

A New Species of *Cnemaspis* (Reptilia: Gekkonidae) from Sumatra, Indonesia

A.A. THASUN AMARASINGHE^{1,2}, MICHAEL B. HARVEY³, AWAL RIYANTO⁴, AND ERIC N. SMITH⁵

¹Research Center for Climate Change, University of Indonesia, Gd. PAU Lt. 8.5, Kampus UI, Depok 16424, Indonesia

³Department of Biological Sciences, Broward College, Davie, Florida 33314, USA

⁴Museum Zoologicum Bogoriense, Research Center for Biology, Indonesian Institute of Science (LIPI) Widyasatwaloka Building, Jl. Raya Jakarta Bogor, Km. 46 Cibinong 16911, Indonesia

⁵Amphibian and Reptile Diversity Research Center, Department of Biology, University of Texas at Arlington, Arlington, Texas 76019, USA

ABSTRACT: We describe a new species of *Cnemaspis* from southern Sumatra, Indonesia. The new species is the first *Cnemaspis* reported from Sumatra and is a large (52.6–58.7 mm in snout–vent length [SVL]) nocturnal species. A combination of the following characters distinguishes the new species from all other Southeast Asian congeners: adults reaching 58.7 mm SVL; supralabials 13 or 14; infralabials 11 or 12; tricarinate ventrals; preloacal pores absent; moderately prominent, randomly arranged, dorsal tubercles; 20 or 21 paravertebral tubercles; no tubercles on lower flanks; caudal tubercles encircling tail; subcaudals keeled; the median row of subcaudals not enlarged; two postloacal tubercles on each side of tail base; no enlarged femoral, subtibial, or submetatarsal scales; subtibial scales keeled; 28–34 subdigital lamellae on fourth toe; dark and light caudal bands distinct in both sexes. We tentatively assign the new species to the *Cnemaspis kendallii* group of the Southern Sunda clade of recent phylogenetic analyses.

Key words: *Cnemaspis rajabasa* sp. nov.; Geckoes; Lampung; Sundaland

DURING the past decade, the number of species in the genus *Cnemaspis* Strauch 1887 has grown rapidly, and the genus currently contains more than 100 species (Grismer et al. 2014a; Uetz and Hallermann 2014). *Cnemaspis* is a polyphyletic genus and contains divergent African, South Asian, and Southeast Asian clades (Bauer et al. 2007; Gamble et al. 2012). Both South Asian and Southeast Asian clades occur in Indonesia (Das 2005; Grismer 2011; Grismer et al. 2014a). Bauer et al. (2007) showed that a diminutive diurnal species from the Mentawai Archipelago (*Cnemaspis modiglianii*) belongs to the South Asian clade, whereas some congeners from Borneo and adjacent islands belong to the Southeast Asian clade of *Cnemaspis* (Grismer et al. 2014a).

Although researchers have described numerous species of *Cnemaspis* from mainland Southeast Asia (e.g., Vietnam, Cambodia, Laos, Thailand, Peninsular Malaysia, Singapore) and several islands close to the Malay Peninsula (de Rooij 1915; Leong et al. 2003; Grismer 2011; Grismer et al. 2014a,b), relatively few species of *Cnemaspis* have been found on the islands of Indonesia (Grismer et al. 2014a). Four species occur on Borneo: *Cnemaspis dringi* Das and Bauer 1998, *C. kendallii* (Gray 1845), *Cnemaspis nigridia* (Smith 1925), and *Cnemaspis paripari* Grismer and Chan 2009. Two species have been described from Natuna Island (*Cnemaspis sundainsula* Grismer et al. 2014a and *Cnemaspis mumpuniae* Grismer et al. 2014a) and one species from Siantan Island (*Cnemaspis sundagekko* Grismer et al. 2014a).

While surveying reptiles and amphibians on Sumatra in 1996, E.N.S. and M.B.H. discovered a population of large, nocturnal *Cnemaspis* in southern Lampung, Indonesia. Comparisons with Southeast Asian congeners revealed several unusual characters in this population; hence, we describe it as a new species.

MATERIALS AND METHODS

We collected the type series by hand, euthanized the specimens with sodium pentobarbital, and fixed the specimens in 10% buffered formalin prior to storage in 70% ethanol. We preserved tissue samples for DNA analysis in 95% ethanol. We compared specimens of the new species to specimens and descriptions of all congeners (see Appendix). Museum acronyms are those of Sabaj Pérez (2014). In order of appearance, represented museums are the Museum Zoologicum Bogoriense (MZB), The University of Texas at Arlington (UTA), the British Museum Natural History (BMNH), and Wildlife Heritage Trust of Sri Lanka (WHT). The slide and digital photograph collections of the Amphibian and Reptile Diversity Research Center at the University of Texas–Arlington contain electronic images of habitat and specimens used in this study.

When diagnosing and describing the new species, we scored specimens for the same morphological characters used in recent descriptions of Southeast Asian congeners (e.g., Grismer et al. 2014a). Using Mitutoyo digital calipers (± 0.1 mm) under a Leica Wild M3Z microscope, we measured the following characters on the left side of the body of each specimen: snout–vent length (SVL, from tip of snout to anterior margin of vent), brachium length (on the dorsal surface from the axilla to the inflection of the flexed elbow), forearm length (on the dorsal surface from the posterior margin of the elbow while flexed to the inflection of the flexed wrist), thigh length (from the anterior margin of the hind limb at its insertion point on the body to the knee while flexed), tibia length (from the posterior surface of the knee while flexed to the base of the heel), axilla–groin length (from the posterior margin of the forelimb at its insertion point on the body to the anterior margin of the hind limb at its insertion point on the body), head length (from posterior edge of mandible to tip of snout); head width (maximum width of head at the angle of the jaws), eye diameter (the greatest horizontal diameter of the orbit); eye–ear length (from posterior border of orbit to anterior border of tympanum), eye–snout length (from anterior border of orbit to tip of snout), eye–nostril length (from anterior border of orbit

² CORRESPONDENCE: e-mail, thasun@rccc.ui.ac.id

TABLE 1.—Meristic and mensural character states of the type series of *Cnemaspis rajabasa*; measurements are in millimeters.

Character	Holotype MZB 6595	Paratype UTA R-61306	Paratype UTA R-61307	Paratype MZB 6593	Paratype MZB 6594
Sex	Female	Female	Male	Male	Male
Supralabials	13	14	13	13	14
Infralabials	11	11	11	11	12
Ventral scales	196	198	203	206	205
Scale rows at midbody	125	128	115	114	112
Paravertebral tubercles	21	21	20	20	20
4th toe lamellae	34	30	32	28	30
Snout-vent length	57.4	56.4	53.8	58.7	52.6
Brachium length	7.5	6.3	8.3	7.5	5.5
Forearm length	9.9	10.0	10.1	11.1	9.6
Thigh length	9.9	10.2	12.5	13.1	12.2
Tibia length	12.9	13.3	13.8	13.9	12.4
Axilla-groin length	24.7	27.1	25.7	28.3	24.2
Head length	14.9	14.8	14.2	15.3	13.6
Head width	8.7	8.8	8.4	8.8	8.1
Eye diameter	5.3	4.6	5.0	5.3	4.7
Eye-ear length	2.2	2.5	2.5	2.7	2.7
Eye-snout length	7.0	6.7	6.2	6.7	5.9
Eye-nostril length	5.5	4.9	5.1	5.5	4.8
Interorbital distance	2.4	2.6	1.9	2.7	1.9
Ear length	1.8	1.7	1.4	1.4	1.7
Internarial distance	2.0	1.9	1.5	1.9	1.7
Eye to mandible length	5.1	5.0	5.2	4.9	4.2
Palm length	8.9	10.4	9.8	10.4	10.4
Foot length	11.0	11.7	12.4	11.9	12.4
Finger I length	3.7	4.5	3.6	3.6	3.9
Finger II length	4.9	5.1	4.9	5.3	5.3
Finger III length	5.1	5.8	5.7	5.4	5.4
Finger IV length	6.3	7.4	6.4	6.5	6.2
Finger V length	6.9	5.3	7.0	7.5	7.1
Toe I length	3.1	3.2	2.9	3.1	3.3
Toe II length	6.4	5.6	5.9	5.5	5.5
Toe III length	6.6	6.9	6.6	6.3	6.7
Toe IV length	7.9	7.6	7.9	7.8	7.7
Toe V length	6.5	7.0	6.5	7.2	7.1

to middle of nostril), interorbital distance (shortest distance between dorso-medial margins of orbits), ear length (greatest horizontal diameter of tympanum), internarial distance (shortest distance between dorsal margins of nostrils), eye to mandible length (from posterior border of orbit to posterior tip of mandible), palm length (from wrist [carpus] to distal tip of longest finger), foot length (from heel to tip of longest toe), and finger and toe lengths (from tip of claw to the nearest fork).

Specific to some of the meristic characters, we counted supralabial and infralabial scales from below the middle of the orbit to the rostral and mental scales, respectively. Our counts of ventrals included all scales from the mental to the last scale bordering the vent. We counted paravertebral tubercles between limb insertions in a straight line immediately left of the vertebral column. We counted subdigital lamellae on Toe IV from the base of the first phalanx to the claw. We counted the number of longitudinal ventral and dorsal scale rows at midbody.

We evaluated size and number of postmental scales contacting the mental, the texture of the scales on the limbs, the arrangement of body tuberculation, the relative size and morphology of the subcaudal scales, the number of postcloacal tubercles on each side of the tail base, and color pattern characteristics. We based our description of color in life on photographs of the type series and field notes of M.B.H. taken at the time of capture. We sexed specimens by examining the dissected gonads. To view some small

characters such as keeling of the ventrals, we applied a reversible methylene blue stain in 70% ethanol.

RESULTS

We present diagnostic morphometric and meristic data as measured on the type specimens (Table 1). Statistically informative tests could not be performed because of the small sample size of specimens of both the new species and its congeners. Nonetheless, interspecific comparisons revealed a suite of characters that distinguish the new species from its congeners (Table 2).

SYSTEMATICS

Cnemaspis rajabasa sp. nov. (Figs. 1–3, Tables 1, 2)

Holotype.—Adult female (MZB 6595; field number ENS 7766) near Sungai Tajur, Gunung (Mount) Rajabasa, Kabupaten Lampung Selatan, Provinsi Lampung, Sumatra, Indonesia (5°48'29"S, 105°37'37"E, datum = WGS84; 425 meters above sea level [m asl]), collected on 15 June 1996 by E.N. Smith (ENS) and M.B. Harvey (MBH).

Paratypes.—An adult female (UTA R-61306, formerly MZB 6596, field number ENS 7767) with the same data as the holotype; three adult males (UTA R-61307, formerly MZB 6592, field number MBH 5543 and MZB 6593–6594, field numbers MBH 5544–5545) with same data as the holotype except collected at 430 m asl.

TABLE 2.—Diagnostic characters differentiating *Cnemaspis rajabasa* from congeners of the *C. kendallii* complex (sensu Grismer et al. 2014a). Abbreviations: w = weak; post = posterior.

Character	<i>C. kendallii</i>	<i>C. sundainsula</i>	<i>C. mumpuniae</i>	<i>C. penanggilensis</i>	<i>C. baueri</i>	<i>C. bidongensis</i>	<i>C. peninsularis</i>	<i>C. sundagekko</i>	<i>C. rajabasa</i>
Maximum SVL (mm)	58.4	84.5	60.9	76.0	67.4	58.1	60.0	68.0	58.7
Supralabials	10,11	8–11	9–12	10–13	11–13	9,10	10,11	11–13	13,14
Infralabials	8,9	7–10	8–11	8–10	8–12	7–9	7–10	8–11	11,12
No. of paravertebral tubercles	18–26	26–37	18–25	30–37	18–27	21–26	17–25	20–25	20–21
Tubercles linearly arranged (1) or more random (0)	w	1	w,0	0	0	0	w,0	0,w	0
Tubercles present (1) or absent (0) on lower flanks	w,1	1	w,1	0,w	w,0	0	w,1	0,w	0
Subcaudals keeled (1) or smooth (0)	1	0	1	1	1	1	1	1	1
Single median row of keeled subcaudals (1) or smooth (0)	0	0	0	1	0	0	0	0	1
Caudal tubercles encircling tail (1) or not (0)	1	0	1	1	1	1	1	1	1
Enlarged median subcaudal scale row (1) or not (0)	0	0,w,post	1	1	1	1	0	0,post	0
No. of postcloacal tubercles (spur) in males	2	2–4	1,2	1,2	1,2	1,2	1,2	2,3	2
Enlarged submetatarsal scale on 1st toe (1) or not (0)	0	w,1	0	0	0	0	0	0	0
No. of 4th toe lamellae	25–33	25–29	29–35	27–34	26–32	26–30	27–33	33–38	28–34
Sample size	14	18	17	18	27	14	86	6	5

Diagnosis.—The following combination of characters distinguishes *Cnemaspis rajabasa* from all other Southeast Asian congeners: adult males reaching 58.7 mm SVL, adult females reaching 57.4 mm SVL; 13 or 14 supralabial scales; 11 or 12 infralabial scales; tricarinate ventral scales; no precloacal pores; moderately prominent, randomly arranged, dorsal tubercles; 20 or 21 paravertebral tubercles; no tubercles on lower flanks; caudal tubercles encircling tail; subcaudal scales keeled; median row of subcaudals not enlarged; two postcloacal tubercles on each side of tail base; no enlarged femoral, subtibial, or submetatarsal scales; subtibial scales keeled; 28–34 subdigital lamellae on fourth toe; dark and light caudal bands distinct in both sexes. These differences are summarized for geographically close congeners (Table 2) and for all Southeast Asian species in Table 6 of Grismer et al. (2014a).

Comparisons.—*Cnemaspis rajabasa* is most similar to *C. kendallii* characters (in parentheses) but can be distinguished from this species by having 13 or 14 (10 or 11) supralabials, ventral scales tricarinate (unicarinate), tubercles on flanks absent (present), and dorsal tubercles not linearly arranged (linearly arranged).

Congeners from the Malay Peninsula, adjacent small islands, Borneo, and Sumatra have suites of characters that distinguish these taxa from *Cnemaspis rajabasa* (52.6–58.7 mm in SVL), which is a relatively large species (maximum SVL of other species in parentheses). Whereas the new species lacks precloacal pores, *Cnemaspis affinis* (Stoliczka 1870; 50.8 mm), *Cnemaspis bayuensis* Grismer et al. 2008a (46.1 mm), *Cnemaspis chanardi* Grismer et al. 2010a (40.1 mm), *Cnemaspis flavolineata* (Nicholls 1949; 41.2 mm), *Cnemaspis harimau* Chan et al. 2010 (40.7 mm), *Cnemaspis kamolnorrnanathi* Grismer et al. 2010a (37.8 mm), *Cnemaspis karsticola* Grismer et al. 2008a (48.1 mm), *Cnemaspis kumpoli* Taylor 1963 (52.0 mm), *Cnemaspis narathiwatensis* Grismer et al. 2010a (43.2 mm), *Cnemaspis omari* Grismer et al. 2014a (41.3 mm), *Cnemaspis perhentianensis* Grismer and Chan 2008 (47.2 mm), *Cnemaspis roticanai* Grismer and Chan 2010 (46.7 mm), *Cnemaspis*

selamatkanmerapoh Grismer et al. 2013 (43.4 mm), *Cnemaspis stongensis* Grismer et al. 2014a (49.3 mm), *Cnemaspis temiah* Grismer et al. 2014a (46.7 mm), and *Cnemaspis vandeventeri* Grismer et al. 2010a (44.7 mm) all have precloacal pores or pore-bearing scales.

Cnemaspis argus Dring 1979 (65.3 mm), *Cnemaspis grismeri* Wood et al. 2013 (50.6 mm), *Cnemaspis hangus* Grismer et al. 2014a (50.5 mm), *Cnemaspis mcguirei* Grismer et al. 2008a (65.2 mm), *Cnemaspis pseudomcguirei* Grismer et al. 2009 (42.5 mm), and *Cnemaspis siamensis* Smith 1925 (37.3 mm) all have 7–9 supralabials (whereas the new species has 13–14).

The ventral scales in the new species are tricarinate, whereas *Cnemaspis aurantiacopes* Grismer and Ngo 2007 (56.5 mm), *Cnemaspis biocellata* Grismer et al. 2008b (40.1 mm), *Cnemaspis boulengeri* Strauch 1887 (66.0 mm), *Cnemaspis caudanivea* Grismer and Ngo 2007 (44.0 mm), *Cnemaspis chanthaburiensis* Bauer and Das 1998 (41.0 mm), *C. dringi* Das and Bauer 1998 (45 mm), *C. flavigaster* Chan and Grismer 2008 (50.1 mm), *Cnemaspis huaseesom* Grismer et al. 2010a (37.9 mm), *Cnemaspis laoensis* Grismer 2010 (40.9 mm), *Cnemaspis monachorum* Grismer et al. 2009 (32.9 mm), *Cnemaspis neangthyi* J.L. Grismer et al. 2010 (54.0 mm), *Cnemaspis niyomwanan* Grismer et al. 2010a (56.8 mm), *Cnemaspis nuicamensis* Grismer and Ngo 2007 (47.5 mm), *Cnemaspis psychedelica* L.L. Grismer et al. 2010b (75.3 mm), *Cnemaspis punctatonuchalis* Grismer et al. 2010a (49.6 mm), and *Cnemaspis tucludupensis* Grismer and Ngo 2007 (51.0 mm) all have smooth ventral scales.

The new species lacks an enlarged median row of subcaudal scales, whereas *Cnemaspis baueri* Das and Grismer 2003 (64.9 mm), *Cnemaspis bidongensis* Grismer et al. 2014b (58.1 mm), *Cnemaspis limi* Das and Grismer 2003 (88.2 mm), *C. mumpuniae* Grismer et al. 2014a (56.6 mm), *C. nigridia* Smith 1925 (80.0 mm), *C. paripari* Grismer and Chan 2009 (50.7 mm), *C. sundagekko* Grismer et al. 2014a (65.6 mm), and *C. sundainsula* Grismer et al. 2014a (84.5 mm) all have an enlarged median row of subcaudals.



FIG. 1.—(A) Adult female holotype of *Cnemaspis rajabasa* MZB 6595; SVL 57.4 mm); and (B) habitat of *C. rajabasa*: Tajur Stream on the southern slopes of Gunung Rajabasa, Lampung, Sumatra; elevation 425 m above sea level, 15 June 1996. Image shows boulders where specimens of the type series of the new species were found. Photos by E.N. Smith. (UTA slide collection-29066, UTADC-8171, and UTADC-8172). Color versions of these images are available online.

Whereas *C. rajabasa* has 20–21 paravertebral tubercles, *Cnemaspis pemanggilensis* Grismer and Das 2006 (76.0 mm) has 30–37 paravertebral tubercles.

Cnemaspis shahruli L.L. Grismer et al. 2010c (36.5 mm) has a black shoulder patch enclosing a single, white ocellus (similar patch absent in *C. rajabasa*), and *Cnemaspis peninsularis* Grismer et al. 2014a (60.0 mm) in males has the posterior portion of original tail black and regenerated tail is yellow.

The new species is unlikely to be confused with any *Cnemaspis* from the Mentawai Archipelago or with *Cnemaspis phuketensis* Das and Leong 2004, because all are members of the South Asian clade. Unlike the new species, *Cnemaspis dezwaani*, *Cnemaspis jacobsoni*, *Cnemaspis modiglianii*, *Cnemaspis whittenorum*, and *Cnemaspis*

phuketensis have SVL < 40 mm, 6–8 supralabials, and 14–18 subdigital lamellae.

Description of holotype and variation.—Where appropriate, characters of the holotype are followed by those of paratypes in parentheses. An adult female, 57.4 mm SVL (female paratype 56.4 mm, males 52.6–58.7 mm); head moderately large, elongate, narrow, distinct from neck, its length 25.9% of SVL (25.2–26.4%); head width 58.4% of head length (57.5–59.5%) and 15.1% of SVL (14.9–15.6%); snout elongate, its length 80.4% (72.8–76.1%) of head width and greater than eye diameter; eye diameter 75.7% of eye-snout length (68.6–80.6%); interorbital region relatively broad, with interorbital distance 16.1% of head length (13.4–17.6%); eye large, its diameter 35.6% of head length (31.1–35.2%); pupil rounded; ear-opening deep, oval;

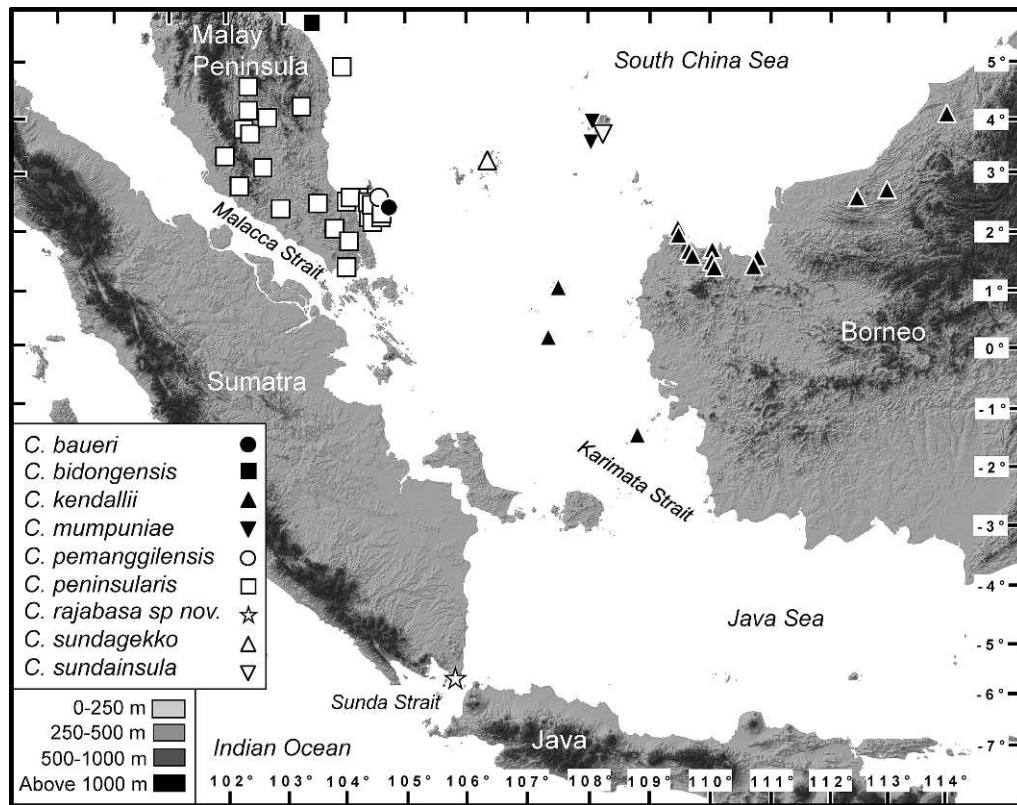


FIG. 2.—Southeast Asia, showing the collection localities of *Cnemaspis rajabasa* in Sumatra (star) and its closest congeners in West Malaysia and larger Sundaic Islands.

diameter of eyes greater than eye to ear distance (eye diameter 240.9% of eye-ear distance; 174.1–200.0%); scales of snout smooth, larger than those of occipital region; scales of interorbital, superciliary, and gular regions granular; rostral scale partially divided by medial groove, posteroventrally in contact with first supralabial, contacted posteriorly by two nasals and two subcircular supranasals; nostrils separated by two enlarged supranasals; no internasal scale between supranasals; nostrils oval, dorsally oriented; 5 postnasals (6 in all paratypes), lowest in broad contact with first supralabial; nasals in broad contact with first supralabial.

Mental subtriangular, elongate, and lengthened posteriorly to level of third supralabial, longer than wide, postero-laterally in contact with two enlarged and elongate postmentals; postmentals medially separated by single postmental scale (MZB 6596 has 3 medial postmental scales); postmentals bordered posteriorly by 6 smooth scales on left side (3–5) and 5 on right side (4 or 5), including medial scale; scales on throat granular and keeled; bluntly pointed scales on side of neck, similar in size to those at middorsum; 5 scale rows (3 or 4) separating orbit from supralabials at level of pupil; 13 supralabials (13 or 14), 11th at midorbit position (11th or 12th); 11 infralabials (11 or 12), decreasing in size toward angle of jaw.

Body slender, elongate; axilla-groin distance 43.0% of SVL (46.0–48.2%); middorsal granules bluntly pointed, homogeneous, tricarinate, intermixed with smooth, enlarged tubercles; dorsal tubercles moderately prominent and randomly arranged, tubercles in clusters of four to six scales; no tubercles on lower flanks; dorsal scales at midbody smaller than ventrals at same level; paravertebral tubercles

21 (20 or 21), subpyramidal and tricarinate, each about four or five times as large as granules separating them, largest surrounded by 9 or 10 granules; abdominal scales subequal in size, tricarinate, bluntly pointed, juxtaposed; ventral scales 42 (36–44) across midbody, ventro-lateral scales on trunk bluntly pointed and smooth; scales around midbody (125–128 vs. 112–115) and less total ventrals (196–198 vs. 203–206); no precloacal or femoral pores (male paratypes also lack precloacal or femoral pores); no enlarged femoral, subtibial, or submetatarsal scales.

Arms moderately short; length of forearm 17.2% of SVL (17.7–18.9%); length of brachium 13.1% of SVL (10.4–15.4%); legs relatively long; length of tibia 22.5% of SVL (23.6–25.6%); thigh short, its length 17.2% of SVL (18.1–23.2%); dorsal scales on both arm and leg bluntly pointed and tricarinate; ventral scales on upper and lower arms granular and smooth, scales on ventral surface of thigh bluntly pointed and tricarinate; digits elongate, slender, all bearing slightly recurved claws; subdigital lamellae entire, 34 on Toe IV (28–30); interdigital webbing absent; relative lengths of fingers and Toes IV > III > V > II > I.

Tail complete, tip of the tail partially broken but still attached (paratypes with regenerated tails); tail base swollen; two conical postcloacal spurs present on each side; dorsal scales on tail bluntly pointed and tricarinate; tail segmented with 18 whorls of tubercles, each whorl consisting of nine conical, enlarged, keeled tubercles separated from one another by 1–5 small scales; each whorl separated from its neighbor by about eight scale rows; subcaudal scales at base bluntly pointed and tricarinate; distally, subcaudals slightly

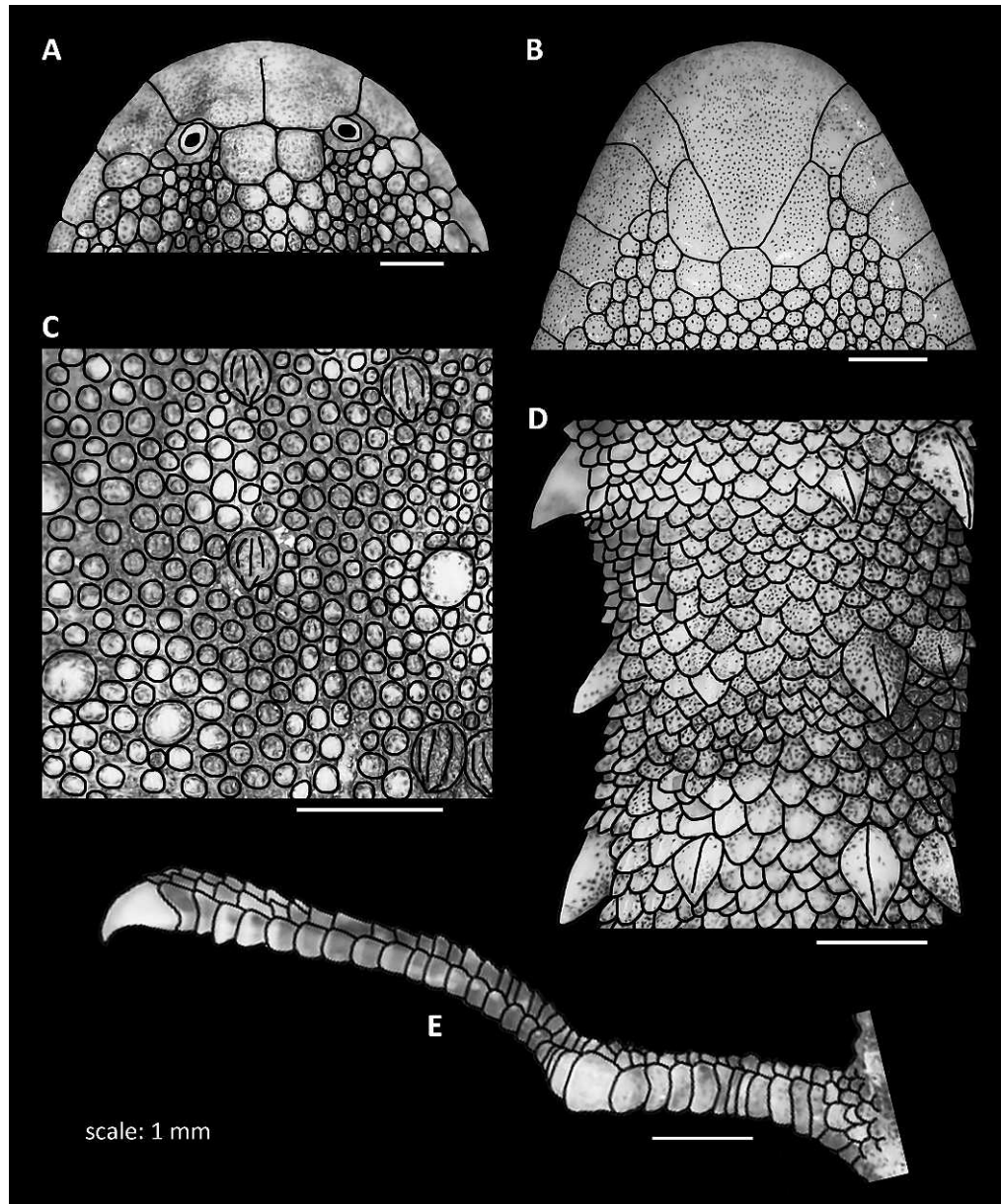


FIG. 3.—Snout in dorsal view (A), chin (B), middorsal granules and tubercles (C), subcaudal scales (D), and subdigital lamellae on Toe IV (E) of *Cnemaspis rajabasa* (MZB 6595; holotype).

keeled and pointed; subcaudals between whorls not enlarged.

Coloration.—In life, the holotype of *C. rajabasa* had a dorsal pattern of pale gray and dark brown markings on a grayish brown ground color. The snout had seven poorly defined dark brown longitudinal lines above the mostly pale gray supralabials: 2/2 on the sides of the head and three between the canthi rostralis. Behind the eye a sharp, pale gray line separated two narrower dark brown lines; both the pale gray line and the upper dark brown line ended medially on the center of the neck. The neck had a vertebral, and pair of paravertebral, dark brown stripes separated from one another by pale gray stripes. On the body, the pattern on the neck broke up into three rows of ocelli, each containing six markings positioned vertebally. Pale gray bands outlined in dark brown crossed the arms and legs (two on the brachium, two on the forearm, three on the thigh, and three on the

tibia). The digits had alternating bands of pale gray (four on each of the outer fingers) and brown. The tail had eight pale gray bands edged in dark brown and separated from one another by brown bands that were 2–3 times as wide as the pale bands. A sharp, pale gold ciliary ring surrounded the pupil.

After 18 yr in preservative, the pale gray pigment has faded to light brown and the grayish brown ground color to chocolate brown. The ventral body and head is mostly brownish fading to cream medially and on the chin. Bands on the tail are continuous ventrally.

Etymology.—The specific epithet is an invariable noun in apposition and refers to Gunung (Mount) Rajabasa, the volcano inhabited by this species at the extreme Southern tip of Sumatra.

Distribution and natural history.—M.B.H. and E.N.S. found *Cnemaspis rajabasa* on the southern slopes of Gunung

Rajabasa (Fig. 2). This locality lies in the extreme southeast portion of the Lampung Province from 425–430 m asl. At the time of collection, the locality was bordered by secondary forest within a durian tree plantation. We encountered specimens on large granitic boulders along a small stream (Sungai Tajur), particularly on the dry streambed close to pools, between 1820 and 2010 h at 21°C (air temperature).

DISCUSSION

Current phylogenetic hypotheses of *Cnemaspis* in Southeast Asia are based mostly on molecular data (Grismer et al. 2014a), and placement of *C. rajabasa* within the phylogeny will remain uncertain until researchers describe molecular data for this species. Grismer et al. (2014a) identified tubercles encircling the tail and loss of preloacal pores as derived characters of the southern Sunda clade. *Cnemaspis rajabasa* possesses both of these characters and appears to be a member of the *C. kendallii* group of the southern Sunda clade. However, the other species in this clade are all diurnal. If we assign *C. rajabasa* to this clade, it would be the only nocturnal species within it.

Cnemaspis rajabasa is the first *Cnemaspis* reported from Sumatra. Interestingly, Sumatra is positioned between the previously known distributions of the South Asian (in the Mentawai Archipelago) and Southeast Asian clades of *Cnemaspis*. Discovery of *C. rajabasa* extends the known distribution of the Southeast Asian clade westward and southward by ~600 km from Pulau Karimata where *C. kendallii* occurs. Based on the recent geologic and climatic history of the region, discovery of a Southeast Asian species rather than a South Asian species on Sumatra might have been predicted. Shallow seas of the Sunda Shelf separate Sumatra from Malaysia and Borneo whereas deep oceanic trenches separate the Mentawai Archipelago from Sumatra. It will be interesting to determine if congeners occur in northern parts of Sumatra or if these geckos have crossed the relatively narrow Sunda Strait to Java.

Acknowledgments.—We thank the Ministry of Research and Technology of the Republic of Indonesia (RISTEK), especially S. Wahyono and L. Shalahuddin, for granting research permits. We thank past and present representatives of The Indonesian Institute of Sciences (LIPI) at the Museum Zoologicum Bogoriense (MZB) for facilitating in-house study of specimens and for export and field research permits, especially R. Ubaidillah, A. Boadi, M. Amir, A. Hamidy, I. Sidik, R.M. Marwoto, Syaripudin, and W. Trilaksono (MZB). G.C. Sarker and P. Thammachoti (UTA) kindly provided laboratory assistance. N. Kurniawan, Widodo, and Marwoto from the Faculty of Mathematics and Natural Sciences of Universitas Brawijaya provided logistical support. P.D. Campbell and I. Ineich helped with specimen examination. We thank P. Uetz, N.K. Amarasinghe, J. Supriatna, and the staff of the Research Center for Climate Change of the University of Indonesia for their support. This work is funded in part by National Science Foundation Grant DEB-1146324 to ENS and MBH.

LITERATURE CITED

- Bauer, A.M., and I. Das. 1998. New species of *Cnemaspis* (Reptilia: Gekkonidae) from southeastern Thailand. *Copeia* 1998:439–444.
- Bauer, A.M., A. de Silva, E. Greenbaum, and T. Jackman. 2007. A new species of day gecko from high elevation in Sri Lanka, with a preliminary phylogeny of Sri Lankan *Cnemaspis* (Reptilia: Squamata: Gekkonidae). *Zoosystematics and Evolution* 83:22–32.
- Chan, K.O., and L.L. Grismer. 2008. A new species of *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from Selangor, Peninsular Malaysia. *Zootaxa* 1877:49–57.
- Chan, K.O., L.L. Grismer, S. Anuar, E. Quah, M.A. Muin, A.E. Savage, J.L. Grismer, N. Ahmad, A.-C. Remigio, and L.F. Greer. 2010. A new endemic rock Gecko *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from Gunung Jerai, Kedah, northwestern Peninsular Malaysia. *Zootaxa* 2576:59–68.
- Das, I. 2005. Revision of the genus *Cnemaspis* Strauch 1887 (Sauria: Gekkonidae), from the Mentawai and adjacent archipelagos off western Sumatra, Indonesia, with the description of four new species. *Journal of Herpetology* 39:233–247.
- Das, I., and A.M. Bauer. 1998. Systematics and biogeography of Bornean geckos of the genus *Cnemaspis* Strauch 1887 (Sauria: Gekkonidae), with the description of a new species. *Raffles Bulletin of Zoology* 46:11–28.
- Das, I., and L.L. Grismer. 2003. Two new species of *Cnemaspis* Strauch 1887 (Squamata, Gekkonidae) from the Seribu Archipelago, Pahang and Johor States, West Malaysia. *Herpetologica* 59:544–552.
- Das, I., and T.-M. Leong. 2004. A new species of *Cnemaspis* (Sauria: Gekkonidae) from Southern Thailand. *Current Herpetology* 23:63–71.
- de Rooij, N. 1915. The Reptiles of the Indo-Australian Archipelago. I. Lacertilia, Testudinata, Emydosauria. E.J. Brill, The Netherlands.
- Dring, J.C. 1979. Amphibians and reptiles from northern Trengganu, Malaysia, with descriptions of two new geckos: *Cnemaspis* and *Cyrtodactylus*. *Bulletin of the British Museum (Natural History) Zoology* 34:181–241.
- Gamble, T., E. Greenbaum, T.R. Jackman, A.P. Russell, and A.M. Bauer. 2012. Repeated origin and loss of adhesive toe pads in geckos. *PLoS ONE* 7:e39429. DOI: 10.1371/journal.pone.0039429.
- Gray, J.E. 1845. Catalogue of the Specimens of Lizard in the Collection of the British Museum. British Museum (Natural History), UK.
- Grismer, J.L., L.L. Grismer, and T. Chav. 2010. New species of *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from southwestern Cambodia. *Journal of Herpetology* 44:28–36.
- Grismer, L.L. 2010. The first record of the genus *Cnemaspis* Strauch (Squamata: Gekkonidae) from Laos with the description of a new species. *Zootaxa* 2475:55–63.
- Grismer, L.L. 2011. Lizards of Peninsular Malaysia, Singapore and their adjacent Archipelagos. Chimaira, Germany.
- Grismer, L.L., and K.O. Chan. 2008. A new species of *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from Pulau Perhentian Besar, Terengganu, Peninsular Malaysia. *Zootaxa* 1771:1–15.
- Grismer, L.L., and K.O. Chan. 2009. A new species of karst dwelling *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from Sarawak, Borneo. *Zootaxa* 2246:21–31.
- Grismer, L.L., and K.O. Chan. 2010. Another new Rock Gecko (genus *Cnemaspis* Strauch 1887) from Pulau Langkawi, Kedah, Peninsular Malaysia. *Zootaxa* 2419:51–62.
- Grismer, L.L., and I. Das. 2006. A new species of gekkonid lizard of the genus *Cnemaspis* Strauch 1887 from Pulau Pemanggil, Johor, West Malaysia. *Herpetological Natural History* 10:1–7.
- Grismer, L.L., and V.T. Ngo. 2007. Four new species of the gekkonid genus *Cnemaspis* Strauch 1887 (Reptilia: Squamata) from Southern Vietnam. *Herpetologica* 63:482–500.
- Grismer, L.L., J.L. Grismer, P.L. Wood, Jr., and K.O. Chan. 2008a. The distribution, taxonomy, and redescription of the geckos *Cnemaspis affinis* (Stoliczka 1870) and *C. flavolineata* (Nicholls 1949) with descriptions of a new montane species and two new lowland, karst-dwelling species from Peninsular Malaysia. *Zootaxa* 1931:1–24.
- Grismer, L.L., K.O. Chan, N. Nasir, and M. Sumontha. 2008b. A new species of karst dwelling gecko (genus *Cnemaspis* Strauch 1887) from the border region of Thailand and Peninsular Malaysia. *Zootaxa* 1875:51–68.
- Grismer, L.L., N. Ahmad, K.O. Chan, D. Belabut, M.A. Muin, P.L. Wood, Jr., and J.L. Grismer. 2009. Two new diminutive species of *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from Peninsular Malaysia. *Zootaxa* 2019:40–56.
- Grismer, L.L., M. Sumontha, M. Cota, J.L. Grismer, P.L. Wood, Jr., O.S.G. Pauwels, and K. Kunya. 2010a. A revision and redescription of the rock gecko *Cnemaspis siamensis* (Taylor 1925) (Squamata: Gekkonidae) from Peninsular Thailand with descriptions of seven new species. *Zootaxa* 2576:1–55.
- Grismer, L.L., V.T. Ngo, and J.L. Grismer. 2010b. A colorful new species of insular rock gecko (*Cnemaspis* Strauch 1887) from southern Vietnam. *Zootaxa* 2352:46–58.
- Grismer, L.L., K.O. Chan, E. Quah, M.A. Muin, A.E. Savage, J.L. Grismer, N. Ahmad, L.F. Greer III, and A.-C. Remigio. 2010c. Another new, diminutive Rock Gecko (*Cnemaspis* Strauch) from Peninsular Malaysia and a discussion of resource partitioning in sympatric species pairs. *Zootaxa* 2569:55–66.
- Grismer, L.L., P.L. Wood, Jr., M. Mohamed, K.O. Chan, H.M. Heinz, A.S.-I. Sumarli, J.A. Chan, and A.I. Loredo. 2013. A new species of

- karst-adapted *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from a threatened karst region in Pahang, Peninsular Malaysia. *Zootaxa* 3746:463–472.
- Grismer, L.L., P.L. Wood, Jr., S. Anuar..., and O.S.A. Pauwels. 2014a. Systematics and natural history of Southeast Asian Rock Geckos (genus *Cnemaspis* Strauch 1887) with descriptions of eight new species from Malaysia, Thailand, and Indonesia. *Zootaxa* 3880:1–147.
- Grismer, L.L., P.L. Wood, Jr., A.B. Ahmad, A.S.-I. Sumarli, and J.J. Vazquez. 2014b. A new species of insular Rock Gecko (genus *Cnemaspis* Strauch 1887) from the Bidong Archipelago, Terengganu, Peninsular Malaysia. *Zootaxa* 3755:447–456.
- Kelaart, E.F. 1852. *Prodromus Faunae Zeylanicae: Being Contributions to the Zoology of Ceylon*, vol. 1. Published by the author, Sri Lanka.
- Leong, T.M., L.L. Grismer, and Mumpuni. 2003. Preliminary checklists of the herpetofauna of the Anambas and Natuna Islands (South China Sea). *Hamadryad* 27:165–174.
- Nicholls, L. 1949. A new gekkonid from the Malay Peninsula. *Bulletin of the Raffles Museum* 19:47–49.
- Sabaj Pérez, M.H. (ed.). 2014. Standard symbolic codes for institutional resource collections in herpetology and ichthyology: An online reference, version 5.0. American Society of Ichthyologists and Herpetologists, USA. Available at <http://www.asih.org/resources>. Archived by WebCite at http://www.asih.org/sites/default/files/documents/resources/symbolic_codes_for_collections_v5.0_sabajperez_2014.pdf on 22 September 2014.
- Smith, M.A. 1925. Contribution to the herpetology of Borneo. *Sarawak Museum Journal* 3:15–34.
- Strauch, A. 1887. Bemerkungen über die Geckonidensammlung im zoologischen Museum der Kaiserlichen Akademie der Wissenschaften zu St. Petersburg. *Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg* 35:1–72.
- Stoliczka, F. 1870. Observations of some Indian and Malayan Amphibia and Reptilia. *Annals and Magazine of Natural History* 6:105–109.
- Taylor, E.H. 1963. The lizards of Thailand. *University of Kansas Science Bulletin* 44:687–1077.
- Uetz, P., and J. Hallermann. 2014. The reptile database. Available at <http://reptile-database.reptarium.cz/search?search=Cnemaspis&submit=Search>. Archived by WebCite at <http://www.webcitation.org/6R73hgzHd> on 16 July 2014.
- Wood, P.L., Jr., E.S.H. Quah, M.S.S. Anuar, and M.A. Muin. 2013. A new species of lowland karst dwelling *Cnemaspis* Strauch 1887 (Squamata: Gekkonidae) from northwestern Peninsular Malaysia. *Zootaxa* 3691:538–558.

Accepted on 3 February 2015
Associate Editor: Adam Leaché

APPENDIX

Specimens Examined

- Cnemaspis kandiana* (Kelaart 1852): Sri Lanka: BMNH 53.4.1.1 (lectotype), BMNH 80.2.2.119A–B; WHT 7267, WHT 7305, WHT 7307, WHT 7308, WHT 7310, WHT 7312, WHT 7313, WHT 7319, WHT 7322.
- Cnemaspis kendallii* (Gray 1845): Borneo: BMNH XXII.92a (lectotype), West Kalimantan: MZB 11918, MZB 13048, MZB 13049.
- Cnemaspis modiglianii* Das 2005: Enggano Island, Bengkulu, Sumatra: MZB 4199, MZB 4203, MZB 4205, MZB 4206–4209, MZB 4233, MZB 4247, MZB 4249–4251, MZB 4273, MZB 4276, MZB 4279, MZB 4383, MZB 4386, MZB 4391, MZB 4392, MZB 4394, MZB 4399, MZB 4402.
- Cnemaspis mumpuniae* Grismer et al. 2014a: Natuna Island: MZB 10167 (holotype).
- Cnemaspis nigridia* (Smith 1925): Borneo: BMNH 1946.8.22.90 (holotype).
- Cnemaspis sundainsula* Grismer et al. 2014a: Natuna Island: MZB 9438 (holotype).
- Cnemaspis whittenorum* Das 2005: Siberut Island, Sumatra: BMNH 1979.225 (holotype), BMNH 1979.226 (paratype).