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A NEW *LUPEROSAURUS* (SQUAMATA: GEKKONIDAE) FROM THE SIERRA MADRE OF LUZON ISLAND, PHILIPPINES

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***ABSTRACT*. –** We describe a new species of *Luperosaurus* from the Sierra Madre Mountain Range of northern Luzon Island, Philippines. *Luperosaurus kubli*, new species, is distinguished from all Philippine *Luperosaurus* by the combination of its large body size (105.4 mm for the holotype), reduced interdigital webbing, cutaneous expansions on limbs limited to only the posterior margins, and by the complete absence of ornate dorsal body tubercles and enlarged scales on the lateral edges of the tail. Because the new species shares features with members of both *Luperosaurus* and *Gekko*, we compare it to both genera, and comment on characters shared by Philippine species in these genera. *Luperosaurus kubli* is distinguished from all Philippine *Gekko* by the combination of a large body size and relatively short, stout, limbs, presence of cycloid, juxtaposed dorsals, and undifferentiated ventrals, the presence of interdigital webbing, and by the absence of dorsal tubercles, enlarged subcaudal scales, and enlarged postmentals.

***KEY WORDS*. –** Philippines; Luzon Island; Sierra Madre Range; new species; *Luperosaurus*; parachute geckos.

INTRODUCTION

Philippine gekkonid taxa include the genera *Gekko* (9 species) *Hemidactylus* (4), *Hemiphyllodactylus* (1), *Cosymbotus* (1), *Cyrtodactylus* (4), *Lepidodactylus* (6), *Gehyra* (1), *Pseudogekko* (4), *Ptychozoon* (1), and *Luperosaurus* (5) (Taylor, 1922; Brown & Alcala, 1978; Gaulke et al., in press). Brown & Alcala (1978), Russell (1979), and Brown et al. (2000a) commented on the lack of definitive characters distinguishing the genera *Luperosaurus* and *Gekko*. Most authors have used the name *Luperosaurus* to refer to forest species with (1) small to moderate body size and stout limbs; (2) moderate to extensive interdigital webbing; (3) pronounced cutaneous expansions bordering the anterior and posterior edges of the limbs; (4) enlarged, irregular, often ornate, tubercles on dorsolateral portions of the body and tail; (5) small, cycloid, juxtaposed scales completely encircling the tail (enlarged subcaudals absent); (6) chin shields small or reduced (differentiated postmentals absent); and (7) body scales cycloid, juxtaposed, nonimbricate, and undifferentiated between dorsal and ventral surfaces. In contrast, the name *Gekko* has been applied to Philippine species that possess (1) moderate to large body size and longer, more slender limbs; (2) near or complete absence of interdigital webbing; (3) a lack of cutaneous expansions, save for ventrolateral adipose folds and very slight expansions bordering the posterior margins of the hind limbs; (4) dorsal tuberculate to conical scales enlarged and arranged in longitudinal rows; (5) enlarged, imbricate subcaudals present; (6) differentiated postmentals enlarged, slender, and elongate; and (7) scales of dorsum between tubercle rows minute, non-imbricate, and distinct from the enlarged, imbricate scales of the venter (Taylor, 1922; Brown & Alcala, 1978; Russell, 1979; Brown et al., 2000a).

Philippine members of the genus *Luperosaurus* include five endemic species (*L. cumingii, L. joloensis, L. macgregori, L. palawanensis,* and an undescribed species; Brown & Diesmos, 2000; Brown et al., 2000a; Gaulke et al., in press). Of the Philippine species of the genus *Gekko*, there are seven endemic species (*G. mindorensis, G. porosus, G. romblon, G. palawanensis, G. gigante, G. emstkelleri* and *G. athymus*; Taylor, 1922; Brown & Alcala, 1978; Rösler et al., 2006), two species shared with other Southeast Asian countries (*G. gecko* and *G. monarchus*; Smith, 1935; Wermuth, 1965; Manthey & Grossmann, 1997), and one species (*G. hokouensis*) of doubtful provenance that may have been erroneously included in the country's gekkonid fauna (Brown & Alcala, 1978; Ota et al., 1989).

Several additional Philippine gekkonid taxa presently await description, including a large-bodied form represented thus far by only a single, highly distinct specimen from the forests of the northern Sierra Madre Mountain Range of Luzon Island (Fig. 1). Although the new species has some characteristics typical of *Luperosaurus* and others reminiscent of *Gekko,* we assign it to the former genus on the basis of the overwhelming number of character states shared with other Philippine members of the genus *Luperosaurus* (Brown et al., 2000a).

The single specimen was collected in 2003, and despite three near-continuous years of fieldwork in the area conducted by our colleagues and us (Brown et al., 1999; 2000b, 2000c; M. Duya, pers. comm.), no additional specimens have been forthcoming. Due to the low probability of obtaining further specimens and because a lack of biodiversity information can compound the conservation crisis of forest destruction in the Sierra Madres (Mallari & Jensen, 1993; van den Top, 2003; Danielsen et al., 1994; van Weerd et al., 2004), we are compelled to describe the new species on the basis of the single highly distinctive specimen.

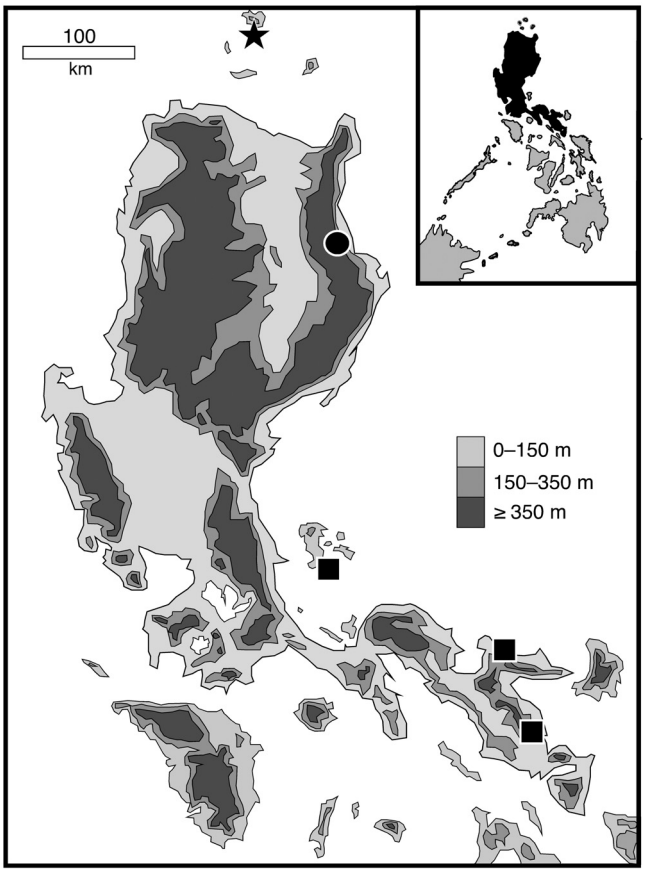

Fig. 1. Map of Luzon island in relation to the Philippines (inset) with elevational contours (key) provided with successively darkened shades of grey. The type locality of *Luperosaurus kubli* is indicated with a black circle. Known collection localities for *L. macgregori* (star) and *L. cumingii* (squares) are also provided.

MATERIAL AND METHODS

We scored data from fluid-preserved specimens deposited in museum collections (under Acknowledgments). Sex was determined by inspection of gonads when possible or by scoring of prominent secondary sexual characteristics (Brown et al., 1997, 2001a; Brown 1999) when dissection was not possible. Measurements (to the nearest 0.1 mm) were taken with Fowler digital calipers following character definitions by Ota & Crombie (1989), Brown et al. (1997) and Brown (1999). Character abbreviations include: the number of supralabials (SUL); infralabials (IFL); circumorbitals (CO); differentiated preanofemoral pore-bearing scales (PS); midbody scales (MBS); vertebrals (VS); tail annuli (TA); subcaudals (SC); snout-to-vent length (SVL); tail length (TL); head length, (HL); head width (HW); head depth (HD) snout length (SNL); eye diameter, (ED); eye-narial distance (END); tympanic annulus diameter (TAD); inter-narial distance (IND); inter-orbital distance (IOD); axilla–groin distance (AGD); femur length (FL); tibia length, (TBL); toe I length (TIL); toe IV length (TIVL); tail width (TW); and tail height (TH).

TAXONOMY

Luperosaurus kubli, new species
(Figs. 2–3)

Material examined. **–** Holotype: PNM 9156 (I. L. Osbucan field number 3-024), adult male; 900 m above sea level, Mt. Lataan, western slopes of Sierra Madre Range, Barangay Disimungal, Municipality of Nagtipunan, Quirino Province, Luzon Island, Philippines (16°20.6'N, 121° 44.0'E), coll. Edmund de Rico, 14 Mar.2003.

Diagnosis. **–** Although the new species somewhat blurs the distinction between our concepts of the genera *Luperosaurus* and *Gekko* (as defined by Brown & Alcala, 1978; Russell, 1979; and Brown et al., 2000a) we refer it to *Luperosaurus* by virtue of (1) its possession of a robust body and stout limbs; (2) interdigital webbing between all adjacent fingers and toes; (3) minute cutaneous folds bordering the posterior edge of the forelimb and a moderate flap on the posterior edge of the hind limbs; (4) small cycloid scales encircling the tail (enlarged, differentiated subcaudals absent); and (5) the absence of enlarged or elongate postmentals. However, we recognize the phenotypic similarity between some members of the genus *Luperosaurus* (*L. kubli, L. palawanensis,* and *L. macgregori*) and members of the genus *Gekko*. Therefore,

we diagnose the new species from the Philippine members of the genus *Gekko* (below; and Brown et al., 2000a).

Luperosaurus kubli most closely resembles *L. macgregori*, and to a lesser extent, *L. palawanensis*, due to the presence of cycloid, juxtaposed, non-imbricate body scales, the absence of dorsal and dorsolateral ornamental tubercles, possession of a moderate cutaneous expansion on the posterior margins of the hind limbs and only slight expansion on the posterior margin of the forelimbs, slight interdigital webbing, and low preanofemoral pore-bearing scale count (Brown & Alcala, 1978; Brown et al., 2000a). However, *L. kubli* differs from all Philippine *Luperosaurus* in having a large body size (SVL = 105.4 mm vs. 61–82.7 in *L. cumingii*; 57.3–58.9 in *L. macgregori*; 43.7–52.0 in *L. palawanensis* and 27.5–32.4 in *L. joloensis*) and it further differs from *L. cumingii, L. palawanensis*, and *L. joloensis* by lacking ornate dorsal and/or dorsolateral body tubercles. The new species differs further from *L. macgregori* by the absence (vs. presence) of enlarged lateral caudal tubercles, a greater number of Toe I and Toe III scansors (*L. kubli*: 12 and 16, respectively; *L. macgregori*: 10 or 11 and 12–14, respectively), and by having fewer infralabials (*L. kubli*: 12 or 13; *L. macgregori*: 14–16). *Luperosaurus kubli* differs further from *L. cumingii* and *L. joloensis* by the lesser extent of interdigital webbing (toes 1/6 to 1/4 webbed vs. 1/2 to 2/3 in these species). Both *L. cumingii* and *L. macgregori* possess preanofemoral pore-bearing scale count ranges that overlap with that of *L. kubli* (15–20 in *L. cumingii* and 16–18 in *L. macgregori*) but those of *L. joloensis* and *L palawanensis* do not (28–32 and 30–31, respectively).

Luperosaurus kubli differs from all known Philippine species of *Gekko* by the near uniform presence of cycloid, juxtaposed, non-imbricate scales covering the body (vs. minute to moderately enlarged scales on dorsum and enlarged, subimbricate to imbricate scales covering the venter in *Gekko). Luperosaurus kubli* also lacks elongate postmentals (vs. present in all Philippine species except *G. gecko*) as well as enlarged imbricate subcaudal scales (vs. present in all Philippine *Gekko* species). *Luperosaurus kubli* and *G. athymus* completely lack dorsal tubercles; in all other Philippine *Gekko*, dorsal tubercles are present. *Luperosaurus kubli* has a lower preanofemoral pore-bearing scale count than any Philippine *Gekko* (n=16; vs. 22–26 in *G. athymus*; 25–45 in *G. monarchus*; 46–60 in *G. mindorensis*; 54–66 in *G.*

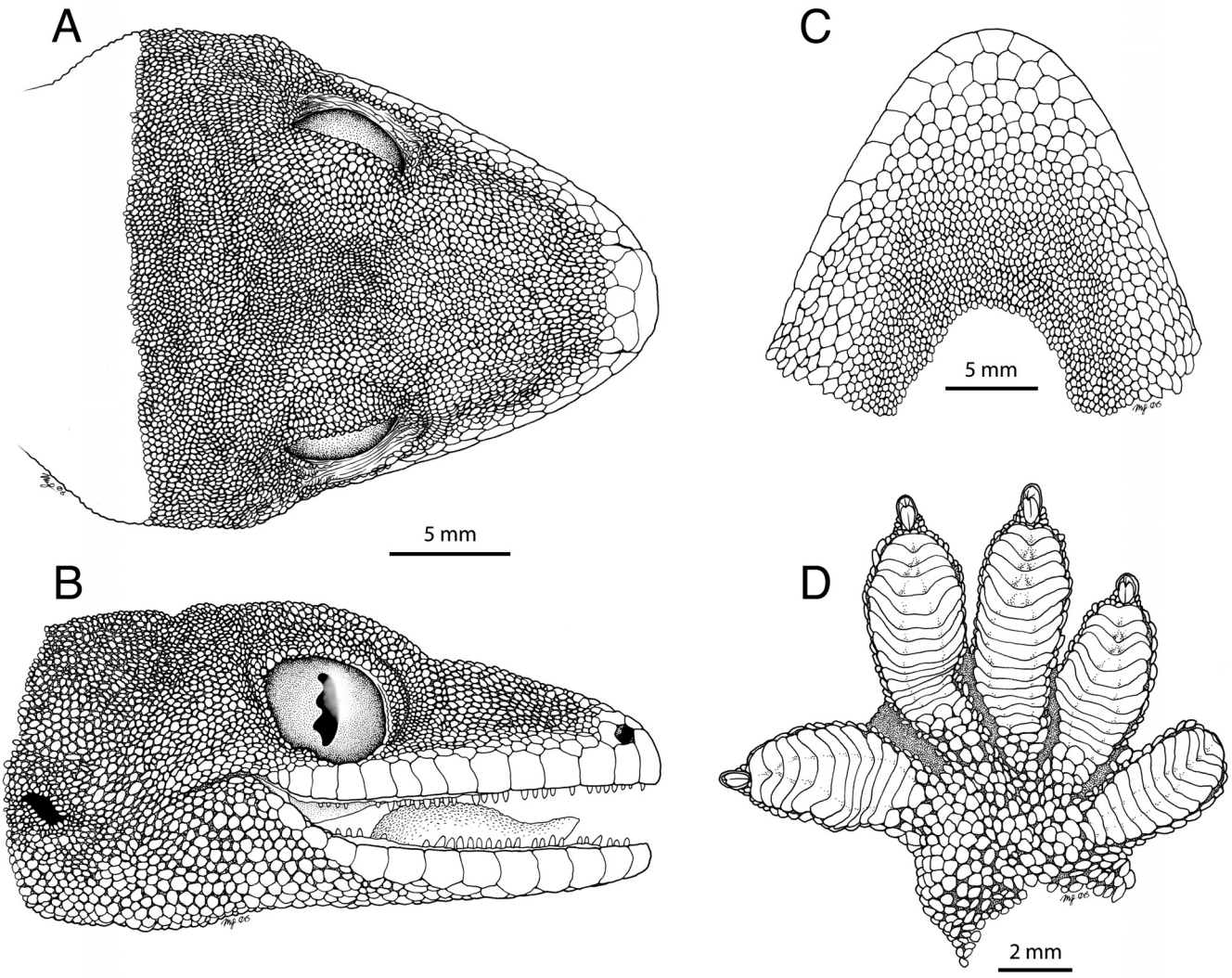

Fig. 2. *Luperosaurus kubli*, holotype (PNM 9156; adult male, SVL = 104.5 mm): A, dorsal view of head, with snout tilted forward 10°); B, lateral view of head; C, ventral view of head; D, palmar surface of right manus.

gigante; 65–72 in *G. palawanensis*; 69–80 in *G. romblon*; and 80 in *G. porosus*).

***Description of holotype*. –** (Figs. 2–3; adult male). Habitus robust, limbs stout and short, tail relatively short; head at widest point (Fig. 2A) significantly wider than (1.3 times) body at widest point (Fig. 3); anterior margins of limbs smooth, lacking cutaneous flaps or dermal folds; posterior margin of forelimbs with minute cutaneous fold (≤ 1.0 mm); posterior margins of proximal (femoral) segment of hind limbs with moderate, 2.0–2.5 mm wide cutaneous expansion; distal (tibial) half of posterior margins of hind limbs with minute cutaneous flap (≤ 1.0 mm); cutaneous expansions with undifferentiated, minute scales on dorsal and lateral surfaces. Head large, characterized by hypertrophied temporal and adductor musculature; snout subelliptical, rounded at tip in dorsal and lateral aspect (Fig. 2A, 2B); HW 83.5% of HL and 21.7% of SVL; SNL 52.8% of HW and 44.1% of HL; dorsal surfaces of head somewhat heterogeneous, with pronounced concave postnasal, prefrontal, interoribital, and parietal depressions; transverse parietal crest immediately posterior to orbits, raised and pronounced; auricular opening punctiform, obliquely ovoid; tympanum deeply sunken; orbits large, their dorsal boundary the result of highly pronounced supraorbital crests; eye large, pupil vertical, its posterior margin wavy (Fig. 2B); TAD 23.8% of ED; limbs stout and relatively short, femoral segments of hind limbs especially robust; TBL 14.8% of SVL, 81.2% of FL.

Rostral large, rectangular, twice as broad as high, with no dorsomedial depression or groove; nostril surrounded by rostral, the first labial, an enlarged subtriangular supranasal, and two smaller postnasals; supranasals separated by a single internasal; internasal azygous, pentagonal; two slightly enlarged cycloid scales follow postnasals along lateral margins of internasal (Fig. 2A, 2B); supralabials 12/13 (L/R; 8–13 subocular), bordered dorsally by one row of slightly differentiated snout scales; infralabials 13/12, bordered ventrally by 4 rows of only slightly differentiated chin scales (twice the size of gular scales); postrictal scales slightly enlarged, 2–3 times the size of scales of temporal region; mental scale triangular, followed by one pair of only slightly enlarged postmentals, and five rows of scales decreasing in size until they become undifferentiated from gular scales; remainder of undifferentiated throat scales very small, round, nonimbricate, juxtaposed (Fig. 2C); dorsal cephalic scales round to oval, nonimbricate, convex to granular; undifferentiated head scales irregularly convex, reducing in size posteriorly by interorbital region and becoming smaller and less granular in the temporal and parietal regions; palpebrals slightly larger than scales in adjacent frontal region; nuchals granular, strongly convex, continuously grading into enlarged dorsals; dorsals enlarged, round, each separated by interstitial granules, giving the appearance under magnification of a "Star of David" arrangement; throat and chin scales increasing greatly in size, becoming slightly imbricate in gular and pectoral regions, and continuing to increase in size through ventral abdomen where they become sub- to non-imbricate and juxtaposed; cephalic tubercles and spines absent; 42/44 circumorbitals, undifferentiated except for very slight dorsolateral transverse elongation and modification into slight, fringe-like points, projecting into orbit in the cases of a few scales; 34 interorbital scales.

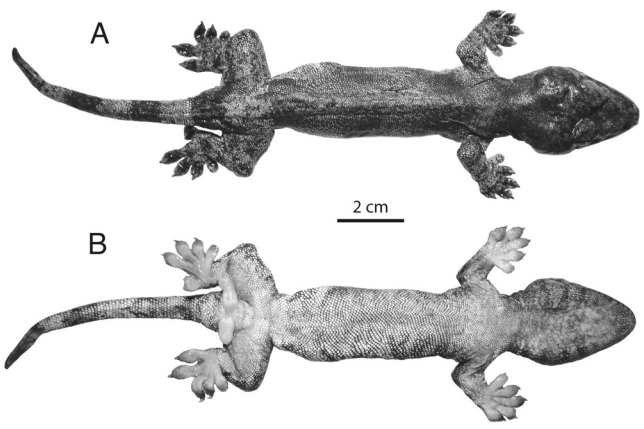

Fig. 3. *Luperosaurus kubli*, holotype (PNM 9156; adult male, SVL = 104.5 mm): Dorsal and ventral views of the body.

Axilla-groin distance 48% of SVL; undifferentiated dorsal body scales round to hexagonal, nonimbricate, smaller in vertebral region, larger laterally; each dorsal with 6–8 minute surrounding interstitial granules; 116 transverse midbody dorsals; scales on dorsal surfaces of limbs enlarged, flat to convex, juxtaposed to subimbricate, heterogeneous in size with interspersed enlarged scales surrounded by markedly smaller scales; scales on dorsal surfaces of manus and pes (on both digits and interdigital webbing) similar to dorsal limb scales; ventral body scales nonimbricate to subimbricate, much larger than lateral or dorsal body scales; imbricate ventrals.

Sixteen continuous dimpled scales in the preanofemoral pore-bearing series, arranged in a non-bowed, widely obtuse, inverted "V" formation; preanofemorals preceded by one similarly enlarged but nondimpled scale rows; followed by slightly reduced scales along medial body axis to vent; scales lateroposterior to preanofemoral series (i.e., along ventroposterior surfaces of hind limb) reduce in size sharply to minute scales under the cutaneous expansion of the posterior edge of the hind limb.

Digits widely dilated and covered on palmar/plantar surfaces by wide, bowed scansors (Fig. 2D); penultimate 2 or 3 scansors deeply notched (not divided); all digits webbed slightly, with web extending 1/5–1/4 from base and ending below the dilated hyperextensible portions of digits; subdigital scansors of manus: 11/12, 12/12, 17/16, 16/16, and 11/12 on left/right digits I–V respectively; pes: 12/12, 13/12, 15/15, 15/15, and 13/13 on left/right digits I–V respectively; all digits clawed but first; first (inner) with greatly reduced minute claw like scale; remaining terminal claw-bearing phalanges compressed, with large recurved claws, rising free at distal end, extending well beyond dilated portion of digit.

Tail base bordered by a single, greatly enlarged cloacal spur on each side of vent; postcloacal swellings pronounced; Tail short, 60.7% of SVL (including regenerated 14 mm tip); TH

Table 1. Distribution of selected diagnostic characters in *Luperosaurus kubli* and the remaining species of *Luperosaurus.* Bilaterally symmetrical characters are presented for the right side of each specimen. Measurements are presented in mm and all specimens (with the exception of the *L. joloensis* paratype and two hatchling *L. cumingii* [measurements excluded]) are considered adults. Sources of data include (1) Brown et al., 2000a, (2) Ota et al. (1996), (3) Russell (1979a), (4) Brown and Alcala (1978), and (5) this study.

n =	*kubli* 1	*cumingii* 4	*macgregori* 3	*palawanensis* 2	*joloensis* 2	*iskandari* 1	*browni* 2	*brooksi* 1	*yasumai* 1
Snout-to-vent length	105.4	61.0–82.7*	57.4–58.9	43.7–52.0	27.5–32.4	69.4	60.0–66.5	58.5	38.9
Body shape	robust	robust	robust	robust	robust	elongate	elongate	elongate	robust
Axilla-groin distance	50.8	40.6	30.1–31.8	19.1–21.1	14.2	37.0	33.1–33.4	31.0	19.0
Subrictal tubercles	–	–	–	+, –	–	+	+	–	–
Intersupranasals contacting rostral	1	2	1–3	1–3	1	1	1	1	3
Lateral tail tubercles	–	+	+	+	+	–	+	+	+
scales contacting nostril	5	5–6	5	5	5	5	5–6	5	5
Head length/head width	1.2	1.2–1.3	1.4	1.2	1.3–1.4	1.6	1.6–1.7	1.7	1.2
Supralabials**	13	15–17	13–15	11–13	11–13	16	13–15	11	9–10
Infralabials**	12	13–15	14–16	10–11	10–12	15–17	13–14	10–11	10–11
Preanao-femorals	16	15–20	16–18	28–32	30–31	10	28–32	40	–
Tail height/tail width	0.76	0.90	0.75–0.87	0.80	0.50	0.77	0.65–0.80	0.72	0.34
No. scansors on toe I	12	11–14	10–11	9–11	8–9	10	11–13	12	8
No. scansors on toe III	16	13–16	12–14	12–13	9–13	17–18	16–19	16	7
Extent web between digits III and IV of pes	1/6–1/4	1/2–3/4	1/5–1/3	1/5–1/4	15–2/3	2/3–3/4	1/2–2/3	3/5	1/2–3/4
Auricular opening	oval moderate	oval, moderate	oval, oblique small	large subcircular	narrow oblique	elliptical, vertical,	oval, oblique	round, small	oval, horizontal
Penultimate scansors	deeply notched	deeply notched	a few divided	bowed	deeply notched	bowed	bowed	notched–divided	weakly notched
Dorsal body scales	round, convex, granular	round, convex, granular	round, convex, granular	round, convex, granular	round, convex, granular	hexagonal flat	round-hex-agonal,flat–convex	round-hex-agonal,flat–convex	round, convex, granular
Dorsal tubercles	–	strongly convex	–	conical or spinose	strongly spinose	few, flat	flat or convex	flat or convex	strongly spinose
Ventrolateral body tubercles	–	a few, convex	a few, convex	a few, spinose	many, spinose	a few, flat	many, convex	a few, flat	many, spinose
Ventrals	granular to subimbricate	small, granular juxtaposed	small, granular juxtaposed	large, flat, subimbricate	small, flat to convex***, subimbricate	large, flat, subimbricate	large, flat, subimbricate	large, flat, subimbricate	large, flat, subimbricate
Anteriormost chin scales	slightly enlarged	small	small	slightly enlarged	slightly enlarged	slightly enlarged	small	small	slightly enlarged
Anterior forelimbs expansions	–	wide flaps	narrow folds	–	moderate folds	wide flaps	moderate fold	–	–
Posterior forelimbs expansions	minute fold	wide flaps	moderate flaps	–	moderate folds	wide flaps	narrow folds	narrow folds	narrow folds
Anterior hindlimbs expansions	–	narrow folds	–	–	narrow folds	narrow folds	–	–	–
Posterior hindlimbs expansions	moderate flaps	wide flaps	moderate flaps	wide flaps	wide flaps	wide flaps	narrow folds	narrow folds	wide flaps
Source	(5)	(1, 5)	(1, 5)	(1, 4)	(1, 2, 3)	(1)	(1, 2)	(1, 3)	(1, 2)

*Based on CAS 182570 and TNHC 61910; **Counted as all enlarged labial scales to point below posterior corner of eye; ***based on MCZ 26118;

(not including basal denticulate lobes) 76.3% of TW; tail not depressed, cylindrical, unadorned, lacking dorsal or lateral tubercles; 11 fracture planes / autotomy grooves (= whorls or annulations) before autotomy scar (52.5 mm), 4–5 annuli estimated in autotomized portion based on length (13.7 mm), for an estimated total annuli count of 15–16; dorsal caudal scales granular, convex, round to hexagonal; scales at posterior margin of each annulation only slightly enlarged.

***Colouration in preservative*. –** Dorsum background dark grey with three straight transverse black bands (10 mm in width) in AGD, the darkest before insertion of hind limbs; dorsal nuchal region and posterior portions of head very dark grey, interorbital region, palpebra, and snout slightly lighter; lateral portions of head and labial scales flat grey; postrictal region with white flecks; dorsal surfaces of limbs light grey with numerous dark brown flecks and two transverse thin bands per distal limb segment; humeral and femoral segments of limbs light grey with dark brown blotches; dorsal surfaces of digits dark grey with slightly lighter claws; dorsal and lateral portions of tail banded alternating dark and light grey (not corresponding to tail annuli); distal autotomy regrowth dark brown; inguinal region with bright white oblique markings.

Infralabial region and chin flat grey; gular region light grey, flanked by slightly lighter ventrolateral jaw colouration, accented by three dark brown postrictal bars on both sides of the head (one subocular, one postrictal, one infratympanic); sternal region homogeneous grey; ventral body and limbs light grey with numerous brown and dark grey blotches; preanofemoral pore-bearing scale series white with orange pores; palmar and plantar surfaces of manus and pes yellowish with light grey subdigital scansors; ventral tail white with three flat grey transverse bars.

***Colouration in life*. –** Dorsal surfaces of body and limbs light tan with dark brown blotches and transverse crossbars; head pale yellow with dark brown blotches and postrictal bars; labials alternating dark brown and bright yellow; iris grey; ventral surfaces of head light grey to white; oblique inguinal marking bright white. (From photographs of holotype before preservation).

***Ecology and Natural History*. –** We have no information on microhabitat preference, abundance and distribution, or reproduction in the new species. The single specimen was first observed gliding/parachuting from the canopy (estimated 8–15 m) and was collected where it landed at 1.5 m above the ground on the trunk of a large tree (70–90 cm dbh). When captured by hand, the animal attempted to escape by twisting and biting the collector. For a description of the forests of the Sierra Madres, see Danielsen et al. (1994).

***Etymology*. –** The specific epithet is chosen from Tagalog (traditional Filipino) term for hidden, unknown, or concealed, in reference to the secretive habits of this apparently rare forest species, and to the uncertain systematic affinities of the genus *Luperosaurus*.

DISCUSSION

The description of *L. kubli* brings the total number of endemic species of Philippine *Luperosaurus* to six (Brown & Diesmos, 2000; Brown et al., 2000a; Gaulke et al., in press). *Luperosaurus kubli* is phenotypically most similar to *L. macgregori*, with the principal differences being *L. kubli*'s lack of lateral tail tubercles, fewer infralabial scales, a greater number of subdigital scansors, and a suite of characters related to *L. kubli*'s dramatically larger body size.

Discussion of species relationships and the systematic affinities of the genera *Gekko* and *Luperosaurus* await a phylogenetic analysis (Brown et al., 2000a; Russell & Bauer, 2002) but it is clear that the new species further obfuscates the obscure boundary between the two genera. We expect that future studies will demonstrate neither genus to be monophyletic and we are intrigued by the possibility that species groups/clades (Brown et al., 2000a) of the genus *Luperosaurus* may be derived from different portions of the genus *Gekko*. The phenotypic similarity of some members of the genus *Gekko* to some members of the genus *Luperosaurus* (e.g., *L. kubli, L. macgregori, L. palawanensis*) is reminiscent of the similarity between some members of the genus *Luperosaurus* (e.g., *L. iskandari*) and members of the genus *Ptychozoon* (e.g., *P. rhacophorus*; Brown et al., 1997, 2000a), suggesting convergent evolution or shared ancestry. Clearly, studies of the phylogenetic relationships of these enigmatic taxa are fertile grounds for future research.

As has been assumed for most species of *Luperosaurus*, we must consider the possibility that the new species may be a high canopy specialist (Brown & Diesmos, 2000; Brown et al., 2000a; Gaulke et al., in press). This might explain why the new species has been encountered by biologists only once despite intensive continual survey efforts in the Sierra Madres (Danielsen et al., 1994; Brown et al., 2000c). However, recent observations (by RMB and C. Oliveros, March 2006) of *L. macgregori* from Babuyan Claro Island off northern Luzon, suggest that the obligate canopy hypothesis may not suffice as an explanation for the rarity of *Luperosaurus* species. On Babuyan Claro where original coastal forests have not yet been removed, *L. macgregori* was quite common (more than 50 specimens observed over in a three night period) in a narrow (30–50 m wide) strip of mature coastal forest; farther away from the coast (500–1,000 m), the species was seldom encountered. Thus we consider it at least possible that the real preferred microhabitat of some species of *Luperosaurus* could be mature coastal forest. If coastal forest was the preferred habitat for some species of the genus *Luperosaurus*, and since this type of forest in the Philippines has now been destroyed by deforestation, this might possibly explain why *Luperosaurus* are so seldom encountered today (Brown & Diesmos, 2000; Brown et al., 2000a). Thus we consider it possible that Philippine members of the genus *Luperosaurus* may be highly endangered, with small fragmented populations persisting at low densities in suboptimal (inland or montane) forested habitats. Future survey work, targeting available coastal forest fragments and climax forest canopies will be

the only way to support or refute the conjecture presented here.

Parachuting locomotion is well known in the genus *Ptychozoon* (Brown et al., 1997) but has seldom been noted in the genus *Luperosaurus*. Although taxonomists have noted cutaneous expansions bordering the limbs of *Luperosaurus* species (Boulenger, 1885; Stejneger, 1907; Russel, 1979; Ota et al., 1996; Brown et al., 2000a), few biologists have published observations of the parachuting behavior of species of the genus *Luperosaurus*. In addition to our observations reported here, we note that ancillary observations of collectors of *L.* cf. *cumingii* (Gaulke et al., in press) involve accounts of parachuting and the capture of *Luperosaurus* in mist nets set for bats (P. Heideman & L. Heaney, pers. comm.). Together, these observations suggest to us that species of *Luperosaurus* naturally may glide or parachute from elevated perches in the same way that has been reported for species of *Ptychozoon* (Brown et al., 1997, and citations therein).

The discovery of another species of *Luperosaurus* from the largely unexplored Sierra Madres of Luzon is not surprising. This vast isolated mountain range is expected to harbor endemics and high levels of undocumented biodiversity (R. Brown et al., 1999, 2000b, 2000c; W. Brown et al., 1997, 1999). The repeated discovery of new species in this geologically distinct and zoogeographically unique component of Luzon emphasizes the immediate need for our ongoing comprehensive herpetological inventory of the northeastern Philippines.

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APPENDIX

Comparative material examined

Luperosaurus cumingii: Philippines, Luzon Isl., Camarines Sur Province, Municipality of Caramoan, Anuling Mountain: UF 77829; Albay Province, Municipality of Tiwi, Barangay Banhaw, Sitio Purok 7, Mt. Malinao, 550 m above sea level: TNHC 61910; *Luperosaurus* cf. *cumingii*: Philippines, Negros Isl., Negros Oriental Prov., Municipality of Valencia, Lake Balinsasayao: SUR 2211; Saksak Cr., Mt. Cuernos de Negros, "Camp Lookout:" CAS-SU 24394–95; Negros Isl., Lake Balinsasayao: CAS 182570; *L. joloensis*, Philippines, Mindanao Isl., "Cotobato Coast:" MCZ 26118; Jolo Isl., Siet Lake: CAS 60675 (paratype); *L. macgregori*, Philippines; Calayan Isl.: CAS-SU 6263 (paratype); Babuyan Island group., Barit Isl. (near Fuga Isl.): USNM 508306–508308; *L. palawanensis*, Philippines, Palawan Isl., Thumb Peak, about 7 km NW of Iwahig: CAS 136740 (paratype); Palawan Isl., Malatgaw River, SE of Thumb Peak, about 3.5 km WNW of Iwahig: CAS 134207 (holotype); *L. browni*, Malaysia, peninsular Malaysia, Selangor, Ulu Gombak forest reserve, 35 km N of Kuala Lumpur: FMNH 185106 (holotype); Malaysia, Sarawak (Borneo Isl.), Lambir National Park: KUZ 12835 (*L. serraticaudus* holotype); *P. rhacophorus*, Malaysia, Sabah, Mt. Kinabalu: KUZ 35118; *L. iskandari*, Indonesia, Sulawesi Is., Propinsi Sulawesi Tengah (Central Sulawesi Province), Kabupaten Banggai, Kecamatan Pagimana, Kampung/Desa Siuna, approximately 4 km E of Dusun Satu (Region 1), Mt. Tompotika (0°44.5'S, 123°01.1'E); *L. yasumai*, Indonesia, Kalimantan (Borneo Isl.), Bukit Soeharto Experimental Forest, 45 km SSW of Samarinda: KUZ 30408 (holotype); *L. brooksi*, Indonesia, Sumatra Isl., Benkuelen, Lebong Tandai: BMNH 1920.1.16.2 (holotype); *Gekko hokouensis*, "Philippines" FMNH 17812 (*L. amissus* holotype); *Gekko gigante,* Philippine s, Iloilo Prov., Gigante South Isl., Tantangan: CAS 124315–17 (paratypes); SW part Gigante Norte Isl.: CAS 124866–67 (Paratypes); *Gekko athymus,* Philippines, Palawan Isl., Palawan Prov., about 10 km WSW of Iwahig: CAS 137677; about 8-9 km S. of Balico: CAS-SU 23119 (holotype); about 20 km SW of Iwahig: CAS-SU 23121 (paratype); *Gekko porosus,* Philippines, Batanes Prov., Batanes Isls., Itbayat Isl.: CAS 60526 (holotype); *Gekko mindorensis,* Philippine s, Negros Isl., Negros Oriental Prov., Himangpangon Cave, Manjayod: CAS-SU 28656–60; *Gekko monarchus,* Philippines, Palawan Isl., Palawan Prov. about 1.5 km. W.S.W. of Iwahig: CAS-SU 28416; about 5 km SSE of Iwahig : CAS-SU 28496; about 7 km WNW of Iwahig: CAS-SU 28554; *Gekko romblon,* Philippines, Sibuyan Isl., Romblon Prov., Taclobo Barrio: CAS 139180–82 (paratypes); *Gekko palawanensis,* Philippines, Palawan Isl., Palawan Prov., about 7 km WNW of Iwahig: CAS 17318; 8 km W of Iwahig: CAS 17319; about 9 km W of Iwahig: CAS 17320–22.