranasals separated by two, small, oval internasals arranged in longitudinal series; rostral in contact with supralabial I, supranasals, and anterior internasal; nostrils round, each surrounded by supranasal, rostral, first supralabial, and two enlarged postnasals; a valvular projection occupies posterior portion of nostril; 2–3 rows of small scales separate orbit from supralabials. Mental triangular, wider (3.17 mm) than deep (2.32 mm); one pair of enlarged postmentals, sharply pointed anteriorly; each bordered anteromedially by mental, medially by other postmental, anterolaterally by first infralabial, laterally by an enlarged lateral chinshield, and posteriorly by two small chin granules and a larger chin shield (approximately 4 times size of granules); supralabials to midorbital position 9; enlarged supralabials to angle of jaws 11; infralabials 10 (right) to 11 (left); interorbital scale rows across narrowest point of frontal bone 20.

Body slender, elongate (TrunkL/SVL ratio 0.45) with very weakly developed, nondenticulate ventrolateral folds. Dorsal scales granular to weakly conical; regularly distributed tubercles (4–6 times size of adjacent scales) extending from occiput and temporal region on to back and tail base; anterior tubercles weakly conical, posterior tubercles with a weakly developed keel on the anterior-facing surface, extending approximately 2/3 along the tubercle; tubercles in approximately 13 rows at midbody, absent from flanks. Ventral scales much larger than dorsals, smooth, subimbricate, with rounded free margins; somewhat larger midventrally, particularly in precloacal region; midbody scale rows across belly to base of ventrolateral folds 34; gular region with relatively homogeneous, smooth scales. 8 large precloacal pores in continuous series, each borne in an enlarged scale; 6 (left) to 7 (right) femoral pores in enlarged femoral scales, each series separated from precloacal pore scales by a diastema of 9 poreless scales; no precloacal groove. Scales on palm and sole smooth, rounded; scalation on dorsal aspects of hindlimb heterogeneous, with enlarged, weakly conical tubercles interspersed among smaller scales; forelimbs with tubercles less well developed.

Fore and hindlimbs moderately long, slender (ForeaL/SVL ratio 0.18; CrusL/SVL ratio 0.21); digits long, slender, strongly inflected at interphalangeal joints, all bearing robust, slightly recurved claws; basal subdigital lamellae nearly as broad as digit, rectangular, without scansorial surfaces (5–6–7–7–6 manus; 6–6–8–7–8 pes); narrow lamellae distal to digital inflection and not including ventral claw sheath: 10–12–13–12–12 (manus), 12–12–13–15–15 (pes); interdigital webbing absent. Relative length of digits (manus; measurements in mm in parentheses): III (7.51) > IV (7.43) > II (6.71) > V (6.32) > I (4.66); (pes): V (9.51) > IV (8.91) > III (8.61) > II (7.43) > I (5.39).

Original tail (in paratype) long, slender, gently tapering to tip; much longer than snout-vent length (TailL/SVL ratio 1.41); original portion of tail weakly segmented; each seg-

ment 7 scale rows in extent; dorsal caudal scales flat, smooth, rectangular, becoming elongate posteriorly, homogeneous except for 2 basalmost segments where 6 parasagittal rows of enlarged, weakly keeled tubercles continue from the body dorsum; ventral scales smooth, greatly enlarged, extending the entire width of the tail venter; two such transverse plates per tail segment. Series of 3 small, smooth, conical postcloacal spurs on each side of tailbase.

Osteology: Parietal bones paired; stapes imperforate. Phalangeal formula 2–3–4–5–3 for manus and 2–3–4–5–4 for pes. Presacral vertebrae 26, including 3 anterior cervical (without ribs), 1 lumbar, and 2 sacral vertebrae; 5 pygal and 16.5 post pygal caudal vertebrae to point of regeneration in holotype (40 in original tail of paratype). Male holotype with one pair of crescentic cloacal bones present, flared posterolaterally and with a minute, nodular, accessory ossification laterally (cloacal bones lacking in female paratype). Endolymphatic sacs not enlarged extracranially.

Coloration. (in preservative)**—**Base color a mid brown. Banded with slightly paler markings, each outlined by darker brown borders anteriorly and posteriorly. One pale band across nape, four across trunk between limb insertions. Dorsal pattern somewhat faded on flanks. Alternating light and dark pattern of dorsum continues on to tail. A prominent brown collar with darker margins from posterior border of orbits across occiput and anterior nape continuing anterior of orbits to nostril. Dorsum of head pale brown with scattered, slightly darker, diffuse markings. Loreal region suffused with darker pigment. A light area surrounding ear. Labial scales brown with lighter borders. Limbs pale brown, weakly banded with alternating darker, irregular markings. Venter cream, tinged by light to mid brown speckling on limbs. Tail mid brown beneath.

Color in life much bolder (Figs. 2–3), base color mid brown with yellowish-cream bands with well-defined dark brown borders. Dorsum of head yellowish-cream with well-defined symmetrical mid brown markings with darker brown borders.

Variation. —Comparative mensural data for the holotype and paratype are presented in Table 1. The paratype is similar to the holotype in most respects except as noted. IRSNB 2586: Adult female. 9 supralabials to middle of eye, 12 enlarged supralabials to corner of mouth; 10 infralabials. 19 interorbital scale rows across narrowest point of frontal bone. Each postmental bordered posteriorly by 3 granules. Precloacal pores in continuous series of 9, separated by diastema of 9 poreless scales from series of 5 left femoral pores and separated by diastema of 7 poreless scales from series of 7 femoral pores; all pores smaller than in male holotype. Enlarged basal subdigital lamellae 5–6–6–6–6 (manus), 5–6–7–8–7 (pes); narrow lamellae distal to digital inflection and not including ventral claw sheath: 9–10–12–12–11 (manus), 10–11–13–12–13 (pes). Color pattern similar to holotype, but paler. 10 dark bands on original tail. Venter uniform cream.

Diagnosis.—*Cyrtodactylus tigroides* may be distinguished from all congeners on the basis of the following combination of characters: slender body, largely homogeneous body scalation, low number of rows (13) of small tubercles, elongate digits and tail, 8-9 preclo-

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acal pores separated from series of 5–7 femoral pores in enlarged scales on each thigh (males and females), absence of precloacal groove, and dorsal color pattern consisting of alternating light and dark bands.

FIGURE 2. Living specimen of *Cyrtodactylus tigroides*, sp. nov. showing the very long tail, elongate, slender limbs and digits, and characteristic dorsal banding pattern of the species. Photo by Nonn Panitvong.

FIGURE 3. Living specimen of *Cyrtodactylus tigroides*, sp. nov. exhibiting a particularly bold dorsal patterning. Photo by Lawan Chanhome.

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TABLE 1. Mensural data for the type series of *Cyrtodactylus tigroides* and *C. chanhomeae.* Abbreviations as in Materials and Methods, all measurements in mm.

	C. tigroides		*C. chanhomeae*	
	CUMZ R 2002.296C holotype	IRSNB 2586 paratype	IRSNB 2585 holotype	CUMZ R 2003.62 paratype
Sex	male	female	male	male
SVL	83.22	74.25	69.90	78.81
HeadL	23.41	21.27	21.43	22.88
HeadW	15.59	13.01	12.97	14.04
HeadH	10.15	8.58	7.64	8.43
OrbD	6.30	5.61	5.47	5.27
EyeEar	6.09	5.24	4.36	5.12
SnEye	10.01	8.55	8.62	8.91
NarEye	7.31	6.12	6.55	6.77
Interorb	7.99	7.20	7.30	7.82
EarL	1.69	1.64	1.27	1.63
Internar	2.56	2.27	1.50	1.14
TrunkL	37.67	30.05	26.40	29.85
ForeaL	14.95	11.89	12.84	13.69
CrusL	17.73	14.38	15.81	15.34
TailL (total)	116.95	108.45	74.43	74.72
TailL (regenerated)	54.96	—	14.09	65.76
TailW	7.35	7.02	6.56	6.54

The condition of precloacal and femoral scales and pores in males has traditionally been widely used to distinguish members of the genus *Cyrtodactylus* (e.g., Smith 1935; Darevsky & Szczerbak 1997; Bauer 2002, 2003). On this basis *C. tigroides* may be distinguished from the following species by the absence of a precloacal groove: *C. annulatus* (Taylor), *C. cavernicolus* Inger & King, *C. fumosus* (Müller), *C. marmoratus* (Kuhl), *C. papuensis* (Brongersma), *C. philippinicus* (Steindachner), *C. pubisulcus* Inger, *C. pulchellus*, *C. rubidus*, *C. sadleiri* Wells & Wellington; from *C. biordinis* Brown & McCoy by the presence of a single, *versus* double row of femoral pores; from the following species by the presence of precloacal pores: *C. jellesmae* (Boulenger), *C. laevigatus* Darevsky, *C. paradoxus* (Darevsky & Szczerbak), *C. sermowaiensis* (de Rooij), and most members of the subgenus *Geckoella* (*C. albofasciatus* [Boulenger], *C. collegalensis* [Beddome], *C.*

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deccanensis [Günther], *C. jeyporensis* [Beddome], *C. nebulosus* [Beddome], and *C. yakhuna* [Deraniyagala]); from the following species by the presence of femoral pores: *C. adleri* Das, *C. brevidactylus* Bauer, *C. condorensis* (Smith), *C. consobrinoides* (Annandale), *C. elok* Dring, *C. fraenatus* (Günther), *C. ingeri* Hikida, *C. intermedius*, *C. irianjayaensis* Rösler, *C. irregularis* (Smith), *C. khasiensis* (Jerdon), *C. lateralis* (Werner), *C. malayanus* (de Rooij), *C. matsuii* Hikida, *C. oldhami*, *C. peguensis*, *C. quadrivirgatus*, *C. sumonthai*, *C. sworderi* (Smith), *C. yoshii* Hikida, *C.* (*G.*) *triedrus* (Günther), and three new species from Myanmar (Bauer 2003); from the following species by the presence of a diastema between the series of femoral pores and the precloacal pores: *C. feae* (Boulenger), *C. jarujini*, *C. loriae* (Boulenger), *C. louisiadensis* (de Vis), *C. malcolmsmithi* (Constable), *C. novaeguineae* (Schlegel), *C. papilionoides*, *C. phongnhakebangensis* Ziegler *et al.*, *C. tiomanensis* Das & Lim, *C. variegatus*, and *C.* sp. nov. (this paper, see below); from the following species by the presence of greatly enlarged subcaudal plates in the original tail: *C. agusanensis* (Taylor), *C. gubernatoris* (Annandale), and *C. wetariensis* (Dunn); from the following species by the presence of 13 longitudinal rows of dorsal tubercles (vs. 16 or more rows): *C. aaroni* Günther & Rösler, *C. abrae* Wells, *C. angularis*, *C. baluensis* (Mocquard), *C. brevipalmatus*, *C. consobrinus* (Peters), *C. darmandvillei* (Weber), *C. derongo* Brown & Parker, *C. interdigitalis*, *C. mimikanus* (Boulenger), *C. slowinskii* Bauer, *C. tuberculatus* (Lucas & Frost), and four new species from Myanmar (Bauer 2003); and from *C. redimiculus* King by its distinctive bold yellowish-cream banding (vs. narrow pale bands).

Cyrtodactylus tigroides is similar in size, habitus, and, to a lesser extent, color to only two other Thai members of the genus: *C. sumonthai* and *C.* n. sp. (see below). It may easily be distinguished from both of these both by details of color and by the configuration of the precloacal and femoral pores.

Distribution and Natural History.—*Cyrtodactylus tigroides* is known only from Sai-Yok, Kanchanaburi Province, western Thailand, close to the Myanmar border. Specimens of the new species were found by night (20h00) along a dry stream at the foot of a limestone hill covered by bamboo forest. Individuals were walking on or hiding in exposed limestone, 1.0–1.5 m above the ground. Another species, *C.* cf. *peguensis* (CUMZ R 2003.19, IRSNB 16653), was found along the same stream, but only on slender branches and vines or on small pieces of limestone near ground level.

***Cyrtodactylus chanhomeae* sp. nov.**
Figures 4–6.

Holotype.—Institut Royal des Sciences Naturelles de Belgique (IRSNB) 2585 (formerly CUMZ R 2003.61), adult male; Thailand, Saraburi Province, Phraputthabata District, Khun Khlon Subdistrict, Phraya Chat-tan Cave, 14°42'N 100°51'E; collected by Montri Sumontha, 23 May 2003 (16:30).

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Paratype.—Chulalongkorn University Museum of Zoology (CUMZ) R 2003.62, adult male; Thailand, Saraburi Province, Phraputthabata District, Khun Khlon Subdistrict, Thep Nimit Cave; 14°42'N 100°51'E; collected by Montri Sumontha, 23 May 2003 (15:50).

FIGURE 4. Holotype (IRSNB 2585) of *Cyrtodactylus chanhomeae*, sp. nov. from Phraya Chat-tan Cave, Phraputthabata District (Khun Khlon Subdistrict), Saraburi Province, Thailand. Note the elongate limbs and digits, and conspicuous dorsal markings. Photo by Aaron M. Bauer.

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Etymology.—The specific epithet is a matronym honoring Dr. Lawan Chanhome of the Queen Saovabha Memorial Institute of the Thai Red Cross Society, Bangkok. Dr. Chanhome has been and continues to be an active contributor to the study of Thai venomous snakes. The epithet is formed in the feminine genitive.

Definition.—A moderately sized *Cyrtodactylus*, snout-vent length to at least 79 mm; body slender, limbs and digits long, slender; one pair of enlarged postmental scales in broad contact with one another; dorsal scalation with 16-18 rows of keeled tubercles; 36–38 ventral scales across belly between ventrolateral folds; no precloacal groove, a continuous series of 32–34 pore-bearing precloacal-femoral scales (at least in males). 7–9 broad basal lamellae and 14 narrow distal lamellae beneath 4th toe of pes. Median subcaudal scales enlarged to form broad transverse plates. Dorsal pattern of purplish brown bands, bordered anteriorly and posteriorly by yellowish-cream bands; 3 such bands on trunk and a fourth on nape and occiput.

Description (based on holotype, IRSNB 2585).—Adult male. Snout-vent length 69.90 mm. Head long (HeadL/SVL ratio 0.30), relatively narrow (HeadW/HeadL ratio 0.61), somewhat depressed (HeadH/HL ratio 0.36), distinct from slender neck. Lores and interorbital region weakly inflated, canthus rostralis not especially prominent, frontonasal region strongly concave. Snout elongate (SnEye/HeadL ratio 0.40), pointed; longer than eye diameter (OrbD/SnEye ratio 0.63); scales on snout and forehead small, rounded, granular, homogeneous; scales on snout larger than those on occipital region. Eye large (OrbD/HeadL ratio 0.26); pupil vertical with crenelated margins; supraciliaries short, bearing minute conical spines posteriorly. Ear opening oval, relatively large (EarL/HeadL ratio 0.06); eye to ear distance much less than diameter of eye (EyeEar/OrbD ratio 0.80). Rostral 61% deep (1.76 mm) as wide (2.88 mm), incompletely divided (40%) dorsally by rostral groove; two enlarged supranasals in broad contact; rostral in contact with supralabial I and supranasals only; nostrils round, each surrounded by supranasal, rostral, first supralabial, and two enlarged postnasals; a valvular projection occupies posterior half of nostril; 2–3 rows of small scales separate orbit from supralabials. Mental triangular, wider (3.60 mm) than deep (2.58 mm); one pair of enlarged postmentals, each bordered anteromedially by mental, medially in broad contact with other postmental, bordered anterolaterally by first infralabial, laterally by second infralabial, posterolaterally by 2 enlarged lateral chinshields, and posteriorly by 3 slightly enlarged chin granules. Supralabials to midorbital position 9 (right) to 10 (left); enlarged supralabials to angle of jaws 12 (right) to 13 (left); infralabials 9 (right) to 10 (left); interorbital scale rows across narrowest point of frontal bone 16.

Body slender, relatively short (TrunkL/SVL ratio 0.38) with very weakly demarcated, non-denticulate ventrolateral folds. Dorsal scales granular to weakly conical; regularly distributed tubercles (3–4 times size of adjacent scales) extending from occipital region on to back and tail base; each tubercle conical, forming a weak keel on the anterior-facing surface, especially in middorsal tubercle rows; tubercles in approximately 18 rows at mid-

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body, absent from flanks. Ventral scales much larger than dorsals, smooth, hexagonal, and subimbricate, largest posteriorly; midbody scale rows across belly to base of ventrolateral folds 38; gular region with relatively homogeneous, smooth scales. Continuous series of 32 precloacal and femoral pores; femoral scales greatly enlarged; no precloacal groove (Fig. 5). Scales on palm and sole smooth, rounded; scalation on dorsal aspects of hindlimb heterogeneous, with enlarged, weakly conical tubercles interspersed among smaller scales; forelimbs with tubercles less well developed.

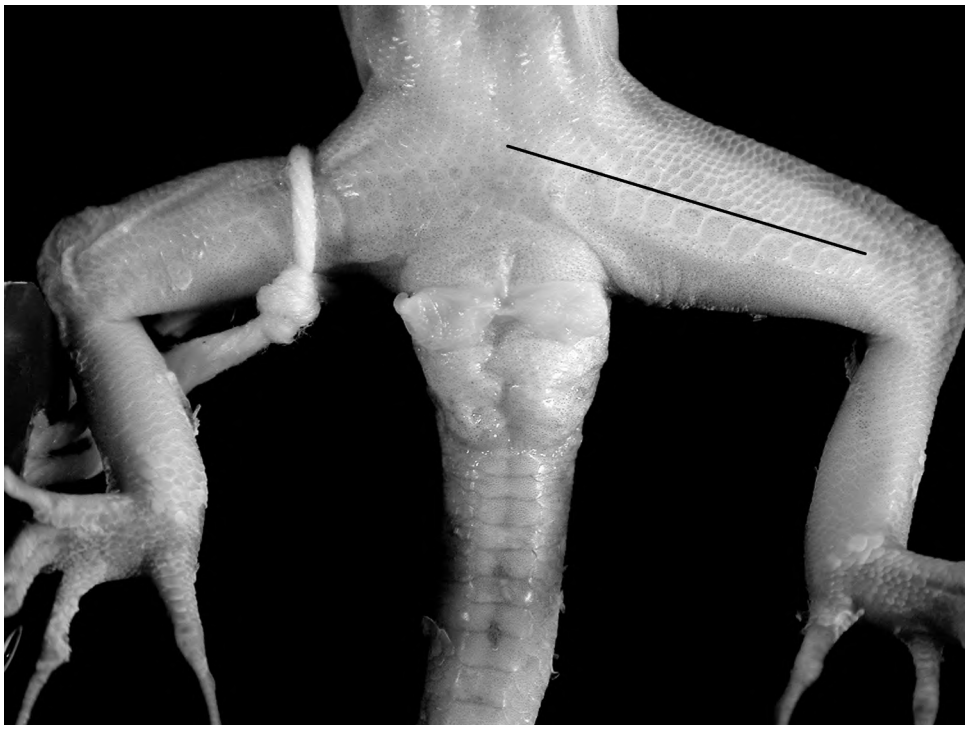

FIGURE 5. Male holotype of *C. chanhomeae*, sp. nov. The black line parallels the pore-bearing scales of the left side of the animal's body. Note the continuous series of precloacal and femoral pores, enlarged femoral scales, and transversely widened subcaudal plates. Photo by Aaron M. Bauer.

Fore and hindlimbs long, slender (ForeaL/SVL ratio 0.18; CrusL/SVL ratio 0.23); digits long, slender, strongly inflected at interphalangeal joints, all bearing robust, slightly recurved claws; basal subdigital lamellae nearly as broad as digit, oval to rectangular, without scansorial surfaces (5–7–7–6–6 manus; 5–7–7–7–8 pes); narrow lamellae distal to digital inflection and not including ventral claw sheath: 10–11–14–12–12 (manus), 12–12–15–14–15 (pes); interdigital webbing absent. Relative length of digits (manus; measurements in mm in parentheses): III (8.08) $\underline{\sim}$ IV (8.05) > II (7.51) = V (7.51) > I (5.80); (pes): IV (9.71) > V (8.76) > III (8.51) > II (8.10) > I (5.63).

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Partly regenerated tail slender, gently tapering to tip; slightly longer than snout-vent length (TailL/SVL ratio 1.06); original portion of tail distinctly segmented; each segment 9 dorsal scale rows in extent; dorsal caudal scales flat, smooth, rectangular, homogeneous except for basal segments where 6 parasagittal rows of enlarged, weakly keeled tubercles continue from the body dorsum to the last pygal segment; ventral scales smooth, greatly enlarged transversely, extending the entire width of the tail venter; two such transverse plates per tail segment. Series of 4 small, smooth, conical postcloacal spurs on each side of tailbase.

Osteology: Parietal bones paired; stapes imperforate. Phalangeal formula 2–3–4–5–3 for manus and 2–3–4–5–4 for pes. Presacral vertebrae 26, including 3 anterior cervical (without ribs), 2 lumbar (one in paratype), and 2 sacral vertebrae; 5 pygal and 18.5 post pygal caudal vertebrae to point of regeneration in holotype (0.5 post-pygal vertebrae in paratype). Both specimens with one pair of crescentic cloacal bones present, flared both medially and laterally. Endolymphatic sacs not enlarged extracranially. Long bones of holotype with incomplete fusion, suggesting it may be a subadult or if mature, that it has not reached maximum size. Those of paratype fused.

Coloration (in preservative)**:** Base color a pale brown. Banded with mid brown markings, each with a darker brown posterior border; each such band bordered anteriorly and posteriorly by a thinner cream band; 3 sets of such alternating bands between limb insertions and one across sacrum. Dorsal pattern faded on flanks. Alternating light and dark pattern of dorsum continues on to tail. 11 dark bands on original portion of tail. Distalmost part of tail very pale (Fig. 4). A prominent brown collar with darker margins from posterior border of orbits through dorsal half of ear and across nape continuing anterior of orbits to nostril. Dorsum of head pale yellow with scattered, slightly darker, diffuse markings at anterodorsal margin of orbits and on parietal. A light line bordering nape band extends from frontonasal area through dorsal part of eye to quadrate and on to occiput. Labial scales beige with scattered brown punctations. Limbs pale brown, weakly marked by darker mottling and scattered irregular white markings, especially distally. Venter cream to beige.

Color in life much bolder (Fig. 6), dark bands purplish brown, paler bands yellowish-cream, somewhat brighter yellow on head and tail. Venter pale brown. Iris greenish brown.

Variation.—Comparative mensural data for the holotype and paratype are presented in Table 1. The paratype is similar to the holotype in most respects except as noted. CUMZ R 2003.62: Adult male. Rostral crease “Y” shaped. Postmentals bordered posterolaterally by a single enlarged lateral chinshield and posteriorly by 2–3 slightly enlarged chin granules; 9 supralabials to middle of orbit, 12 (left) to 13 (right) enlarged supralabials to corner of mouth; 10 infralabials. 18 interorbital scale rows across narrowest point of frontal bone. Tubercles in approximately 16 longitudinal rows at midbody; midbody scale rows across belly to base of ventrolateral folds 36. Precloacal-femoral pores in single series of 34, with one poreless scale separating 5 most distal pores on right thigh from remainder of series.

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Enlarged basal subdigital lamellae 5–6–7–7–7 (manus), 6–7–7–9–7 (pes); narrow lamellae distal to digital inflection and not including ventral claw sheath: 12–12–13–13–13 (manus), 12–13–14–14–16 (pes). Transversely widened subcaudal plates evident even on regenerated portion of tail. Color pattern similar to holotype, but head markings more pronounced.

FIGURE 6. Adult male holotype of *Cyrtodactylus chanhomeae*, sp. nov. (IRSNB 2585) in life. Note the large eyes and pale yellowish markings. Photo by Lawan Chanhome.

Diagnosis.—*Cyrtodactylus chanhomeae* may be distinguished from all congeners on the basis of the following combination of characters: body slender, limbs and digits long, dorsal scalation with 16–18 rows of keeled tubercles, 36–38 ventral scales across belly between ventrolateral folds, no precloacal groove, a continuous series of 32–34 pore-bearing precloacal-femoral scales (at least in males), median subcaudal scales enlarged to form broad transverse plates, and dorsal pattern of purplish brown bands, bordered anteriorly and posteriorly by yellowish-cream bands (5 such pale bands between limb insertions).

On the basis of its continuous single series of precloacal and femoral pores and absence of a precloacal groove, *Cyrtodactylus chanhomeae* may be distinguished from *C. tigroides* and the majority of its other congeners (refer to Diagnosis of *C. tigroides*). Among those species with a continuous series of pores (or for which this condition could not be adequately assessed based on literature and specimens available to the authors), the new species may be distinguished from the Pacific species *C. abrae*, *C. derongo*, *C. loriae*, *C. louisiadensis*, *C. novaeguineae*, and *C. tuberculatus* on the basis of its much smaller size (to 79 mm SVL for types vs. > 110 mm SVL), as well as lower ventral scale counts

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and coloration differences. It may be distinguished from *C. papilionoides* and *C. malcolmsmithi* by its greatly expanded subcaudal plates, which extend the entire width of the tail, from *C. darmandvillei* by its much smaller and less coarse dorsal tubercles, from *C. jarujini* by its lower number of pores (32 vs 52) and banded rather than spotted or blotched pattern, from *C. variegatus* by its greater number of midventral scale rows (36–38 vs 22), from *C. tiomanensis* and *C. phongnhakebangensis* by its greater number of pale bands (4–5 vs 3) between limb insertions, and from *C. feae* by its lack of a well-defined reticulate pattern on the dorsum of head.

Distribution and Natural History.—*Cyrtodactylus chanhomeae* has thus far been found only in and around caves in the Phraputthabata District (Khun Khlon Subdistrict) of Saraburi Province in central Thailand, north of Bangkok.

Three male specimens of *C. chanhomeae* were found by day on the walls of limestone caves, 10-20 m from the cave mouth in near total darkness, at heights of 0–3 m above the ground (where cave ceiling was 2–8 m). At night, one female was found inside a cave, and a juvenile was found outside the cave entrance (19:20, 23 May 2002). Others were seen inside caves between 22:00 and 0:30 (30–31 May 2003). Other gecko species found in the vicinity of the type locality were *Gekko siamensis* Grossmann & Ulber, *Gehyra* cf. *fehlmanni* (Taylor), and *Dixonius melanostictus* (Taylor). The first two of these were observed both inside and outside the caves. Several specimens of *C. chanhomeae* were kept alive in captivity for some time. During this time they readily accepted crickets and meal worms and bit if handled roughly. The species is able to jump quite long distances, but does not run quickly.

Discussion

The discovery of two new *Cyrtodactylus* brings the total number of Thai members of the genus to 14. Nine new species of *Cyrtodactylus* have recently been discovered in neighboring Myanmar (Bauer 2002, 2003) and it is likely that additional species will be found throughout southeast Asia as areas that have thus far escaped herpetological investigation are explored. Despite nearly a century of relatively intensive, though sporadic, collecting in Thailand the discovery of several new species of *Cyrtodactylus* suggests that additional field work, especially in the many regions of limestone caves and outcrops, is warranted.

The new species, *C. tigroides* and *C. chanhomeae* , as well as the recently described *C. sumonthai*, each are quite different from one another with respect to precloacal and femoral pore configuration. All, however, share a similar gracile, long-limbed, large-eyed habitus which may be indicative either of close relationship or similar ecology, or both. It is probably safe to assume that none of these species is closely allied either to members of the Indian-Sri Lankan subgenus *Geckoella*, or to the much larger Australo-Papuan taxa. The new species bear the greatest resemblance to the small to moderately sized members of the genus that make up the majority of the species ranging from Myanmar to Borneo,

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but within this assemblage it is not yet possible to hypothesize any particular pattern of relationships. All three Thai species, however are superficially similar to the Vietnamese species *C. phongnhakebangensis*, which is an inhabitant of primary forests on or near karst cliffs.

Cyrtodactylus chanhomeae is the third cave-dwelling member of the genus to be identified, following the Niah Cave gecko, *C. cavernicolus*, of Sarawak (Inger & King 1961; Harrisson 1961, 1966; O'Shea 1985) and *C. sumonthai*, recently described from Rayong Province, Thailand (Bauer *et al.* 2002). None of these species, however, is likely to be a true cave obligate (Hikida 1990; Bauer *et al.* 2002), but it appears that limestone caves may provide both shelter and foraging area for these geckos, which may best be considered as troglophiles or facultative cavernicoles (*sensu* Chapman 1985). Cave systems and karst landscapes are widely but discontinuously distributed in Thailand (Dunkley 1995) and it is probable that biological exploration in other such areas will result in the discovery of additional new species of gracile *Cyrtodactylus*.

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