

## A COLLECTION OF AMPHIBIANS AND REPTILES FROM HILLY EASTERN CAMBODIA

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**ABSTRACT.** – The first amphibian and reptile collection is reported from hilly eastern Cambodia since Henri Mouhot's work in 1859. The collection contains 30 species of amphibians and 42 species of reptiles. *Leptobranchium mouhoti*, new species, and *Ophryophryne synoria*, new species, are described. Of the remaining collection, 11 species of amphibians (39.3%) and seven species of snakes (33.3%) are reported from Cambodia for the first time. Comparisons of the frogs show strong faunal overlap with that of mountainous central Vietnam, but little faunal overlap with the Cardamom Mountains of southwestern Cambodia.

**KEY WORDS.** – Cambodia, amphibians, reptiles, new species.

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### INTRODUCTION

The amphibian and reptile fauna of Cambodia has received very limited attention. Bourret's monographs on the amphibians (1942), turtles (1941a), and snakes (1936) of French Indochina (= Cambodia, Laos, and Vietnam), published during the height of French colonial power in the region, remain the major works on Cambodia, supplemented only by Saint Girons' (1972a) monograph on Cambodian snakes. Consequently, the snakes of Cambodia are the best known component of the herpetofauna, and the lizards the least known. Since Saint Girons, years of civil conflict and security concerns in Cambodia have hampered new investigations by foreign and national workers. A recent, improved political situation has made new herpetological fieldwork possible, and that attention has largely focused on the Cardamom Mountains of southwestern Cambodia, including their low elevation river valleys. This new fieldwork in the Cardamoms has resulted in publications on the amphibian fauna, including descriptions of three new frog species (Ohler et al., 2002), a new snake species (Daltry & Wüster, 2002), and the status of two critically endangered, large reptiles, *Crocodylus siamensis* and *Batagur baska* (Daltry & Chheang, 2000; Platt et al., 2003a, b; Holloway & Heng, 2004). Elsewhere in Cambodia, new work has been conducted on the trade and reproductive biology of

homalopsine watersnakes at Tonle Sap Great Lake (Stuart et al., 2000; Murphy et al., 2002) and on the trade and distribution of turtles (Lehr & Holloway, 2000, 2002; Touch et al., 2000; Stuart et al., 2002; Holloway, 2003; Stuart and Platt, 2004).

Three upland areas in Cambodia contain sufficient topography to harbor swift, rocky streams: the Cardamom and Elephant Mountains in the southwest, a cluster of low hills in the north-center and along the northern border, and the hills and mountains in the extreme east. These eastern uplands in Mondolkiri, Ratanakiri, and Stung Treng Provinces are part of the Annamite Mountains that separate Vietnam from Laos and Cambodia. More specifically, the uplands in eastern Mondolkiri Province (maximum elevation 1,078 m) are the lower slopes of the Langbian (=Da Lat) Plateau in southern Vietnam, and the uplands in eastern Ratanakiri Province (maximum elevation over 1,500 m) are the lower slopes of the Kontum Plateau in central Vietnam.

Only one herpetological collection has been made in the eastern uplands of Cambodia. Henri Mouhot (1826-1861), French explorer and naturalist, made natural history collections in Thailand, Cambodia, and Laos from 1858-1861 under the sponsorship of the Royal Geographical and Zoological Societies of London. Although Mouhot was

primarily interested in ornithology and conchology, he did collect some specimens of amphibians and reptiles during his voyage (Mouhot, 1864). His herpetological collections from Cambodia were sent to the British Museum, where they were described by John Edward Gray and Albert Günther (Gray, 1861a, b; Günther, 1861, 1864). During his expedition, Mouhot made a single trip to eastern Cambodia. In 1859 he traveled by boat from Phnom Penh up the Mekong River to “Pemptiélan” (probably Kampong Cham today), then “150 miles” eastward overland to a village called “Brelum,” where he lived from 16 August–29 November among the Stiên (= Stieng) hill tribe (Mouhot, 1864). Ashburton in Mouhot (1864) gave coordinates for Brelum as “lat. 11°58’, long. 107°12,” and if taken to be precise, place Brelum inside present-day Vietnam approximately 25 km from the Mondolkiri Province, Cambodia border. Brelum was considered within the confines of Cambodia at the time of Mouhot’s visit, and the border has probably been redefined since. In any case, Mouhot certainly traversed through, and worked in or very close to, present-day hilly Mondolkiri Province, Cambodia, during his time in Brelum. *Bufo galeatus*, described by Günther from Mouhot’s Cambodian collection, is at least one example of a species that Mouhot must have obtained during the Brelum expedition; this upland species of toad is known to occur in eastern Cambodia (see below) and central and southern Vietnam (Smith, 1921; Inger et al., 1999; Liu et al., 2000), but not southwestern Cambodia (Ohler et al., 2002; B. L. Stuart and D. A. Emmett, unpublished data).

Here we report on new herpetological collections made in 2000 and 2003 in the uplands of eastern Mondolkiri, northeastern Ratanakiri, and northeastern Stung Treng Provinces, Cambodia.

## STUDY AREAS

The Seima Biodiversity Conservation Area, part of what was formerly the Samling Forest Concession, is situated in Keo Seima and O’Rang Districts, Mondolkiri Province, at the border with Vietnam. The Seima Biodiversity Conservation Area is 305,400 ha in size, and ranges from 109 m elevation in Keo Seima to 800 m elevation in O’Rang. Higher elevations are predominantly covered by evergreen and evergreen mixed with deciduous forests, and lower elevations are dominated by grasslands with deciduous dipterocarp forest, gallery evergreen forest, and bamboo forest. The Cambodian Forestry Administration and Wildlife Conservation Society (WCS) have been working together to promote biodiversity conservation in the Seima Biodiversity Conservation Area since March 2000. The authors collected specimens of amphibians and reptiles at the Seima Biodiversity Conservation Area from 30 October–10 November and 09–12 December 2003, with a few specimens collected at other times by colleagues (names provided in Species Accounts) that were donated to us for the purpose of this work (Fig. 1).

Phnom Nam Lyr Wildlife Sanctuary is situated in O’Rang and Pichrada Districts, Mondolkiri Province, at the border

with Vietnam. Phnom Nam Lyr Wildlife Sanctuary lies slightly northeast of Seima Biodiversity Conservation Area, and a continuous strip of forest along the Cambodian border connects both areas. The sanctuary is 47,500 ha in size, and ranges from 300 m elevation to a maximum of 1,078 m elevation on the summit of Phnom Nam Lyr Mountain. Lower elevations in the sanctuary are dominated by grasslands with deciduous dipterocarp forest, gallery evergreen forest, and bamboo forest, and Phnom Nam Lyr Mountain is covered by evergreen forest, bamboo forest, and a mixture of the two. Phnom Nam Lyr Wildlife Sanctuary was established on 01 November 1993 under the Royal Decree on Creation and Designation of Protected Areas in Cambodia, signed by His Majesty the King Norodom Sihanouk. The senior author, An Dara, and Suon Phalla collected specimens of amphibians and reptiles at Phnom Nam Lyr Wildlife Sanctuary from 14–21 June 2000 (Fig. 1).

Virachey National Park, formerly known as Virachey Protected Area, is situated in Ta Veng, Von Sai, and Andong Meas Districts in Ratanakiri Province, and in Siem Pang District in Stung Treng Province. The national park is 332,500 ha in size, and is bordered on the north by Laos and on the east by Vietnam. Hills and low mountains dominate the topography of the park, with most areas above 400 m elevation, and with maximum elevations above 1,500 m elevation near the Laos border. Most of the park is covered by bamboo forest and evergreen forest, usually in varying degrees of mixture. Virachey National Park was established on 01 November 1993 under the Royal Decree on Creation

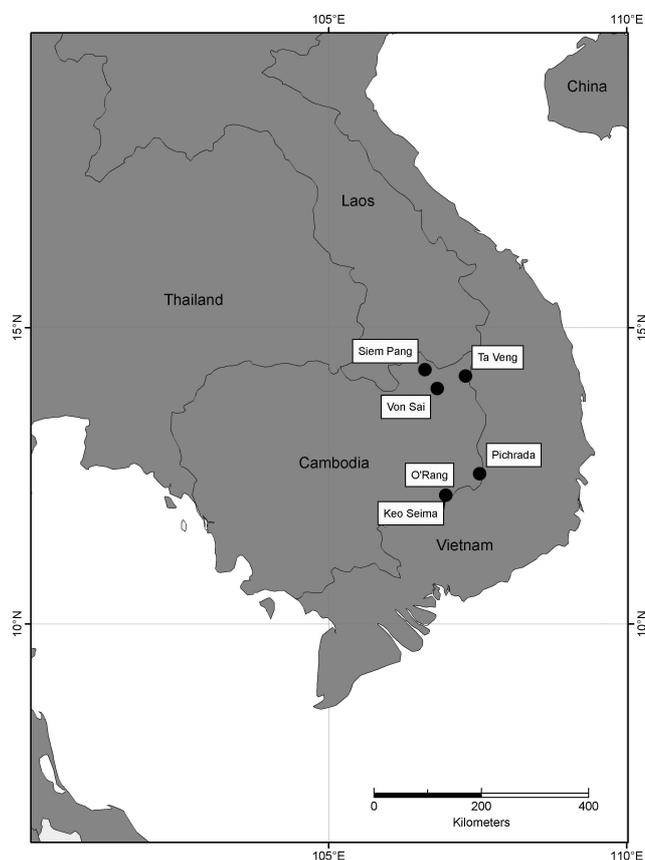


Fig. 1. Map showing the collecting localities in this study.

Table 1. Complete locality information for district names provided in Species Accounts.

District	Protected Area	Province
Keo Seima	Seima Biodiversity Conservation Area	Mondolkiri
O'Rang	Seima Biodiversity Conservation Area	Mondolkiri
Pichrada	Phnom Nam Lyr Wildlife Sanctuary	Mondolkiri
Ta Veng	Virachey National Park	Ratanakiri
Von Sai	Virachey National Park	Ratanakiri
Siem Pang	Virachey National Park	Stung Treng

and Designation of Protected Areas in Cambodia, signed by His Majesty the King Norodom Sihanouk. The authors collected specimens of amphibians and reptiles at Virachey National Park from 19 November-05 December 2003 (Fig. 1).

## METHODS

Specimens were caught in the field by hand, preserved in 10% buffered formalin, and later transferred to 70% ethanol. Tissue samples were taken by preserving pieces of liver in 95% ethanol or 20% DMSO/EDTA-salt saturated storage buffer before the specimens were fixed in formalin. Specimens and tissues were deposited and comparative material was examined in The Field Museum, Chicago (FMNH). Comparative material was also examined from the holdings of the Muséum national d'Histoire naturelle, Paris (MNHN).

Measurements were made with dial calipers to the nearest 0.1 mm. Measurement abbreviations used are: SVL = snout-vent length; HDL = head length from tip of snout to rear of the jaws; HDW = head width at the commissure of the jaws; SNT = snout length from tip of snout to the anterior corner of the eye; EYE = diameter of the exposed portion of the eyeball; IOD = interorbital distance; TMP = horizontal diameter of tympanum; TEY = tympanum-eye distance from anterior edge of tympanum to posterior corner of the eye; TIB = tibia length; TAL = tail length; TTL = total length; BDW = maximum body width; FOT = foot length from proximal edge of inner metatarsal tubercle to tip of fourth toe; IML = length of inner metatarsal tubercle; IMW = width of inner metatarsal tubercle; CPL = maximum straight carapace length, including shell projections; CPW = maximum carapace width.

Only species with preserved voucher specimens are reported here. Specimens with affinities to *Limnectes hascheanus*, *Philautus banaensis* and *Cyrtodactylus irregularis* were collected during this fieldwork, but will be treated elsewhere.

For the sake of brevity, localities are given with district name as the largest political unit (Table 1).

## SPECIES ACCOUNTS

Nineteen species characteristic of anthropogenically-modified environments were collected (Table 2) near villages, agricultural lands, and roads, with some also taken in open grassland or disturbed forest. All are currently recognized to have wide ranges in mainland Southeast Asia.

### Megophryidae

#### *Leptobrachium mouhoti*, new species

(Figs. 2-4)

**Material examined.** – Holotype: FMNH 262756, adult male, in shallow water among tree roots at bank of O Doeung Por Stream in hilly evergreen forest, near 12°18'08.4"N 107°03'08.1"E, 500 m elev., Seima Biodiversity Conservation Area, O'Rang District, Mondolkiri Province, Cambodia; coll. B. L. Stuart, K. Sok, and T. Neang, 2 Nov.2003.

Paratypes: FMNH 261757-60, 261762-63 (six adult males), FMNH 261761 (one adult female), evergreen mixed with deciduous and bamboo forest, near 12°18'06.4"N 107°03'06.1"E, 600-700 m elev., Phnom Nam Lyr Mountain, Phnom Nam Lyr Wildlife Sanctuary, O'Rang District, Mondolkiri Province, Cambodia, coll. B. L. Stuart, D. An, and P. Suon, 16-17 Jun.2000. FMNH 261764 (one adult male), gallery evergreen forest along stream, near 12°29'49"N 107°29'33"E, 700 m elev., Phnom Nam Lyr Mountain, Phnom Nam Lyr Wildlife Sanctuary, O'Rang District, Mondolkiri Province,

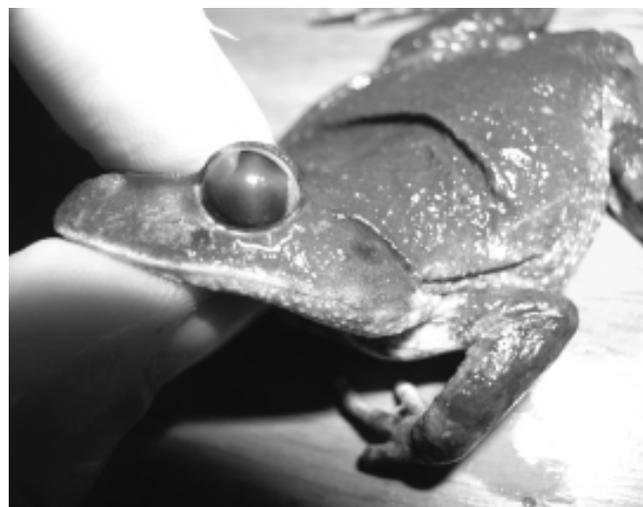


Fig. 2. Eye of *Leptobrachium mouhoti*, new species, holotype male (FMNH 262756), in life.

Table 2. Voucher numbers and district localities of species in the collection that are characteristic of anthropogenically-modified environments.

Taxon	FMNH number	Locality
<b>Bufo</b>		
<i>Bufo melanostictus</i> Schneider	261880, 262751-52 262750 262749	Keo Seima Siem Pang Ta Veng
<b>Microhylidae</b>		
<i>Microhyla heymonsi</i> Vogt	262058-59	Pichrada
<i>Microhyla ornata</i> (Duméril and Bibron)	262699-700, 262703	Pichrada
<i>Microhyla pulchra</i> (Hallowell)	262785 262677	Keo Seima Pichrada
<b>Ranidae</b>		
<i>Hoplobatrachus rugulosus</i> (Wiegmann)	262748, 262590-91 262596-97	Keo Seima Pichrada
<i>Fejervarya limnocharis</i> (Gravenhorst)	262770-74, 262932 262769 261990-96	Keo Seima O'Rang Pichrada
<i>Occidozyga lima</i> (Gravenhorst)	261806, 262780-82 261785-86	Keo Seima Pichrada
<i>Occidozyga martensii</i> (Peters)	261807-08, 262825-31 262823-24 261813-22 262822	Keo Seima O'Rang Pichrada Siem Pang
<b>Rhacophoridae</b>		
<i>Polypedates leucomystax</i> (Gravenhorst)	262810-13, 263130-35 263152-71 262808-09 262805-07	Keo Seima Pichrada Siem Pang Von Sai
<b>Agamidae</b>		
<i>Calotes versicolor</i> (Daudin)	262046-47	Pichrada
<b>Scincidae</b>		
<i>Mabuya macularia</i> (Blyth)	262978-79 262977 261834	Keo Seima O'Rang Pichrada
<i>Mabuya multifasciata</i> (Kuhl)	262953 262952	Siem Pang Ta Veng
<b>Gekkonidae</b>		
<i>Cosymbotus platyurus</i> (Schneider)	261831	Keo Seima
<i>Gehyra mutilata</i> (Wiegmann)	262976	O'Rang
<i>Gekko gecko</i> (Linnaeus)	261848-49	Pichrada
<b>Colubridae</b>		
<i>Enhydris plumbea</i> (Boie)	259222	Pichrada
<i>Ptyas korros</i> (Schlegel)	263017	O'Rang
<i>Rhabdophis subminiatus</i> (Schlegel)	263010 259207-09	Siem Pang Pichrada
<b>Elapidae</b>		
<i>Bungarus fasciatus</i> (Schneider)	263019	Ta Veng

Cambodia, coll. B. L. Stuart, D. An, and P. Suon, 22 Jun.2000. FMNH 261765 (one adult male), gallery evergreen forest along stream, near 12°29'41"N 107°31'09"E, 700 m elev., Phnom Nam Lyr Mountain, Phnom Nam Lyr Wildlife Sanctuary, O'Rang District, Mondolkiri Province, Cambodia, coll. B. L. Stuart, D. An, and P. Suon, 23 Jun.2000. FMNH 262753-55 (three adult males), hilly evergreen forest, waterfall on O Ngeugn Stream, 12°18'50.5"N 107°06'03.4"E, 500 m elev., Seima Biodiversity Conservation Area, O'Rang District, Mondolkiri Province, Cambodia, coll. B. L. Stuart, K. Sok, and T. Neang, 11 Dec.2003; FMNH 262757 (one adult male), same data as holotype except date of collection on 6 Nov.2003.

Comparative material examined: *Leptobrachium banae* FMNH 258079, Xe Kong Province, Laos. *Leptobrachium buchari* FMNH 258080-90, Champasak Province, Laos. *Leptobrachium chapaense* FMNH 258065, 258067-71, Bolikhamxay Province, Laos. *Leptobrachium hendricksoni* FMNH 178260-61, paratypes, Pahang, Malaysia. *Leptobrachium pullum* FMNH 196015, syntype, Annam, Vietnam. *Leptobrachium smithi* FMNH 172661-62, 173973-75, Chiang Mai, Thailand; FMNH 263263, Vientiane Province, Laos; FMNH 258091-92, 258097, 258101-06, Sayaboury Province, Laos. *Leptobrachium xanthospilum* FMNH 252914, 252920, Gia Lai Province, Vietnam. Additional data on *L. banae* and *L. xanthospilum* taken from original description (Lathrop et al., 1998), on *L. buchari* taken from original description (Ohler et al., 2004), on *L. chapaense*

taken from Lathrop et al. (1998), on *L. hendricksoni* taken from original description (Taylor, 1962), on *L. pullum* taken from original description (Smith, 1921) and Matsui et al. (1999), and on *L. smithi* taken from original description (Matsui et al., 1999). Complete data on *L. hasseltii* taken from Dubois and Ohler (1998), Iskandar (1998), and Matsui et al. (1999).

**Etymology.** – The specific epithet is a patronym honoring Henri Mouhot (1826-1861), French explorer, naturalist, and earliest scientific collector of amphibian and reptile specimens in hilly eastern Cambodia.

**Diagnosis.** – A *Leptobrachium* having males with SVL 51.6-64.7 and female 70.2; eye black with a narrow, orange-red crescent on outer margin from the anterior corner over the eye to lower rear corner; uniform dark gray dorsum; flank gray with small light spots; venter gray or brown with small light spots.

**Description of holotype.** – Habitus moderately stocky; head wider than long. Snout rounded in dorsal view, slightly projecting beyond lower jaw in profile; nostril closer to tip of snout than to eye; canthus rostralis distinct, constricted behind nostrils; lores oblique, slightly concave; diameter of eye less than length of snout; interorbital distance much greater than width of upper eyelid; tympanum round, weakly visible, slightly elevated relative to skin of temporal region, diameter smaller than that of the eye, diameter greater than the distance between the tympanum and eye; no pineal ocellus; large, slit-like vocal sac openings on floor of mouth; no nuptial pad.

Tips of all fingers blunt, not swollen; relative finger lengths  $II = IV < I < III$ ; two oval palmar tubercles in contact, low callous bumps on ventral surface of fingers; no finger webbing. Tips of toes blunt, slightly swollen; relative toe lengths  $I < II < V < III < IV$ ; webbing on toe I to base of tip, on preaxial side of toe II to toe articulation, on postaxial side of toe II to base of tip, on preaxial side of toe III to level of proximal subarticular tubercle continuing as a fringe to base of tip, on postaxial side of toe III to midway between proximal

subarticular tubercle and tip continuing as a fringe to base of tip, on preaxial and postaxial sides of toe IV to level of tip of toe V continuing as a fringe to base of tip, and on toe V to midway between base and tip; a distinct, oval inner metatarsal tubercle, no outer metatarsal tubercle; heels non-overlapping when legs are held at right angles to body.

Skin on dorsum and dorsal surface of forelimbs smooth with fine network of ridges; skin on dorsal surface of hindlimbs smooth; skin on flank, chin, belly, and ventral surface of thigh with dense, small glandular warts; skin on ventral surface of forelimbs and tibiotarsus smooth; large oval axillary gland on ventrolateral surface slightly posterior to insertion of forelimb with body; distinct, whitish, round femoral gland on posteroventral surface of thigh, closer to knee than vent.

**Colour of holotype in life.** – Dorsum uniform dark gray-black, with three scattered round gray spots on back near groin; flank dark gray with small, scattered white spots, usually on warts; dorsal surface of forelimb and tibiotarsus with dark gray bands; anterior and dorsal surface of thigh with silver-copper bands; eye black with a narrow, orange-red crescent on outer margin from the anterior corner over the eye to lower rear corner (orange-red colouration visible only in posterior corner of eye in relaxed living animal, remainder visible when upper eyelid is maximally retracted); black spot at anterior and posterior corner of eye and on tympanum; chin, chest, belly and ventral surface of thigh gray with small light gray spots on warts, gray darkening posteriorly; ventral surface of forelimb and tibiotarsus dark gray with distinct light gray marbling.

**Colour of holotype in preservative.** – Dorsum and dorsal surface of limbs uniform dark gray, with three scattered round gray spots on back near groin; flank dark gray with small, scattered white spots, usually on warts; grayish-brown crossbars on anterior surface of thigh and anterior and posterior surface of tibia; eye gray-blue with a narrow, light orange crescent bordered with black on outer margin from the anterior corner over the eye to lower rear corner (visible

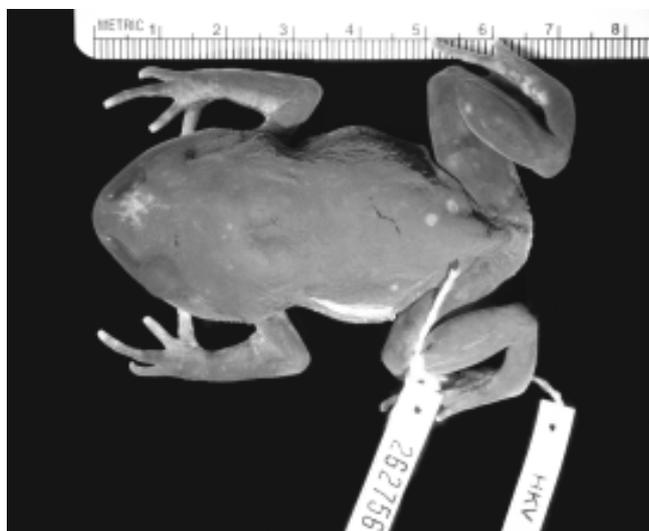


Fig. 3. Dorsal view of *Leptobrachium mouhoti*, new species, holotype male (FMNH 262756), in preservative.



Fig. 4. Ventral view of *Leptobrachium mouhoti*, new species, holotype male (FMNH 262756), in preservative.

Table 3. Measurements (mm) of adult *Leptobrachium mouhoti*, new species. Abbreviations defined in the text.

Measurement	Males	Female
	Holotype and paratypes	Paratype
	<b>Range; Mean ± S.D. (N = 13)</b>	<b>(N = 1)</b>
SVL	51.6-64.7; 58.3 ± 3.5	70.2
HDL	20.5-24.7; 22.7 ± 1.2	25.0
HDW	23.9-29.0; 26.5 ± 1.4	29.8
SNT	8.6-11.8; 10.1 ± 1.0	11.7
EYE	6.6-7.6; 7.1 ± 0.3	8.1
IOD	6.7-9.5; 8.1 ± 0.9	8.6
TIB	17.3-23.0; 20.2 ± 1.9	22.6
IML	3.1-3.9; 3.6 ± 0.2	4.3
IMW	1.1-1.9; 1.5 ± 0.2	1.5
	<b>Range; Median (N = 13)</b>	<b>(N = 1)</b>
HDL:HDW	0.82-0.88; 0.86	0.84
HDL:SVL	0.37-0.41; 0.39	0.36
TIB:SVL	0.32-0.38; 0.35	0.32
IML:IMW	1.79-3.18; 2.40	2.87
IML:SVL	0.06-0.07; 0.06	0.06

only by retracting upper eyelid); black spot at anterior and posterior corner of eye and on tympanum; ventral surface grayish-brown with small creamy-white spots on warts, concentrated anteriorly, some larger creamy-white spots on chest; grayish-brown marbling on ventral surface of forelimb and tibia; axillary and femoral glands creamy-white.

**Measurements.** – Holotype: SVL 64.0, HDL 24.7, HDW 28.1, SNT 11.8, EYE 7.1, IOD 9.5, TIB 23.0, IML 3.6, IMW 1.5.

**Variation.** – Black spots or streak below edge of canthus in some paratypes. The scattered round gray spots on back near groin are present only in two other specimens, but in different locations on the back. Ventral pigmentation is more brown than gray in some paratypes. Measurements of paratypes summarized in Table 3.

**Comparisons.** – Four other species of *Leptobrachium* have reddish (orange, red, or scarlet) eye colouration: *L. hasseltii* Tschudi, 1838, *L. hendricksoni* Taylor, 1962, *L. pullum* (Smith, 1921), and *L. smithi* Matsui, Nabhitabhata & Panha, 1999. *Leptobrachium mouhoti* differs from *L. hasseltii* by having a uniform dark gray dorsum (discrete dark rounded spots on dorsum in *L. hasseltii*) and lacking longitudinal rows of ridges on hindlimb (present in *L. hasseltii*). *Leptobrachium mouhoti* differs from *L. hendricksoni* by having males with SVL 51.6-64.7 (male *L. hendricksoni* 45-46), having a dark gray dorsum (lavender-brown dorsum in *L. hendricksoni*), and having the venter gray or brown with small light spots (venter white with small black spots in *L. hendricksoni*). *Leptobrachium mouhoti* differs from *L. pullum* by having males with SVL 51.6-64.7 and female 70.2 (male *L. pullum* 44.4-47.0, female *L. pullum* 49.4-52.8) and having orange-

red eye colouration restricted to a narrow crescent on the anterior, dorsal, and posterior outer margins of eye (upper half of iris scarlet in *L. pullum*). *Leptobrachium mouhoti* differs from *L. smithi* by having a uniform dark gray dorsum (large dark dorsal markings in *L. smithi*), having the flank dark gray with small, scattered white spots (flank with distinct dark spots in *L. smithi*), and having orange-red eye colouration restricted to a narrow crescent on the anterior, dorsal, and posterior outer margins of eye (upper half of iris scarlet or yellow in *L. smithi*).

An additional four species of *Leptobrachium* occur in parts of Laos and Vietnam near to eastern Cambodia: *L. buchardi* Ohler, Teynié & David, 2004, *L. banae* Lathrop, Murphy, Orlov & Ho, 1998, *L. chapaense* (Bourret, 1937), and *L. xanthospilum* Lathrop, Murphy, Orlov & Ho, 1998. *Leptobrachium mouhoti* differs from *L. buchardi* by having a narrow orange-red crescent on the anterior, dorsal, and posterior outer margins of eye (upper part of iris pale green in *L. buchardi*), and having the female with SVL 70.2 (female *L. buchardi* 49.5). *Leptobrachium mouhoti* differs from *L. banae* by having gray and silver-copper bands on limbs (orange-red or red bands on limbs in *L. banae*), and having a narrow orange-red crescent on the anterior, dorsal, and posterior outer margins of eye (dorsal half of iris and outer margin of eye white in *L. banae*). *Leptobrachium mouhoti* differs from *L. chapaense* by having a narrow orange-red crescent on the anterior, dorsal, and posterior outer margins of eye (upper half of iris black, white, or sky blue in *L. chapaense*). *Leptobrachium mouhoti* differs from *L. xanthospilum* by having males with SVL 51.6-64.7 and female 70.2 (male *L. xanthospilum* 62.8-73.4, female *L. xanthospilum* 83.2-84.8), having the flank dark gray with small, scattered white spots (flank with distinct large yellow

spots in *L. xanthopilum*), and having a narrow orange-red crescent on the anterior, dorsal, and posterior outer margins of eye (upper half of iris white in *L. xanthopilum*).

**Ecology.** – Specimens were collected at night on leaf litter of the forest floor, often near streams. The species was frequently heard calling at night in June, November, and December, suggesting it calls year-round. FMNH 262754 was calling from a muddy depression under a 25 cm diameter rock 2.5 m from a wide, swift stream, and FMNH 261762 was calling from a depression under a log 4 m from a stream. FMNH 261760-61 were in amplexus at night while floating in a shallow, 3 m wide stream pool with sandy substrate.

### *Ophryophryne hansii* Ohler

**Material examined.** – Siem Pang: FMNH 262777, bamboo mixed with evergreen forest, O Chay Stream, 14°17'38.7"N 106°36'44.8"E, 370 m elev., 2 Dec.2003.

**Remarks.** – A single male (SVL 45.6) closely resembles the holotype (FMNH 252880) and male paratypes (FMNH 252873, 252875, 252878-79, 252884, 252892-93), which we have examined, from Gia Lai Province, Vietnam. The specimen has small tubercles on the side of the head; larger tubercles on the top of the head, upper eyelid, and dorsum; warts on the flank and groin; a distinct supratympanic fold from eye to behind axilla; no skin folds or ridges on the dorsal surface of the body; a dark brown oval nuptial pad on the dorsal and medial surface of the first finger from its base to the articulation and in a small round patch on the dorsal surface of the base of the second finger; the second finger slightly shorter than the fourth finger; the tympanum to eye distance greater than the horizontal diameter of the tympanum; and dark gray colouration in preservative. The Cambodian specimen disagrees with Ohler's (2003) original description by having the tympanum diameter larger than half (62.5%) of the eye diameter, and is slightly larger than males in the type series (SVL 35.3 – 43.0 mean  $\pm$  SD 38.8  $\pm$  2.5, N = 7). The specimen illustrated in Figure 2 of Ohler (2003) is not the holotype of *O. hansii* (FMNH 252880), nor is it referable to this species, but the text description of the holotype matches FMNH 252880.

The specimen was taken at night (1918 hrs.) on a 5 cm diameter rock midstream in a 7 m wide shallow, swift rocky stream.

This is the first report of the genus in Cambodia.

### *Ophryophryne synoria*, new species (Fig. 5)

**Material examined.** – Holotype: FMNH 262779, adult male, O Chung Chry Stream, near 12°17'30"N 107°03'06"E, 500 m elev., Seima Biodiversity Conservation Area, O'Rang District, Mondolkiri Province, Cambodia, coll. B. L. Stuart, K. Sok, and T. Neang, 4 Nov.2003.

Paratype: FMNH 262778, adult male, collected with the holotype.

Comparative material examined: *Ophryophryne gerti* FMNH 252899, 252901, Gia Lai Province, Vietnam. *Ophryophryne hansii* FMNH 252880, holotype, Gia Lai Province, Vietnam; FMNH 252873, 252875, 252878-79, 252882, 252884, 252892-93, paratypes, Gia Lai Province, Vietnam. *Ophryophryne microstoma* FMNH 254250-51, Vinh Phu Province, Vietnam. Additional data on *O. gerti* and *O. microstoma* taken from original descriptions (Boulenger, 1903; Ohler, 2003). Complete data on *Ophryophryne pachyproctus* taken from original description (Kou, 1985) and Ohler (2003).

**Diagnosis.** – An *Ophryophryne* having males with SVL 45.8-47.3; tympanum diameter 80% of the eye diameter; second finger shorter than fourth finger; small tubercles containing black spinules on maxilla, mandible, and rear of back; fine, colourless spinules on dorsal surface of tibia and ventral surface of tarsus; strong dorsolateral glandular ridge from above shoulder to level of 4/5 of distance between axilla and groin; large tubercles on rear of back; large warts on flanks; black nuptial pad covering most of dorsal surface of first phalanx of second finger.

**Description of holotype.** – Habitus moderately stocky; head slightly wider than long. Snout truncate in dorsal view, obliquely projecting beyond lower jaw in profile; nostril closer to tip of snout than to eye; canthus rostralis constricted, rounded; lores vertical; diameter of eye slightly greater than length of snout; interorbital distance slightly smaller than width of upper eyelid; single, distinct, pointed supraorbital horn projecting from upper eyelid, about equal in length to distance from nostril to tip of snout; tympanum round, visible, slightly elevated relative to skin of temporal region, diameter smaller than that of the eye, diameter greater than the distance between the tympanum and eye; no pineal ocellus.

Tips of all fingers blunt, slightly swollen near tips; relative finger lengths I < II < IV < III; palmar tubercle indistinct, no subarticular or supernumerary tubercles; no finger webbing. Tips of toes like fingers; relative toe lengths I < II < V < III



Fig. 5. *Ophryophryne synoria*, new species, holotype male (FMNH 262779), in life.

< IV; no webbing between toes I and II, webbing confined to base between other toes; an oval, indistinct inner metatarsal tubercle, no outer metatarsal tubercle.

Skin on dorsum shagreened, small tubercles on tympanum, temporal region, snout, and from posterior half of upper eyelid to area above shoulder, larger tubercles on rear of back; small tubercles containing black spinules on maxilla, mandible, and rear of back; fine, short, colourless spinules on dorsal surface of tibia and ventral surface of tarsus; distinct glandular supratympanic fold from eye to behind axilla; strong dorsolateral glandular ridge from above shoulder to level of 4/5 of distance between axilla and groin; a delicate glandular V-shaped ridge on dorsum, with tips at level of tympanum and apex at level slightly posterior to shoulder; a delicate glandular inverted V-shaped ridge on dorsum, with tips at level of 2/3 of distance between axilla and groin and apex at level of 1/2 of distance between axilla and groin; a delicate, glandular, medial longitudinal ridge connecting these apices; one to three delicate oblique ridges on dorsal surface of tibia; two small transverse folds on posterior edge of upper eyelid; large warts on sides intermixed with smaller warts; two small pointed, projecting dermal flaps above vent; skin on venter shagreened; black nuptial pad on dorsal and medial surface of finger I from its base to near distal joint and on most of dorsal surface of the first phalange of finger II.

**Colour of holotype in life.** – Dorsum olive-brown with large, yellowish-green spots; dorsal surface of head yellowish-green from tip of snout to eyes, olive-brown V-shaped marking on crown between supraorbital horns with apex pointing posteriorly; temporal region olive-brown; pupil black, outlined in orange, diamond-shaped in horizontal orientation; iris copper with black streaks radiating from pupil; upper surface of limbs with dark gray and black bands; black spots on outer surface of forelimbs and tibia; sides purplish-gray with grayish-white flecking and large black spots; throat uniform dark purplish-gray; chest and anterior half of belly purplish-gray; posterior half of belly and lower surface of limbs purplish-gray with grayish-white flecking; vent and posterior surface of thigh near vent black, posterior surface of thigh near tibio-tarsal articulation dark gray with black and white spots; dorsal surface of foot and tarsus white with black flecking; ventral surface of foot and tarsus black.

**Measurements.** – Holotype: SVL 47.3, HDL 13.8, HDW 14.4, SNT 4.0, EYE 4.3, IOD 3.5, TMP 3.5, TEY 2.5, TIB 22.4. Paratype: SVL 45.8, HDL 13.1, HDW 14.2, SNT 3.7, EYE 4.5, IOD 3.5, TMP 3.6, TEY 2.0, TIB 21.2.

**Etymology.** – The specific epithet from *synoria* (Greek) for borderland, referring to the proximity of the type locality to the Vietnam border.

**Comparisons.** – *Ophyrophryne synoria* differs from *O. gerti* Ohler, 2003, by having males with SVL 45.8-47.3 (male *O. gerti* 32.0-34.8), having the tympanum diameter 80% of the eye diameter (tympanum diameter about half the eye diameter in *O. gerti*), having the tympanum to eye distance 55-71% of the tympanum diameter (about equal in *O. gerti*), and having

the second finger shorter than the fourth finger (equal in *O. gerti*). *Ophyrophryne synoria* differs from *O. hansii* Ohler, 2003, by having a strong dorsolateral glandular ridge from above shoulder to level of 4/5 of distance between axilla and groin (absent in *O. hansii*) and having a black nuptial pad covering most of the dorsal surface of the first phalange of the second finger (black nuptial pad on the second finger small, round, and weakly visible in *O. hansii*). *Ophyrophryne synoria* differs from *O. microstoma* Boulenger, 1903, by having a strong dorsolateral glandular ridge from above shoulder to level of 4/5 of distance between axilla and groin (absent in *O. microstoma*), having large tubercles on rear of back (absent in *O. microstoma*), having large warts on the flanks (granules in *O. microstoma*), and having the second finger shorter than the fourth finger (equal in *O. microstoma*; Ohler, 2003). *Ophyrophryne synoria* differs from *O. pachyproctus* Kou, 1985 by having males with SVL 45.8-47.3 (male *O. pachyproctus* SVL 28-30) and lacking the anus terminal on a dermal protuberance (present in *O. pachyproctus*).

**Ecology.** – The holotype and paratype were collected together at night in a swift, 30 cm wide stream flowing over solid rock substrate in hilly evergreen forest. The paratype was taken at 1935 hrs. on a boulder under a fallen tree at the edge of the water. The holotype was taken at 1940 hrs. under a rock ledge 15 cm from the water.

## Bufonidae

### *Bufo galeatus* Günther

(Fig. 6)

**Material examined.** – Pichrada: FMNH 261766-67, evergreen mixed with deciduous and bamboo forest, Phnom Nam Lyr Mountain, along O Nam Lyr Stream, near 12°32'16"N 107°32'00"E, 600 m elev., 17 Jun.2000; FMNH 261768-69, evergreen mixed with deciduous and bamboo forest, Phnom Nam Lyr Mountain, near 12°32'16"N 107°32'00"E, 600-700 m elev., 18-21 Jun.2000.

O'Rang: FMNH 262759, hilly evergreen forest, O Rokhlong Stream, near 12°18'35.3"N 107°04'28.0"E, 500 m elev., 12 Dec.2003; FMNH 262760, hilly evergreen forest, O Ronas Stream, 12°17'30.7"N 107°03'06.0"E, 450 m elev., 3 Nov.2003; FMNH 262761-62, hilly

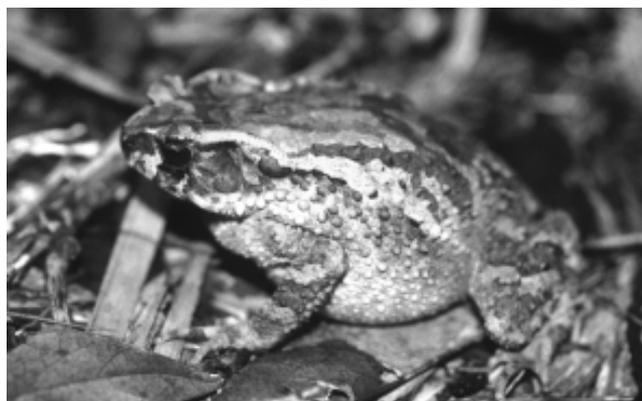


Fig. 6. Female *Bufo galeatus* from Phnom Nam Lyr Wildlife Sanctuary, Pichrada District, Mondolkiri Province, Cambodia.

evergreen forest, O Ngeugn Stream, near 12°18'58"N 107°05'59"E, 550 m elev., 5 Nov.2003; FMNH 262763, hilly evergreen forest, O Doeung Por Stream, near 12°18'08"N 107°03'08"E, 500 m elev., 6 Nov.2003; FMNH 262764, hilly evergreen with bamboo forest, 12°15'41.6"N 107°03'48.2"E, 480 m elev., 7 Nov.2003.

Siem Pang: FMNH 262758, bamboo mixed with evergreen forest, 14°17'39.5"N 106°37'42.3"E, 400 m elev., 2 Dec.2003.

**Remarks.** – These agree with Günther's (1864) original description of a single specimen from Cambodia, and the expanded descriptions by Smith (1921) and Inger et al. (1999) based on collections from Vietnam. The specimens have a bony ridge connecting the eye with the parotoid gland; large, conical, pointed tubercles in an oblique band from the corner of the mouth to above the axilla; and similar but slightly smaller tubercles on the sides and limbs, the largest of these in a row from the parotoid to the groin. As reported by Inger et al. (1999), females have conspicuously longer and more pointed tubercles on the sides of the head and body than do males, and females (SVL 75.3 – 88.5, mean  $\pm$  SD 83.4  $\pm$  7.1, N = 3) are considerably larger than males (SVL 49.9 – 60.2, mean  $\pm$  SD 55.1  $\pm$  3.4, N = 6). Males have a black nuptial pad on the dorsal and medial surface of the first and second fingers.

Specimens were collected day and night on forest trails and at night along streams. FMNH 262759 was taken at night (2015 hrs.) in shallow water of a 4 m wide seep running over a large rock face and FMNH 262760 was found at night (1840 hrs.) on a sand and boulder mid-stream bank in a 3 m wide flowing stream. FMNH 261766-67 were in amplexus in June on a log emerging from a small (<1 m wide) flowing stream with sandy substrate.

This is the first report of the species in Cambodia since its original description.

## Microhylidae

### *Kalophrynus interlineatus* (Blyth)

**Material examined.** – Keo Seima: FMNH 262687, along small river in disturbed evergreen mixed with deciduous forest, 150 m elev., coll. J. Walston, May.2000.

Pichrada: FMNH 262688, rock hill at base of Phnom Nam Lyr Mountain, near 12°32'16"N 107°32'10"E, 700 m elev., 18 Jun.2000; FMNH 262689-90, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 21-22 Jun.2000.

**Remarks.** – These agree with the expanded descriptions by Parker (1934; as a subspecies of *K. pleurostigma* Tschudi) and Matsui et al. (1996) by having toes less than one-third webbed, with the third toe webbing not extending beyond the distal subarticular tubercle; and the free portion of the fifth toe longer than the distance from snout to nostril. The dorsal pattern is variable, as reported by Parker (1934): FMNH 262687 has a narrow dark streak commencing on the tip of the snout; FMNH 262688 has a reticulated dark

marking; FMNH 262689 has an inverted V-shaped dark marking, and scattered round, black spots; and FMNH 262690 has no distinct markings. All four specimens have a black ocellar spot edged in white at the groin.

FMNH 262688 was collected at night (2030 hrs.) on the bare surface of a rock outcrop, and FMNH 262690 was taken on a forest trail in the morning (0930 hrs.), both away from water.

Ohler et al. (2002) reported the species from the mountains of southwestern Cambodia. Parker (1934) and Bourret (1942) reported the species from Cambodia, without specific localities.

### *Microhyla bermorei* (Blyth)

**Material examined.** – Keo Seima: FMNH 262838, hilly evergreen mixed with deciduous and bamboo forest, near 12°10'34.9"N 106°57'47.6"E, 190 m elev., 9 Nov.2003; FMNH 262839-42, bamboo mixed with evergreen forest, near 12°16'45.7"N 106°56'36.4"E, 180 m elev., 8 Nov.2003.

O'Rang: FMNH 262837, hilly evergreen forest, near 12°16'24.6"N 107°03'53.1"E, 350 m elev., 10 Dec.2003.

Pichrada: FMNH 262653, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 20 Jun.2000.

Siem Pang: FMNH 262833-36, bamboo mixed with evergreen forest, tributary of O Chay Stream, 14°18'28.6"N 106°33'02.6"E, 310 m elev., 5 Dec.2003.

Ta Veng: FMNH 262832, hilly evergreen forest mixed with bamboo forest, O Greng Mak Stream, 14°12'00.5"N 107°18'29.8"E, 200 m elev., 20 Nov.2003.

**Remarks.** – An adult female (SVL 41.7) and nine adult males (SVL 30.5 – 40.0, mean  $\pm$  SD 35.1  $\pm$  3.5, N = 9) have an obtusely pointed snout; dark throat; toes fully webbed, reaching base of expanded discs on toes; third and fifth toes equal in length; and outer and inner metatarsal tubercles. Males have a strong fold across the throat.

Specimens were collected day and night on sandy, gravel or rocky banks of slow-moving streams, and on the forest floor away from water.

Bourret (1942) reported the species from north-central Cambodia, and both Bourret (1942) and Ohler et al. (2002) reported the species from the mountains of southwestern Cambodia.

## Ranidae

### *Limnonectes dabanus* (Smith) (Fig. 7)

**Material examined.** – O'Rang: FMNH 262747, hilly evergreen forest, O Ronas Stream, 12°17'30.7"N 107°03'06.0"E, 450 m elev., 3 Nov.2003.

Pichrada: FMNH 261924-27, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest along O Nam Lyr Stream, near 12°32'16"N 107°32'00"E, 600 m elev., 16 Jun.2000; FMNH 261929-32, 261935, 261937, 261942, 261944-45, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 17-21 Jun.2000.

Siem Pang: FMNH 262744-45, bamboo mixed with evergreen forest, near 14°16'03.7"N 106°37'44.6"E, 600 m elev., 1 Dec.2003; FMNH 262920, bamboo mixed with evergreen forest, O Chay Stream, 14°17'38.7"N 106°36'44.8"E, 370 m elev., 02 Dec.2003.

**Remarks.** – Seventeen adult males fully agree with Smith's (1922) brief original description of *Rana macrogathus dabana* from the Langbian Plateau of southern Vietnam by having distinctly enlarged heads, encompassing nearly half the SVL; a swelling consisting of dense fibrous tissue on top of the head, commencing at the interorbital region and extending to or near to the level of the posterior border of the tympanum; the heels not or only slightly touching when the hindlimbs are folded at right angles to the body; and in measurements (Table 4). The specimens also fully agree with the holotype (MNHN 1948.0126) of *Rana toumanoffi* Bourret, 1941b, a single male from Mimot, Cambodia, which we have examined. There are no apparent differences in body measurements among Smith's syntypes, our Cambodian specimens, and Bourret's holotype of *R. toumanoffi* (Table 1), although the degree of enlargement of the head and head swelling varies considerably among individual males, even from the same locality. We treat *Rana toumanoffi* as a junior synonym of *Limnonectes dabanus*.

Smith (1922) stated that juveniles and females of the species belonging to the *Rana doriae* group, in which he included *L. dabanus*, resemble each other so closely that "it is practically impossible to distinguish between them." A large series (FMNH 261928, 261933-34, 261936, 261938-41, 261943, 262665, 262669, 262743, 262746, 262902-19, 262921-31, 262933-38, 262940-51, N = 60) of females, juveniles, and undeveloped males are tentatively assigned here to *L. dabanus* because they generally agree in skin texture and size (except head measurements) and were collected with the 17 developed males. Nine of the 77 (11.7%) specimens have a light vertebral stripe from the tip of the snout to near the vent.



Fig. 7. Male *Limnonectes dabanus* from Phnom Nam Lyr Wildlife Sanctuary, Pichrada District, Mondolkiri Province, Cambodia.

Specimens were collected in and along small streams. This was the most frequently encountered, forest-dwelling frog species during our fieldwork. A developed male (FMNH 261937) was collected at night (2015 hrs.) in June sitting in a depression about twice its body size in a sandy vertical bank with exposed tree roots, 15 cm above a stream pool. The depression appeared to have been constructed by the frog, possibly for breeding activity.

This is the first report of the species in Cambodia since Bourret's (1941b) description of its junior synonym *R. toumanoffi* from Mimot.

#### *Limnonectes kuhlii* (Tschudi)

**Material examined.** – Siem Pang: FMNH 262726-30, bamboo mixed with evergreen forest, near 14°16'03.7"N 106°37'44.6"E, 550-600 m elev., 01 Dec.2003.

Ta Veng: FMNH 262722-25, hilly evergreen mixed with bamboo forest, O Lopeung Stream, 14°11'16.3"N 107°17'36.1"E, 160 m elev., 19-21 Nov.2003.

**Remarks.** – Three males (SVL 60.3 – 66.5, mean ± SD 63.7 ± 3.1, N = 3) and six females (SVL 50.1 – 61.6, mean ± SD 55.5 ± 3.9, N = 6) have the tympanum hidden; a supratympanic fold from the eye to behind axilla; low, radiating intersecting ridges on the dorsum; heavy wrinkling on flanks; rounded, white asperities on the dorsal surface of the tibia and tarsus; and all toes fully webbed to disc. The head and odontoids at the front of the mandible are larger in males than in females.

Specimens were collected submerged in shallow water or on the bank within 30 cm of rocky seeps, small rocky streams, and side pools of rocky streams.

This is the first report of the species from Cambodia.

#### *Limnonectes poilani* (Bourret) (Fig. 8)

**Material examined.** – O'Rang: FMNH 262741, hilly evergreen forest, O Rokhlong Stream, near 12°18'35.3"N 107°09'28.0"E, 500 m elev., 12 Dec.2003; FMNH 262742, hilly evergreen forest, O Kamen Stream, near 12°19'35"N 107°05'33"E, 500 m elev., 01 Nov.2003.

Pichrada: FMNH 262659-64, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest along O Nam Lyr Stream, near 12°32'16"N 107°32'00"E, 600 m elev., 16 Jun.2000; FMNH 262666-68, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 17 Jun.2000; FMNH 262670-71, gallery evergreen forest along stream, near 12°29'49"N 107°29'33"E, 700 m elev., 22 Jun.2000.

**Remarks.** – Bourret (1942) described *poilani* as a subspecies of *Rana kohchangae* (Smith, 1922) based on a single male from Dong Tam Ve, Vietnam. Ohler et al. (2002) moved

Table 4. Measurements of male *Limnonectes dabanus* (Smith, 1922): syntypes of *Rana macrognathus dabana*, new Cambodian specimens, and the holotype of *Rana toumanoffi*. Measurements of *Rana macrognathus dabana* were taken from Smith (1922); all other measurements were taken by the present authors. Abbreviations are given in the text.

Measurement	<i>Rana macrognathus dabana</i> Smith, 1922 4845, 2637, 2547, 4844 syntypes	FMNH Cambodian specimens	<i>Rana toumanoffi</i> Bourret, 1941b MNHN 1948.0126 holotype
	<b>Range; Mean <math>\pm</math> S.D.</b> (N=4)	<b>Range; Mean <math>\pm</math> S.D.</b> (N=17)	<b>(N=1)</b>
SVL	51.0 – 55.0; 53.0 $\pm$ 1.8	49.7 – 64.6; 57.6 $\pm$ 4.6	54.9
HDL	21.0 – 22.0; 21.8 $\pm$ 0.5	25.8 – 39.4; 32.4 $\pm$ 3.6	30.1
HDW	24.0 – 26.0; 25.0 $\pm$ 0.8	24.0 – 35.1; 29.6 $\pm$ 3.3	27.7
SNT	9.5 – 10.0; 9.9 $\pm$ 0.3	9.3 – 14.7; 12.3 $\pm$ 1.4	12.3
EYE	5.5 – 6.0; 5.8 $\pm$ 0.3	5.0 – 6.1; 5.7 $\pm$ 0.3	6.0
IOD	5.0 – 6.0; 5.6 $\pm$ 0.5	5.6 – 8.5; 7.3 $\pm$ 1.0	7.0
TMP	5.5 – 6.0; 5.8 $\pm$ 0.3	6.2 – 9.7; 8.0 $\pm$ 0.9	7.0
TIB	24.0 – 26.0; 25.3 $\pm$ 1.0	22.8 – 29.5; 26.1 $\pm$ 1.8	28.3
FOT	24.0 – 26.0; 25.3 $\pm$ 1.0	22.6 – 29.5; 26.5 $\pm$ 1.9	26.9
	<b>Range; Median (N = 4)</b>	<b>Range; Median (N = 17)</b>	<b>(N = 1)</b>
TIB:SVL	0.46-0.49; 0.48	0.43-0.49; 0.45	0.51

*poilani* to species rank and into the genus *Limnonectes*. We examined Bourret's holotype of *Rana kohchange poilani* (MNHN 1948.0127) and it is clearly conspecific with adult males in our collection from Cambodia. The Cambodian series also fully agrees with specimens of both sexes reported as *Rana* cf. *blythii* from central Vietnam by Inger et al. (1999), and these should also be referred to *L. poilani*. Specifically, males (SVL 84.1 – 99.5, mean  $\pm$  SD 90.0  $\pm$  6.7, N = 4) and females (SVL 69.5 – 95.3, mean  $\pm$  SD 80.2  $\pm$  8.7, N = 6) from Cambodia have a ridge of skin on the medial border of the outer three fingers, widest on the second finger; the first and fifth toes have movable flaps of skin externally; the first three toes and the fifth are fully webbed to the base of the swollen tips; the webbing on the fourth toe reaches the distal subarticular tubercle and continues to the tip as a movable flap of skin; tubercles on the upper eyelid; two black bars extend from the eye to lip; and a black streak covers the upper half of the tympanum and the supratympanic fold. The adult



Fig. 8. *Limnonectes poilani* from Phnom Nam Lyr Wildlife Sanctuary, Pichrada District, Mondolkiri Province, Cambodia.

males have enlarged odontoids at the front of the mandible and enlarged heads with two temporal swellings. Bourret (1942) described a median longitudinal ridge on the top of the head from the level of the posterior edge of the eyes to the level of the insertion of the forelimbs to the body; this character is apparent in the holotype, but not in the Cambodian males. Two of four adult males and four of six adult females have a light vertebral stripe from the tip of the snout to the vent.

The colouration in life of the adult female FMNH 262741 follows. Brown above with dark brown and black spotting on the dorsum and limbs; creamy-tan band followed posteriorly by a black band between the upper eyelids; dark brown lip bars; throat white with grey flecking, anterior half of venter and underside of forelimbs white, posterior half of venter and underside of hindlimbs yellow; posterior surface of thigh with yellow and black reticulations; pinkish-orange wash on upper surface of fingers and toes.

The specimens were collected in shallow water or on dirt and leaf litter banks within 3 m of small streams. Orlov (1997) described the breeding behavior of this species (as *Rana* cf. *blythii*) in Vietnam.

This is the first report of the species in Cambodia.

#### *Rana attigua* Inger, Orlov & Darevsky

**Material examined.** – Pichrada: FMNH 261920-22, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo, near 12°32'16"N 107°32'00"E, 600-700 m elev., 21 Jun.2000; FMNH 261923, gallery evergreen forest along stream, near 12°29'49"N 107°29'33"E, 700 m elev., 22 Jun.2000.

**Remarks.** – Four males with nuptial pads (SVL 34.0 – 36.6, mean  $\pm$  SD 35.5  $\pm$  1.3, N = 4) agree with the original description (Inger et al., 1999) and the FMNH type series from Gia Lai Province, Vietnam, except the Cambodian males are slightly smaller than males with nuptial pads in the type series (SVL 36.2 – 45.5, mean  $\pm$  SE 41.3  $\pm$  0.3, N = 43; Inger et al., 1999), and the nuptial pads have a distinct notch in the ventral margin. These discrepancies are noteworthy because two of the characteristics used by Inger et al. (1999) to distinguish *R. attigua* from the similar, co-occurring *R. milleti* Smith, 1921, at the type locality in Vietnam were body size and condition of the nuptial pad. Specifically, Inger et al. (1999) reported that *R. milleti* males with nuptial pads have SVL 34.2 – 40.4 (mean  $\pm$  SE 37.0  $\pm$  0.2, N = 52), but only four of 43 male *R. attigua* were less than 39.0, and the nuptial pad in *R. milleti* has a distinct notch or constriction in the ventral margin, but that of *R. attigua* is straight. We re-examined specimens assigned to *R. milleti* (FMNH 253425-86) by Inger et al. (1999), and only about half of the adult males have a notch or constriction in the ventral margin of the nuptial pad, rendering this character to be non-diagnostic. The most conspicuous differences in preservative between *R. attigua* and *R. milleti* are those of colouration, as stated by Inger et al. (1999): the underside of the thigh is immaculate whitish and the underside of the calf is immaculate or with only faint dark speckling in *R. attigua*, but the underside of the thigh has dark speckling and the underside of the calf has dark spotting in *R. milleti*; and the rear of the thigh has only a light dusting of dark pigment in *R. attigua*, but the rear of the thigh has a distinct pattern of dark brown forming a network around small light spots or blotches in *R. milleti*.

Three were taken in a flooded grassy clearing in the forest, and one was on leaf litter 2 m from a small stream.

This is the first report of the species from Cambodia. The similar *R. milleti* was recently reported from southwestern Cambodia (Chuaynkern et al., 2004).

#### ***Rana banaorum* Bain, Lathrop, Murphy, Orlov, & Ho**

**Material examined.** – Pichrada: FMNH 263255-58, gallery evergreen forest along large stream, near 12°31'18"N 107°33'13"E, 600 m elev., 19 Jun.2000; FMNH 263253-54, 263259, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo, near 12°32'16"N 107°32'00"E, 600-700 m elev., 17-21 Jun.2000; FMNH 263247-52, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo along O Nam Lyr Stream, near 12°32'16"N 107°32'00"E, 600 m elev., 16 Jun.2000.

Siem Pang: FMNH 262880, bamboo mixed with evergreen forest, tributary of O Chay Stream, near 14°19'09.8"N 106°35'37.5"E, 325 m elev., 3 Dec.2003.

Ta Veng: FMNH 262873, hilly evergreen mixed with bamboo forest, O Greng Mak Stream, 14°12'00.5"N 107°18'29.8"E, 200 m elev., 20 Nov.2003; FMNH 262870, 262874-75, 262878, hilly evergreen mixed with bamboo forest, O Lopeung Stream, 14°11'16.3"N 107°17'36.1"E, 160 m elev., 19-22 Nov.2003.

O'Rang: FMNH 262739, 262899, hilly evergreen forest, O Chung Chry Stream, near 12°17'30"N 107°03'06"E, 500 m elev., 04 Nov.2003; FMNH 262892-98, hilly evergreen forest, O Ronas Stream, 12°17'30.7"N 107°03'06.0"E, 450 m elev., 03 Nov.2003; FMNH 262796, hilly evergreen forest, near 12°16'24.6"N 107°03'53.1"E, 350 m elev., 10 Dec.2003; FMNH 262797-99, hilly evergreen forest, waterfall on O Ngeugn Stream, 12°18'50.5"N 107°06'03.4"E, 500 m elev., 11 Dec.2003; FMNH 262740, 262800-01, 262887-88, hilly evergreen forest, O Ngeugn Stream, near 12°18'58"N 107°05'59"E, 550 m elev., 30 Oct.-05 Nov.2003.

**Remarks.** – These agree with Bain et al.'s (2003) original description by having males with SVL 46.7 – 60.0 (mean  $\pm$  SD 55.4  $\pm$  3.9, N = 10); males with gular pouches; females with uniformly pale yellow eggs; and weakly visible glandular dorsolateral folds. Females are much larger than males, with SVL 76.5– 108.7 (mean  $\pm$  SD 96.0  $\pm$  10.8, N = 10).

Specimens were collected at night on banks, rock faces, boulders, tree branches, and tree roots along and above swift rocky streams, often near cascades. The stomach of female FMNH 262798 (SVL 104.5) contained a large centipede and large wasp. The ovaries of FMNH 262800 (SVL 108.7) contained 2,966 eggs of approximately 2-3 mm diameter.

This is the first report of the species since its description from Gia Lai Province, Vietnam.

#### ***Rana johnsi* Smith**

**Material examined.** – Pichrada: FMNH 261882, deciduous forest with grassy understory and bamboo, near 12°29'49"N 107°29'33"E, 700 m elev., 23 Jun.2000.

**Remarks.** – A single mature female (SVL 56.5) agrees with Smith's (1921) original description and Inger et al.'s (1999) amplified description based on material from central and southern Vietnam in having long legs (TIB:SVL 0.69 in the Cambodian specimen; 0.62 – 0.68, median 0.64, N = 6 females, Smith 1921); a distinct, continuous dorsolateral fold; full webbing to disc on toes III and V, webbing to distal subarticular tubercle on toe IV and continuing to disc as a narrow fringe; an inverted, V-shaped glandular fold between the shoulders; a dark streak below canthus from tip of snout to eye; and a dark patch from the eye to shoulder, enclosing the tympanum.

The specimen was taken in the morning (0700 hrs.) in an open grassy area.

This is the first report of the species from Cambodia.

#### ***Rana macrodactyla* (Günther)**

**Material examined.** - Pichrada: FMNH 262061, Bou Sraa Village, 12°32'05"N 107°25'55"E, 700 m elev., 14 Jun.2000.

**Remarks.** – A single female (SVL 38.5) has a very slender habitus; narrow, elongated head; fourth toe very long,

webbing on fourth toe reaching the middle subarticular tubercle, continuing on postaxial side of toe to the base of disc as a movable flap of skin; distinct, broad, light-coloured dorsolateral fold; dorsum olive with dark brown spots; light-coloured medial longitudinal stripe from tip of snout to vent; and dark longitudinal stripes on posterior surface of thigh.

The specimen was taken on a log in a grassy area near a rice paddy.

The species has been reported from localities throughout Cambodia (Bourret, 1942; Ohler et al., 2002).

### *Rana morafkai* Bain, Lathrop, Murphy, Orlov, & Ho

**Material examined.** – Siem Pang: FMNH 262732-33, 262881-82, evergreen mixed with bamboo forest, near 14°18'28.9"N 106°33'32.1"E, 430 m elev.; 4 Dec.2003; FMNH 262883-85, evergreen mixed with bamboo forest, waterfall of O Chhay Stream, tributary of O Chay Stream, 14°15'49.6"N 106°31'46.0"E, 200 m elev.; 5 Dec.2003.

Ta Veng: FMNH 262731, hilly evergreen forest mixed with bamboo, O Greng Mak Stream, 14°12'00.5"N 107°18'29.8"E, 200 m elev., 20 Nov.2003; FMNH 262871-72, 262876-77, 262879, hilly evergreen mixed with bamboo forest, O Lopeung Stream, 14°11'16.3"N 107°17'36.1"E, 160 m elev., 19-22 Nov.2003.

O'Rang: FMNH 262738, O Doeung Por Stream, hilly evergreen forest, near 12°18'08.4"N 107°03'08.1"E, 500 m elev., 2 Nov.2003; FMNH 262886, hilly evergreen forest, near 12°16'24.6"N 107°03'53.1"E, 350 m elev., 10 Dec.2003; FMNH 262734-37, 262803, hilly evergreen forest, O Ngeugn Stream, near 12°18'58"N 107°05'59"E, 550 m elev., 31 Oct.-5 Nov.2003; FMNH 262802, 262804, 262889-91, 262900-01, hilly evergreen forest, O Doeung Por Stream, near 12°18'08"N 107°03'08"E, 500 m elev., 2-6 Nov.2003.

**Remarks.** – These agree with the original description (Bain et al., 2003) by having males with SVL 39.9 – 46.7 (mean  $\pm$  SD 42.3  $\pm$  2.0, N = 8); males with gular pouches; females with uniformly pale yellow eggs; and no dorsolateral folds. Females are much larger than males, with SVL 74.0 – 85.5 (mean  $\pm$  SD 81.3  $\pm$  3.9, N = 8).

Specimens were collected at night on banks, rock faces, boulders, and tree roots along and above swift rocky streams, often near cascades. The ovaries of FMNH 262735 (SVL 79.3) contained 770 eggs of approximately 1.5 mm diameter. The disparity in number and size of eggs between this species and the very similar, co-occurring *R. banaorum* suggests they may have different reproductive strategies.

This is the first report of the species in Cambodia.

### *Rana nigrovittata* (Blyth)

**Material examined.** – Keo Seima: FMNH 262865-69, bamboo mixed with evergreen forest, near 12°16'45.7"N 106°56'36.4"E, 180 m elev., 8 Nov.2003.

Pichrada: FMNH 261971-74, evergreen mixed with deciduous and bamboo forest, Phnom Nam Lyr Mountain, along O Nam Lyr Stream, near 12°32'16"N 107°32'00"E, 600 m elev., 16 Jun.2000; FMNH 261975, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 17 Jun.2000; FMNH 261976-77, gallery evergreen forest along large stream, near 12°31'18"N 107°33'13"E, 600 m elev., 19 Jun.2000; FMNH 261978, gallery evergreen forest along stream, near 12°29'49"N 107°29'33"E, 700 m elev., 22 Jun.2000.

O'Rang: FMNH 262858-61, hilly evergreen forest, O Ngeugn Stream, near 12°18'58"N 107°05'59"E, 550 m elev., 30-31 Oct.2003; FMNH 262862, hilly evergreen forest, O Kamen Stream, near 12°19'35"N 107°05'33"E, 500 m elev., 1 Nov.2003; FMNH 262863, hilly evergreen forest, O Ronas Stream, 12°17'30.7"N 107°03'06.0"E, 450 m elev., 3 Nov.2003; FMNH 262864, hilly evergreen forest, O Chung Chry Stream, near 12°17'30"N 107°03'06"E, 500 m elev., 4 Nov.2003.

Siem Pang: FMNH 262851, bamboo mixed with evergreen forest, O Chay Stream, 14°17'38.7"N 106°36'44.8"E, 370 m elev., 2 Dec.2003; FMNH 262852-53, bamboo mixed with evergreen forest, tributary of O Chay Stream, near 14°19'09.8"N 106°35'37.5"E, 325 m elev., 3 Dec.2003; FMNH 262854, evergreen mixed with bamboo forest, waterfall of O Chhay Stream, tributary of O Chay Stream, 14°15'49.6"N 106°31'46.0"E, 200 m elev., 5 Dec.2003; FMNH 262855, bamboo mixed with evergreen forest, tributary of O Chay Stream, 14°18'28.6"N 106°33'02.6"E, 310 m elev., 5 Dec.2003; FMNH 262856-57, evergreen mixed with bamboo forest, near 14°18'28.9"N 106°33'32.1"E, 430 m elev., 4 Dec.2003.

Ta Veng: FMNH 262843-44, 262850, hilly evergreen forest mixed with bamboo, O Lopeung Stream, 14°11'16.3"N 107°17'36.1"E, 160 m elev., 19-22 Nov.2003; FMNH 262845-46, hilly evergreen forest mixed with bamboo, O Greng Mak Stream, 14°12'00.5"N 107°18'29.8"E, 200 m elev., 20 Nov.2003; FMNH 262847-49, hilly evergreen forest mixed with bamboo, small tributary of O Lopeung Stream, 14°11'16.3"N 107°17'36.1"E, 160 m elev., 21 Nov.2003.

**Remarks.** – These match the specimens from central Vietnam assigned by Inger et al. (1999) to this species by having males and females not differing in SVL (males 48.1 – 60.0, mean  $\pm$  SD 53.8  $\pm$  3.2, N = 11; females 51.4 – 60.3, mean  $\pm$  SD 55.9  $\pm$  2.8, N = 13); the dark lateral band broken up by lighter colouration; often dark pigmentation, usually in the form of mottling, on the venter; males without gular pouches but with wrinkled skin at the corners of the throat; males with gray nuptial pads on the dorsal and medial surfaces of the first finger; and a conspicuous, pigmented gland on the proximal one-third of the upper arm, larger in males than females.

Specimens were collected in shallow water and on sand, gravel and rocky banks of streams, usually in sections of streams with slow-moving water.

This is the first report of the species from Cambodia.

### *Rana taipehensis* van Denburgh

**Material examined.** – Keo Seima: FMNH 262784, road through grassland and disturbed evergreen forest, 12°08'22.9"N 106°55'27.4"E, 165 m elev., 9 Dec.2003.

Pichrada: FMNH 262064-65, deciduous dipterocarp forest with grassy understorey, near 12°31'38"N 107°33'19"E, 600 m elev., 19 Jun.2000.

**Remarks.** – A male (SVL 31.4, TMP:EYE 1.13) and two females (SVL 40.5-44.6; TMP:EYE 0.89-1.00) agree with van Denburgh's (1909) original description. The specimens have the interorbital distance greater than the width of upper eyelid; a distinct, broad dorsolateral fold; male with small white asperities on dorsum; finger I equal in length to finger II; male with whitish nuptial pad on medial and dorsal surface of finger I from its base to level of the distal edge of the subarticular tubercle; toe IV webbed to distal subarticular tubercle; and an oval inner and round outer metatarsal tubercle.

In life, the dorsum was green and the dorsolateral folds yellow.

The male and one female were collected at night (2040 hrs.) in vegetation at the edge of a pond formed by water filling a bomb crater, and one female was collected at night (1813 hrs.) crossing a road.

Ohler et al. (2002) reported the species from the mountains of southwestern Cambodia.

## Rhacophoridae

### *Chirixalus nongkhorensis* (Cochran)

**Material examined.** – Pichrada: FMNH 263094-97, Bou Sraa Village, 12°32'05"N 107°25'55"E, 700 m elev., 14 Jun.2000; FMNH 263098-101, deciduous dipterocarp forest with grassy understorey, near 12°31'38"N 107°33'19"E, 600 m elev., 19 Jun.2000.

**Remarks.** – An adult female (SVL 31.7) and seven adult males (SVL 21.2 – 25.5, mean ± SD 23.9 ± 1.5, N = 7) agree with Cochran's (1927) original description. These have the two outer fingers appearing to be opposable to the two inner ones; webbing at the base of the two outer fingers; interorbital distance much greater than width of upper eyelid; dorsum brownish with irregular darker markings; and upper surface of hindlimb with dark spots but no complete crossbars.

Specimens were collected on vegetation at the edge of two ponds, one natural and the other formed by water filling a bomb crater.

This is the first report of the species from Cambodia.

### *Rhacophorus annamensis* Smith

(Fig. 9)

**Material examined.** - O'Rang: FMNH 262767-68, 262783, hilly evergreen forest, O Ngeugn Stream, near 12°18'58"N 107°05'59"E, 550 m elev., 31 Oct.2003; FMNH 262765, hilly evergreen forest, waterfall on O Ngeugn Stream, 12°18'50.5"N 107°06'03.4"E, 500 m elev., 11 Dec.2003; FMNH 262766, hilly evergreen forest, O

Rokhlong Stream, near 12°18'35.3"N 107°04'28.0"E, 500 m elev., 12 Dec.2003.

Pichrada: FMNH 262637-41, 262643-50, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 16-21 Jun.2000; FMNH 262642, gallery evergreen forest along large stream, near 12°31'18"N 107°33'13"E, 600 m elev., 19 Jun.2000.

**Remarks.** – Fifteen males (SVL 54.5 – 63.6, mean ± SD 59.5 ± 3.2, N = 15) and three females (SVL 70.5 – 79.4, mean ± SD 74.6 ± 4.5, N = 3) agree with Smith's (1924) original description and Inger et al.'s (1999) expanded description of the species. Males have a snout gently sloping in profile to a sharp point projecting beyond the lower jaw, and females have a rounded snout in profile that is not sloping or projecting (Inger et al. 1999). The finger discs are rounded and those of the outer fingers larger than the tympanum, webbing extends to the distal edge of the subarticular tubercle of the first finger and to the discs of the outer three fingers, the toes are webbed to the base of discs, and a low, oval inner but no outer metatarsal tubercle is present. Most of the specimens have two or three small papillae on each side just above the anus, and four to six long white tubercles, rarely fused at the base, below the anus.

A juvenile (FMNH 262783, SVL 14.8) is grayish-white with large black spots on the dorsum with dark bars on the limbs, and fully agrees with the description of *R. notater*, a species described by Smith from a single metamorph in the same publication as *R. annamensis*. Orlov et al. (2002) also noted the similarity of juvenile *R. annamensis* with *R. notater*. We treat *Rhacophorus notater* as a junior synonym of *R. annamensis*.

In O'Rang, adults were taken at night on tree branches 2.5-4 m above the ground, and the juvenile was taken during the day (1550 hrs.) on a forest trail, all near large waterfalls. In Pichrada, specimens were taken at night on vegetation, tree branches, roots and rocks over small streams and seeps. There in June, adults were calling, a foam nest was hanging over a small seep from tree leaves on the same branch where FMNH

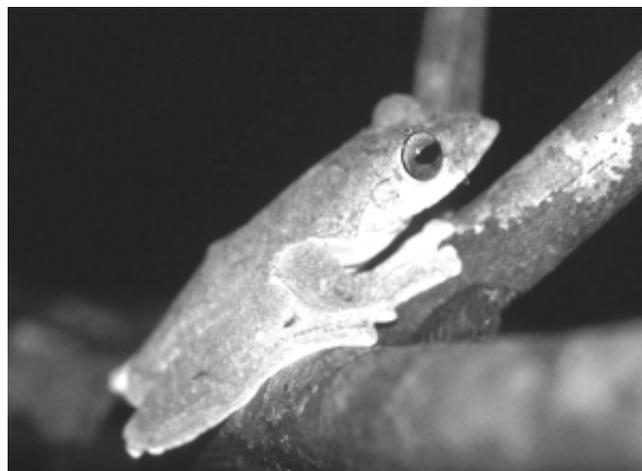


Fig. 9. Male *Rhacophorus annamensis* from Phnom Nam Lyr Wildlife Sanctuary, Pichrada District, Mondolkiri Province, Cambodia.

262645 was perched, and one pair (FMNH 262643-44) was taken in amplexus on a small rock mid-stream.

This is the first report of the species from Cambodia.

***Theلودerma asperum* (Boulenger)**

**Material examined.** – Keo Seima: FMNH 262787, evergreen mixed with deciduous forest, UTM 0725385 1351814, coll. J. Walston, 18 Aug.2002; FMNH 261896, disturbed evergreen mixed with deciduous forest, 250 m elev., coll. J. Walston, May.2000.

**Remarks.** – These two specimens (FMNH 262787 SVL 23.0, FMNH 261896 SVL 22.3.) agree with Boulenger’s (1886) description by having scattered white asperities on the dorsal surface; fingers without webbing; interorbital distance greater than width of upper eyelid; a grayish marking on top of the head, rear of lower back, and flanks; and a dark ventral surface with light reticulations.

Both were collected in artificial holes holding rainwater that had been cut by resin-tappers in large dipterocarp trees.

Ohler et al. (2002) reported the species from the mountains of southwestern Cambodia.

***Theلودerma stellatum* Taylor**

**Material examined.** – Keo Seima: FMNH 262786, hilly evergreen forest mixed with deciduous & bamboo, near 12°10'34.9"N 106°57'47.6"E, 190 m elev., 9 Nov.2003.

**Remarks.** – This single female (SVL 33.8) fully agrees with Taylor’s (1962) description of the species from Chanthaburi, Thailand. The specimen has the dorsal surface covered in whitish asperities; fingers about 1/3 webbed, the third finger disc about equal to the diameter of tympanum; the interorbital distance about equal to width of upper eyelid; and a dark ventral surface with light reticulations.

The specimen was taken at night (1820 hrs.) on the trunk of a 1 m diameter at breast height tree, 20 cm above a water-filled cavity near the base of the tree.

This is the first report of the species in Cambodia.

**Ichthyophiidae**

***Ichthyophis kohtaoensis* Taylor**

(Fig. 10)

**Material examined.** – Ta Veng: FMNH 262775, hilly evergreen forest mixed with bamboo, small tributary of O Lopeung Stream, 14°11'16.3"N 107°17'36.1"E, 160 m elev., 21 Nov.2003.

**Remarks.** – The single specimen has body length 27 times the body width (TTL 320; BDW 11.8); pharyngeal region wider than head; 335 transverse body folds curving forward

dorsally, curving backward ventrally and forming a distinct angle mesially except posteriorly; four transverse folds interrupted by vent; tentacle near lip, closer to eye than nostril; and small white asperities on the tail.

In life, the specimen had purplish-blue colouration; a broad, golden yellow lateral stripe, one branch beginning at the middle of the lower jaw and one branch beginning under the eye, terminating at the tail tip; and a cream spot on tentacle and vent.

The specimen was collected during heavy rain at night (1835 hrs.) crawling on leaf litter and bare soil 2 m from a 1 m wide swift, rocky stream.

This is the first report of the Order Gymnophiona from Cambodia.

**Bataguridae**

***Cyclemys atripons* Iverson and McCord**

(Fig. 11)

**Material examined.** – O’Rang: FMNH 262710-11, hilly evergreen forest, O Doeng Por Stream, near 12°18'08"N 107°03'08"E, 500 m elev., 6 Nov.2003.

Pichrada: FMNH 259050, gallery evergreen forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 21 Jun.2000.

**Remarks.** – A male (CPL 181, CPW 142) and two females (CPL 200-214, CPW 161-162) have a mostly yellow plastron; densely pigmented bridge; nearly immaculate chin; and dark spotting on top of the head. FMNH 259050 has 8 dark and 7 light, FMNH 262710 has 11 dark and 12 light, and FMNH 262711 has 10 dark and 11 light neck stripes. These match the descriptions of both *C. atripons* and *C. pulchriata*, two species that were described almost concurrently and that have been considered the same taxon (Iverson in Guicking et al., 2002). These specimens from Cambodia are assigned to *C. atripons* following Stuart and Platt (2004); further



Fig. 10. Adult *Ichthyophis kohtaoensis* (FMNH 262775) from Virachey National Park, Ta Veng District, Ratanakiri Province, Cambodia.

taxonomic work is needed to determine the correct application of these two names. The distribution record of FMNH 259050 was included in Stuart and Platt (2004).

FMNH 259050 was found at night (2020 hrs.) at the base of large boulder on a sandy bank 1.5 m from a swift, shallow, sandy-substrate stream. FMNH 262710-11, male and female, respectively, were found together at night (1830 hrs.) under 25 cm of water on the bottom of a 5 x 15 m stream pool with slow current and solid rock substrate, approximately 50 cm apart.

### Gekkonidae

#### *Dixonius vietnamensis* Das

**Material examined.** – Pichrada: FMNH 261844-45, rocky outcrop at base of Phnom Nam Lyr Mountain, near 12°32'16"N 107°32'10"E, 700 m elev., 18 Jun.2000.

Keo Seima: FMNH 263008, Keo Seima camp, 12°08'16.0"N 106°54'54.8"E, 160 m elev., 10 Nov.2003; FMNH 263003-07, hilly evergreen forest mixed with deciduous and bamboo, near 12°10'34.9"N 106°57'47.6"E, 190 m elev., 9 Nov.2003.

Siem Pang: FMNH 263002, evergreen forest mixed with bamboo, waterfall of O Chhay Stream, tributary of O Chay Stream, 14°15'49.6"N 106°31'46.0"E, 200 m elev., 5 Dec.2003.

**Remarks.** – These specimens agree with Das' (2004) original description by having the adult head width (measured at angle of jaws) greater than head length (measured from posterior edge of posterior supralabial to snout tip); two supranasals in narrow contact; dark canthal stripe terminating at back of head; ear opening less than one half eye diameter; and adult SVL 42.1-46.3 (mean ± SD 45.2 ± 1.7, N = 5). The Cambodian specimens differ from the original description by having dark blotches on the lips in adults, and having two distinct colour morphs represented by both sexes: uniform grayish-brown (FMNH 263002-03, 263005-07) and grayish-

brown with irregular black blotches on the dorsum (FMNH 263004, 263008). Only the second, blotched morph was described in the type series of two adult males and two juveniles. Smith (1935) noted the same two colour morphs in the similar *D. siamensis* (Boulenger) and stated that intergradation between them is rare.

Four adult males are present in the Cambodian series, and of these one (FMNH 263007, SVL 42.6, uniform morph) has six preanal pores, two (FMNH 263004, SVL 46.0, and FMNH 261844, SVL 46.5, blotched morphs) have eight preanal pores, and one (FMNH 261845, SVL 46.1, blotched morph) has nine preanal pores.

The specimens were active at night on a rocky outcrop and riverbank near the edge of forest, and within 75 cm of the ground on large tree trunks (40-150 cm diameter at breast height) in the forest. One (FMNH 263008) was found during the day retreating under a board next to a wooden building.

This is the first report of the species since its original description from Tinh Khanh Hoa Province, Vietnam.

### Agamidae

#### *Acanthosaura capra* Günther

(Figs. 12-13)

**Material examined.** – O'Rang: FMNH 262956, hilly evergreen forest near O Ngeugn Stream, near 12°18'58"N 107°05'59"E, 550 m elev., 31 Oct.2003; FMNH 262957, hilly evergreen forest near O Doeung Por Stream, near 12°18'08"N 107°03'08"E, 500 m elev., 6 Nov.2003.

**Remarks.** – These agree with Günther's (1861) original description by having a long moveable horn at the posterior terminus of the supraciliary edge; no spine above the tympanum or on the side of the neck; a diastema between the nuchal crest and the dorsal crest; and upper parts covered in small scales that are mostly uniform in size. In life, the male (FMNH 262957; SVL 110.5) had a green body with black spotting and a few larger yellow spots encircled with black;

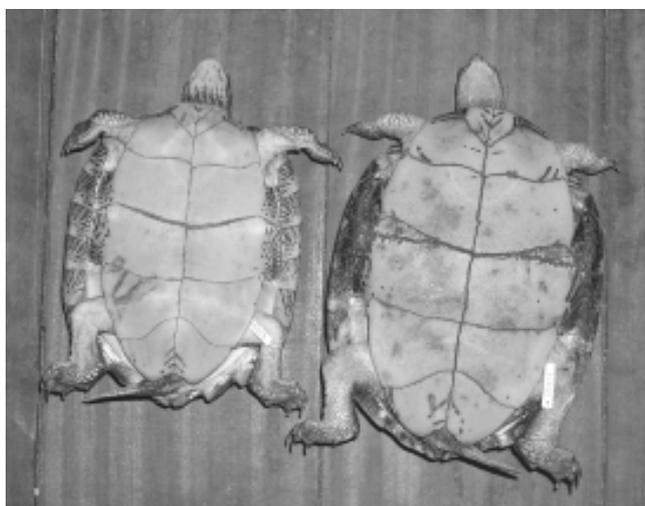


Fig. 11. Male and female *Cycllemys atripons* (FMNH 262710-11) from the Seima Biodiversity Conservation Area, O'Rang District, Mondolkiri Province, Cambodia.



Fig. 12. Male *Acanthosaura capra* (FMNH 262957) from the Seima Biodiversity Conservation Area, O'Rang District, Mondolkiri Province, Cambodia.

yellow postorbital horn and nuchal crest; greenish-yellow head with a wide black band extending from around the eye to the nuchal crest, and continuing as a narrow band from the posterior end of the nuchal crest to the shoulder; black throat with a yellow and orange gular pouch; and reddish-brown iris. The gravid female (FMNH 262956; SVL 137.9) had a dark olive-brown head and body; and a yellow supraciliary edge, postorbital horn, nuchal crest, upper lip and gular pouch.

Both were collected sleeping at night 1.5-2 m above the ground on 2-3 cm diameter vertical saplings, 40-100 m from swift streams.

This is the first report of the species in Cambodia since its original description.

***Acanthosaura coronata* Günther**  
(Fig. 14)

**Material examined.** – O’Rang: FMNH 262964, hilly evergreen forest near O Doeung Por Stream, 12°18’02.6”N 107°03’18.1”E, 500 m elev., 2 Nov.2003; FMNH 262965, hilly evergreen forest with bamboo, 12°15’41.6”N 107°03’48.2”E, 480 m elev., 7 Nov.2003.

Pichrada: FMNH 263034, Phnom Nam Lyr Mountain, hilly evergreen forest mixed with deciduous and bamboo, near 12°32’16”N 107°32’00”E, 600-700 m elev., 20 Jun.2000.

**Remarks.** – Three males agree with the original description (Günther, 1861) and expanded descriptions (Günther, 1864; Boulenger, 1885) of *A. coronata* by having a prominently projecting, serrated supraciliary edge that obscures the eyelid and orbit in dorsal view; a single short spine (sometimes broken) posterior to the supraciliary edge and separated from it by a notch; a single (sometimes two adjacent) short spine on the back of head about midway between the tympanum and nuchal crest; a continuous nuchal and dorsal crest; a light-coloured band edged with black across the crown and from the eye to upper lip; and small body size (SVL 67.5 – 70.3,

mean ± SD 68.5 ± 1.6, N = 3). *Acanthosaura coronata* is morphologically distinct from *A. lepidogaster* (Cuvier) and should be removed from its synonymy, where it was placed by Smith (1935).

The colouration of FMNH 262964 follows. In life, upper parts of body light green with gray-brown mottling; crown, nape, tympanum, and upper lip light green; distinct, light green (“yellowish-olive” according to Günther, 1861) bar edged with black on crown between supraciliary edges; distinct white and light green (“yellowish” according to Günther, 1861) bar edged with black from eye to upper lip; five narrow, black, chevron-shaped markings on vertebral line, first at the level of insertion of forelimbs with body and fifth slightly posterior to level of insertion of hindlimbs with body; limbs brown with dark brown bands; white spot on elbow and white stripe on outer surface of tibia; white band edged with black on dorsal surface of hand and foot; tail with brown and pinkish-orange bands; orange-red bar on chest extending between forelimbs; throat and venter grayish-white with black flecking; ventral surface of foot and fourth toe with brown bands; and iris reddish-brown. In preservative, the light green on the upper parts and the orange-red bar on the chest is lost. Günther (1864) stated that “the ground-colour of the male is grey, of the female brownish red; irregular dark-brown bands across the back,” but the three males reported here vary considerably in preservative in ground-colour and the extent of dorsal dark markings. FMNH 263034 has reddish-brown ground-colour but the others are grey-brown, and FMNH 262965 has heavy black chevron-shaped markings on the vertebral line but these are only slightly visible or absent in the others.

The species appears to live on or near to the ground. FMNH 262694 was observed during the day (1625 hrs.) on the ground



Fig. 13. Female *Acanthosaura capra* (FMNH 262956) from the Seima Biodiversity Conservation Area, O’Rang District, Mondolkiri Province, Cambodia.



Fig. 14. Male *Acanthosaura coronata* (FMNH 262965) from the Seima Biodiversity Conservation Area, O’Rang District, Mondolkiri Province, Cambodia.

in the forest and ran up a 15 cm diameter at breast height tree when pursued. FMNH 263034 was taken during the day (1300 hrs.) on a rock near a small stream. FMNH 262965 was sleeping at night (1915 hrs.) on the twig of a small sapling 1 m above the ground.

This is the first report of the species since its original description from Cambodia.

### *Bronchocela smaragdina* Günther

**Material examined.** - Pichrada: FMNH 262309, deciduous dipterocarp forest with grassy understorey, near 12°32'12"N 107°32'53"E, 600 m elev., 19 Jun.2000.

**Remarks.** - This adult female (SVL 110.5, TAL 365.0) fully agrees with Günther's (1864) original description, except the ventrolateral stripe was white in life rather than yellow. The specimen has the ventral scales in 12 rows, twice the size of the lateral scales; small, uniform scales between the orbit and tympanum; the fourth toe about 1/4 longer than the third toe; a weak nuchal crest; and no dorsal crest, gular pouch, or fold before the shoulder.

In life, uniformly bright green, with head and venter yellowish-green; white ventrolateral stripe between insertion points of forelimb and hindlimb and on base of tail; brown stripe on posterior surface of thigh; dorsal surface of proximal 1/5 of tail green, lateral surface and distal 4/5 of tail brown with darker flecking; and tympanum brown.

The specimen was collected at dusk (1800 hrs.) on a tree branch 3.5 m above the ground in the forest, away from any body of water. The species is probably arboreal and infrequently observed; the three local hunters present at the time of capture stated that they had never seen this lizard before.

Smith (1935) reported that only three specimens were known: the two female types obtained by Mouhot in Cambodia, and a third specimen obtained by Smith at Dalat on the Langbian Plateau in southern Vietnam.

This is the first report of the species from Cambodia since the original description.

### *Calotes emma* Gray

**Material examined.** - Ta Veng: FMNH 262954-55, hilly evergreen forest mixed with bamboo, 14°11'52.8"N 107°18'18.0"E, 200 m elev., 20 Nov.2003.

**Remarks.** - These have a spine at the posterior end of the supraciliary edge; a spine above the tympanum; a spine on the occiput about midway between the tympanum and nuchal crest; and an oblique skin fold in front of the shoulder containing small, granular, darkly pigmented scales.

Both specimens were collected at night sleeping on vegetation in the forest 1 m or less above the ground.

This is the first report of the species from Cambodia.

### *Calotes mystaceus* Duméril & Bibron

**Material examined.** - Pichrada: FMNH 262685, deciduous dipterocarp forest with grassy understory, near 12°31'38"N 107°33'19"E, 600 m elev., 19 Jun.2000; FMNH 262686, Phnom Nam Lyr Mountain, hilly evergreen forest mixed with deciduous and bamboo, near 12°32'16"N 107°32'00"E, 600-700 m elev., 20 Jun.2000.

Keo Seima: FMNH 262968, Keo Seima camp, 12°08'16.0"N 106°54'54.8"E, 160 m elev., 8 Nov.2003; FMNH 262969-70, hilly evergreen forest, 12°11'29.3"N 106°59'52.3"E, 315 m elev., 10 Nov.2003.

O' Rang: FMNH 262967, hilly evergreen forest, near 12°16'24.6"N 107°03'53.1"E, 350 m elev., 11 Dec.2003.

Ta Veng: FMNH 262966, disturbed evergreen forest mixed with bamboo, near soldier outpost, 14°09'07.7"N 107°15'33.3"E, 130 m elev., 23 Nov.2003.

**Remarks.** - These have one or two adjacent spines above the tympanum; no spine at the posterior end of the supraciliary edge; a spine on the occiput about midway between the tympanum and nuchal crest; and a deep oblique skin fold in front of the shoulder containing small, granular, darkly pigmented scales.

The specimens were collected during the day on a dirt road and around wooden buildings, or sleeping on trees at night 0.75-2 m above the ground in open forest and forest clearings.

This is the first report of the species from Cambodia.

### *Draco indochinensis* Smith

**Material examined.** - O' Rang: FMNH 262713, hilly evergreen forest, 12°20'05.8"N 107°02'26.2"E, 500 m elev., 12 Dec.2003; FMNH 262714, hilly evergreen forest with bamboo, 12°15'41.6"N 107°03'48.2"E, 480 m elev., 7 Nov.2003.

**Remarks.** - A juvenile (FMNH 262713; SVL 70.8) and adult (FMNH 262714; SVL 107.8) fully agree with the original and expanded descriptions (Smith, 1928, 1935) of *D. indochinensis*, except the juvenile has 10 and the adult 11 supralabials on each side (9 given by Smith for two females). The nostril is directed upwards; the tympanum is naked; the patagium is supported by five ribs; some of the four black transverse bands on the dorsal surface of the patagium bifurcate as they approach the body; and a thick black transverse band extends across the posterior gular region from one throat lappet to the other. Smith (1935) and McGuire and Heang (2001) distinguished both sexes of *D. indochinensis* from the similar *D. blanfordii* Boulenger by the latter character.

The juvenile was collected in the morning (0844 hrs.) on the trunk of a tree 1.5 m above the ground. The adult was sleeping

at night (1835 hrs.) on the trunk of an 18 cm diameter at breast height tree 2.5 m above the ground.

This is the first report of the species in Cambodia since the holotype was obtained at Bokor, in the Elephant Mountains of southwestern Cambodia.

***Physignathus cocincinus* Cuvier**

**Material examined.** – Keo Seima: FMNH 262958-59, UTM 0721041 1350686; Chen Chea, 12 Sept.2003.

O'Rang: FMNH 262962, hilly evergreen forest along O Kamen Stream, near 12°19'35"N 107°05'33"E, 500 m elev., 1 Nov.2003; FMNH 262963, hilly evergreen forest along O Doeung Por Stream, near 12°18'08"N 107°03'08"E, 500 m elev., 6 Nov.2003.

Pichrada: FMNH 262674-75, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 18 Jun.2000.

Siem Pang: FMNH 262961, hilly evergreen forest mixed with bamboo, near 14°18'28.9"N 106°33'32.1"E, 430 m elev., 4 Dec.2003.

Ta Veng: FMNH 262960, hilly evergreen forest mixed with bamboo along O Greng Mak Stream, 14°12'00.5"N 107°18'29.8"E, 200 m elev., 20 Nov.2003.

**Remarks.** – Two adult males (SVL 176-201), four subadults, and two juveniles have strongly compressed tails, heavily keeled below; mostly green colouration, with two subadults and one adult having four oblique, light-coloured body bands between the axilla and groin visible in preservative; well-developed nuchal, dorsal, and caudal crests in the adults, weakly visible in the young; and femoral pores, 6/5 (left/right) and 7/6 in adult males, 8/8 and 8/9 in two subadults.

Four specimens (FMNH 262675, 262960, 262962-63) were collected at night sleeping on vegetation 1-4 m above the ground, close to or overhanging forested streams. FMNH 262674 was collected at night sleeping on a sapling in the forest, 50 m from the nearest stream. FMNH 262961 drowned in a stream gill net set for fish. FMNH 262958-59 perished from injuries after being confiscated by authorities from local hunters encountered in the forest at night.

Tirant (1885) reported the species from Cambodia, without a specific locality.

**Lacertidae**

***Takydromus sexlineatus* Daudin**

**Material examined.** – Keo Seima: FMNH 262990, 12°08'16.0"N 106°54'54.8"E, 160 m elev., Chen Chea, 27 Nov.2003.

Pichrada: FMNH 261856, Bou Sraa Village, 12°32'05"N 107°25'55"E, 700 m elev., 14 Jun.2000; FMNH 261857-58, Phnom Nam Lyr Mountain, evergreen mixed with deciduous and bamboo forest, near 12°32'16"N 107°32'00"E, 600-700 m elev., 20 Jun.2000.

Ta Veng: FMNH 262989, soldier outpost, 14°09'07.7"N 107°15'33.3"E, 130 m elev., 19 Nov.2003.

**Remarks.** – Five specimens have tail length 2.50-4.30 (median 4.08, N = 3) times the SVL; a single femoral pore; four strongly keeled dorsal plates across the middle of the back, the keels forming continuous lines; keeled head shields; and no ocellate spots on flanks.

FMNH 262989-90 were collected in grassy areas close to wooden buildings, and FMNH 261856 was collected at night (1945 hrs.) sleeping on the leaf of a bush 15 cm above the ground.

This is the first report of the species from Cambodia.

**Scincidae**

***Lipinia vittigera* (Boulenger)**

**Material examined.** – Ta Veng: FMNH 262975, 262984, disturbed evergreen forest mixed with bamboo near soldier outpost, 14°09'07.7"N 107°15'33.3"E, 130 m elev., 23 Nov.2003; FMNH 262986, hilly evergreen forest mixed with bamboo, O Lopeung Stream, 14°11'16.3"N 107°17'36.1"E, 160 m elev., 19 Nov.2003.

**Remarks.** – These have an acutely pointed snout nearly twice the diameter of the eye; three distinct light-coloured (yellowish in life) longitudinal stripes across the back consisting of a vertebral stripe from the snout tip to tail and a dorsolateral stripe from above the eye to tail, each flanked by a black stripe; and a weak, light-coloured lateral stripe. In life the tail was bright orange. One is a juvenile (FMNH 262975, SVL 25.7) and two are larger and probably adults (FMNH 262984, SVL 37.5 and FMNH 262986, SVL 33.2).

FMNH 262986 was taken during the day (1600 hrs.) on the trunk of a 15 cm diameter at breast height tree 70 cm above ground, 8 m from a large stream.

This is the first report of the species from Cambodia.

***Lygosoma quadrupes* (Linnaeus)**

**Material examined.** - Pichrada: FMNH 261866, on dirt road through deciduous forest with grassy understorey and bamboo, near 12°29'49"N 107°29'33"E, 700 m elev., 22 Jun.2000.

**Remarks.** – A single specimen has an elongate, slender, diminutive habitus; four very short limbs, the forelimb (3.8) 7.2% the SVL (52.4); five fingers, the three median fingers about equal in length; five toes, the three median toes about equal in length; the snout to forelimb distance (11.5) 31.9% the axilla to groin distance (36.0); a minute ear opening, partly covered with scales; a single frontoparietal; and brown colouration with darker brown longitudinal lines on dorsum and flanks, continuing onto tail.

The specimen was taken during the day (1200 hrs.) on a dirt road that formed part of the former Ho Chi Minh Trail.

This is the first report of the species from Cambodia.

### *Sphenomorphus maculatus* (Blyth)

**Material examined.** – O'Rang: FMNH 262992, hilly evergreen forest, O Ngeugn Stream, near 12°18'58"N 107°05'59"E, 550 m elev., 31 Oct.2003; FMNH 262993, hilly evergreen forest, O Rokhlong Stream, 12°17'30"N 107°03'06"E, 500 m elev., 4 Nov.2003.

Siem Pang: FMNH 262982, bamboo mixed with evergreen forest along tributary of O Chay Stream, 14°18'28.6"N 106°33'02.6"E, 310 m elev., 5 Dec.2003; FMNH 262991, bamboo & grasses along O Kanome Stream, 14°15'08.0"N 106°37'58.8"E, 175 m elev., 11 Nov.2003.

**Remarks.** – These have a concave rostral scale; all scales smooth; scales on dorsum larger than those on side; bronze above, with two median series of black spots on back; black lateral band from tip of snout to tail, becoming lighter with jagged margin on tail; flank white with black speckling; and lower parts creamy-white.

The specimens were collected on the banks of rocky streams.

This is the first report of the species from Cambodia.

### *Sphenomorphus rufocaudatus* Darevsky & Nguyen

**Material examined.** – Keo Seima: FMNH 262999-3000, hill evergreen mixed with deciduous forest, near 12°18'02"N 107°03'18"E, 500 m elev., 2 Nov.2003.

O'Rang: FMNH 262997, hilly evergreen forest, 12°15'35.7"N 107°03'56.8"E, 542 m elev., 30 Oct.2003; FMNH 262998, evergreen mixed with bamboo and deciduous forest, 12°16'50.2"N 107°03'31.0"E, 472 m elev., 1 Nov.2003; FMNH 263001, disturbed evergreen forest, 12°17'44.8"N 107°03'16.5"E, 450 m elev., 3 Nov.2003.

**Remarks.** – These fully agree with the original description (Darevsky & Nguyen, 1983) and topotypes from Gia Lai Province, Vietnam (FMNH 252341-62). The specimens have smooth scales; the dorsal and lateral scales about equal in size; 32-34 scale rows around body; four supraorbitals; two enlarged preanals; short limbs with five fingers; bronze colouration above, with weak, longitudinal, broken stripes formed by small black spots, those of the median stripe the largest; and an irregular, broad, black dorsolateral stripe from nostril to tail.

Specimens were collected during the day on or under leaf litter, or under logs.

This is the first report of the species from Cambodia.

### *Tropidophorus microlepis* Günther

**Material examined.** – O'Rang: FMNH 262972, hilly evergreen forest, O Doeung Por Stream, near 12°18'08.4"N 107°03'08.1"E, 500 m elev., 2 Nov.2003; FMNH 262973, hilly evergreen forest, O Ngeugn Stream, near 12°18'02.9"N 107°05'22.7"E, 440 m elev., 5 Nov.2003.

Keo Seima: FMNH 262974, bamboo forest mixed with evergreen, near 12°16'45.7"N 106°56'36.4"E, 180 m elev., 8 Nov.2003.

**Remarks.** – These three specimens (SVL 57.0 – 69.0, mean  $\pm$  SD 64.5  $\pm$  6.5, N = 3) agree with Günther's (1861) original description by having a single pair of frontonasals; keels on dorsal tail scales terminating in elevated spines; keels on dorsal body scales not terminating in elevated spines; smooth throat scales; median subcaudals wider than ventrals; and three large preanals, flanked by two smaller scales. The keels on the lateral body scales are arranged obliquely. FMNH 262972-73 have weak black spots on the chin scales and unmarked throats, but FMNH 262974 has distinct black spots on the chin scales and black spots arranged into five longitudinal stripes on the throat.

All were found in and along streams. Specifically, FMNH 262972 was taken at night (1840 hrs.) under a rock on a sandy bank 20 cm from a stream, FMNH 262973 was collected during the day (1515 hrs.) in a crevice of a wet rock face next to a 3 m high cascade of a 20 m wide stream, and FMNH 262974 was found at night (1927 hrs.) clinging to a submerged branch under 15 cm of water next to the bank of a 3.5 m wide rocky stream.

This is the first report of the species from Cambodia. Günther (1861) described this species in the same paper that he described other species collected by Mouhot in Cambodia. However, Smith (1935) placed the type locality as Khao Sebab in Chanthaburi Province, Thailand, which is close to the southwestern border with Cambodia.

## Xenopeltidae

### *Xenopeltis unicolor* Reinwart in Boie

**Material examined.** – Siem Pang: FMNH 263016, evergreen mixed with bamboo forest, near 14°18'28.9"N 106°33'32.1"E, 430 m elev., 4 Dec.2003.

**Remarks.** – A single female has smooth, highly iridescent scales; brown dorsal scales, the first row creamy-white edged in brown, the second to fourth rows brown edged in creamy-white; creamy-white ventral scales, brown at outer edges posteriorly; 15 longitudinal scale rows at mid-body; and a wedge-shaped head, indistinct from neck.

The specimen was taken at night (1810 hrs.) on the leaf litter bank 1.5 m from a 3 m wide stream with slow current.

Saint Girons (1972a) reported the species from several localities in the lowlands of central Cambodia.

## Colubridae

*Ahaetulla prasina* (Reinwardt in Boie)

**Material examined.** – Pichrada: FMNH 259198, evergreen mixed with deciduous and bamboo forest, Phnom Nam Lyr Mountain, near 12°32'16"N 107°32'00"E, 600-700 m elev., 20 Jun.2000.

O' Rang: FMNH 263012, near 12°19'18"N 107°05'53"E, 7 Nov.2003.

**Remarks.** – These have an elongated snout, length about two times eye diameter; rostral scale upturned, slightly projecting, but not as a nasal appendage; black markings on dorsal scale edges forming oblique lines anteriorly; and a uniform dark gray venter.

The Pichrada specimen was in gray colour phase and found asleep at night (1855 hrs.) 1.5 m above the ground on the top of a large-leaved bush. The O' Rang specimen was in gold colour phase and killed by a local during the day (1500 hrs.) in herbaceous vegetation on the side of a road.

Saint Girons (1972a) reported the species from several localities throughout Cambodia, including Ratanakiri.

*Boiga cyanea* (Duméril, Bibron & Duméril)

**Material examined.** – Keo Seima: FMNH 259177, on road through disturbed evergreen mixed with deciduous forest, 150 m elev., coll. J. Walston and P. Davidson, May.2000.

O' Rang: FMNH 263014, hilly evergreen forest along O Rokhlong Stream, near 12°18'35.3"N 107°04'28.0"E, 500 m elev., 12 Dec.2003.

**Remarks.** – A male (FMNH 263014) has 21 scale rows at mid-body; enlarged vertebral scales; 257 ventral scale rows; and 124 subcaudal scale rows. FMNH 259177 is an incomplete specimen consisting of only the head and the anterior two head-lengths of the body. Both specimens have eight supralabials; 10 infralabials; one preocular; and two postoculars.

In life, FMNH 263014 had a green dorsum and venter; white chin with baby-blue infralabials; and bluish-white marbling on some anterior ventrals.

FMNH 259177 was killed on a road by a motor vehicle. FMNH 263014 was climbing at night (1925 hrs.) on the vertical trunk of a 10 cm DBH (diameter at breast height) sapling 4 m above the ground, 5 m from a 6 x 8 m stream pool at the base of a waterfall.

Saint Girons (1972a) reported the species from central and southwestern Cambodia.

*Dinodon septentrionalis* (Günther)

**Material examined.** – O' Rang: FMNH 263009, hilly evergreen forest, O Kamen Stream, near 12°19'35.3"N 107°05'33.4"E, 500 m elev., 1 Nov.2003.

**Remarks.** – A single female closely agrees with Günther's (1875) original description. The specimen has 17 scale rows at mid-body; the median four dorsal scale rows feebly keeled; 202 ventral scale rows; 80 subcaudal scale rows; an undivided anal scale; loreal longer than deep; one preocular and two postoculars; eight supralabials, the third, fourth and fifth entering the orbit; black trunk with 26 white bands on the body, approximately 1-1.5 dorsal scale rows wide along the vertebral row at midbody, the first at about ventral scale row 23; 15 white bands on the tail; dark bands on posterior half of venter, subcaudals marbled with black.

The specimen was taken at night (2005 hrs.) crawling on a 1 m diameter fallen tree, 2.2 m above a 3 m wide stream.

This is the first report of the species from Cambodia.

*Homalopsis nigroventralis* Deuve, new combination  
(Fig. 15)

**Material examined.** – Ta Veng: FMNH 263029, bamboo mixed with deciduous forest, O Lopeung Stream, 14°10'39.2"N 107°17'25.1"E, 150 m elev., 19 Nov.2003.

Siem Pang: FMNH 263030, bamboo mixed with evergreen forest, O Kanome Stream, 14°13'33.7"N 106°36'16.0"E, 170 m elev., 30 Nov.2003; FMNH 263031-32, bamboo mixed with evergreen forest, O Kanome Stream, 14°15'08.0"N 106°37'58.8"E, 175 m elev., 1 Dec.2003; FMNH 263033, bamboo mixed with evergreen forest, 14°12'53.8"N 106°35'51.3"E, 100 m elev., 29 Nov.2003.

**Remarks.** – A juvenile male, subadult male, two adult males, and an adult female agree with Deuve's (1970) description of *nigroventralis*, as a subspecies of *H. buccata* (Linnaeus) from Laos, by having 11-13 supralabials; 15-16 infralabials; 35-38 longitudinal scale rows at midbody; 157-165 ventrals (mean  $\pm$  SD 160.8  $\pm$  3.2, N = 5); and a dark venter with light spots.

In life, the juvenile male (FMNH 263033) had light orange dorsal body bands; a broad tan band on the dorsal surface of head; a broken creamy-white ventrolateral stripe connecting the dorsal body bands; a distinctive white X-like marking on the chin; and a black venter with scattered white spots. The



Fig. 15. Male and female *Homalopsis nigroventralis* (FMNH 263031-32) from Virachey National Park, Siem Pang District, Stung Treng Province, Cambodia.

three adults (FMNH 263030-32) had a brown dorsum with faint, lighter banding that disappeared posteriorly; an olive brown head with black markings on the snout and over eyes; venter yellowish-olive (FMNH 263030, male), olive (FMNH 263031, female), or olive-brown (FMNH 263032, male), darkening posteriorly to dark gray; creamy-white spots on the ventrals and subcaudals, beginning on the throat as a single spot on each ventral forming a longitudinal line, becoming more scattered posteriorly but sometimes arranged in pairs; creamy-white X-like marking on chin.

The juvenile was taken during the day (1400 hrs.) from the bottom of a 3 m wide swift stream flowing over solid rock substrate, 50 cm from the base of a 30 cm high cascade. The specimen was under 25 cm of water, with its head and anterior part of body emerging vertically from a small rock pile. The subadult was collected during the day (1255 hrs.) swimming under 25 cm of water in a shallow, 8 m wide flat stream with moderate current and a substrate of rocks. The adults drowned at night in gill nets set for catching fish in a 6 m wide stream with moderate current and substrate composed of sand and small rocks. The stream in which the juvenile was found in was mostly covered by forest canopy, but the other streams had no canopy cover, and were lined with tall grass, bamboo, and forest.

*Homalopsis nigroventralis* is easily distinguished from *H. buccata* by ventral colouration (*buccata* has a white venter with black spots) and habitat preference (*buccata* occurs in lentic and slow-moving bodies of water such as lakes, marshes and large rivers), and we treat them as separate species. Deuve (1970) reported that *buccata* and *nigroventralis* do not co-occur in Laos.

This is the first report of the species from Cambodia.

#### *Liopeltis stoliczkae* (Sclater)

**Material examined.** – Pichrada: FMNH 259193, deciduous forest with grassy understory and bamboo, near 12°29'49"N 107°29'33"E, 700 m elev., 22 Jun.2000.

**Remarks.** – A single male (SVL 330; TAL 232) fully agrees with Sclater's (1891) original description and Smith's (1943) expanded description of the species. The specimen has the head slightly distinct from neck; snout length twice the eye diameter; a small nostril in a long, undivided nasal; a square loreal; eight supralabials, the fourth and fifth touching the eye; 15 longitudinal scale rows at mid-body, reducing to 13 posteriorly; 155 ventrals; a brownish dorsum with a broad black stripe on the side of head that extends onto the anterior part of body before gradually disappearing; a gray stripe on the outer margins of the ventrals; and a thin gray stripe on the median of the ventrals.

The specimen was taken during the day (1200 hrs.) on bamboo 2 m above the ground at the edge of a dirt road.

Smith (1943) reported the species from northeastern India and Myanmar, and to be rare, with only five specimens

known. This is the first report of the species from Cambodia and represents a large range extension.

#### *Oligodon cinereus* (Günther)

**Material examined.** – Pichrada: FMNH 259201, deciduous forest with grassy understory and bamboo, near 12°29'49"N 107°29'33"E, 700 m elev., 22 Jun.2000.

**Remarks.** – A single juvenile agrees with Günther's (1864) original description of a single specimen from Cambodia, and the expanded description by Wagner (1975), by having 17 longitudinal scale rows at mid-body, reducing to 15 posteriorly; eight supralabials, the fourth and fifth touching the eye; one preocular; two postoculars; 168 ventrals, with an obtuse keel along each side; 26 divided subcaudals; and a single anal scale.

In life the specimen was red above, with narrow light gray crossbars bordered with black.

The specimen was taken during the day (1100 hrs.) on a dirt road through bamboo.

Saint Girons (1972a) reported the species from Trapeang Chan, in central Cambodia.

#### *Oligodon ocellatus* (Morice)

(Fig. 16)

**Material examined.** – Ta Veng: FMNH 263011, hilly evergreen forest mixed with bamboo, 14°11'38.4"N 107°17'21.9"E, 200 m elev., 22 Nov.2003.

**Remarks.** – A single female agrees with Saint Girons' (1972b) expanded description of Morice's type specimens from Tay-Ninh, southern Vietnam by having 19 longitudinal scale rows at mid-body, reducing to 15 posteriorly; eight supralabials, the fourth and fifth touching the eye; two preoculars; and two postoculars. Saint Girons (1972b) reported two Tay-Ninh females to have 161-165 ventrals and 27-29 subcaudals, but the Cambodian female has 173 ventrals and 32 subcaudals.



Fig. 16. Female *Oligodon ocellatus* (FMNH 263011) from Virachey National Park, Ta Veng District, Ratanakiri Province, Cambodia.

In life, the specimen was orange above, with dark orange head markings edged in black; 11 dark orange dorsal body blotches, edged in black, the last above the vent, each separated by three narrow black crossbars; chin and anterior 2/3 of ventrals yellowish-ivory; posterior 1/3 of ventrals salmon-pink; and subcaudals white.

The specimen was collected during the day (1400 hrs.) in a cavity in the trunk of a 35 cm diameter at breast height tree 30 cm above the ground.

Saint Girons (1972a) reported the species from Kirirom, in southwestern Cambodia.

***Pareas margaritophorus* (Jan)**

**Material examined.** – Siem Pang: FMNH 263022, bamboo forest, 14°18'52.8"N 106°35'49.9"E, 340 m elev., 3 Dec.2003.

**Remarks.** – A single juvenile has smooth scales; the head distinct from neck; body not strongly compressed; vertical eye diameter slightly greater than the distance from the ventral edge of eye to ventral edge of upper lip; vertebral scales not enlarged; gray dorsum with lateral, black and white transverse bars comprised of black scales with a white spot on the anterior part of scale; underparts whitish with black speckling.

The specimen was collected during the day (1440 h) on bamboo leaf litter 10 m from an 8 m wide stream with no current.

This is the first report of the species in Cambodia.

***Ptyas carinatus* (Günther)**

**Material examined.** – O'Rang: FMNH 262712, hilly evergreen forest, O Ngeugn Stream, Mok Romum Waterfall, near 12°18'58"N 107°05'59"E, 550 m elev., 5 Nov.2003.

**Remarks.** – A single female has large body size (SVL 189; TAL 62); 16 longitudinal scale rows at midbody, with weak keels on medial two rows; 207 ventrals; 111 subcaudals; and 9 supralabials.

In life, the specimen was uniform olive-brown above anteriorly, with indistinct yellowish-white bands formed by exposed interstitial skin; upper parts black posteriorly with five irregular, broken, yellowish-brown longitudinal stripes; upper surface of tail black with a yellowish-brown spot in the two medial scale rows; venter creamy anteriorly, becoming gray posteriorly; venter with row of large, light-coloured spots on the outer edge of ventral and subcaudal scales from mid-body to tip of tail, spots widely spaced anteriorly but on every scale row posteriorly.

The specimen was removed alive from the jaws of a 3.5 m *Ophiophagus hannah* (Cantor) at night (1830 hrs.). Both snakes were approximately 1 m from the water on the bank of a swift, 5 m wide stream between two large waterfalls.

This is the first report of the species from Cambodia.

***Rhabdophis chrysargos* (Schlegel)**

**Material examined.** – Siem Pang: FMNH 263020, evergreen forest, 14°16'34.8"N 106°32'10.5"E, 200 m elev., 5 Dec.2003.

**Remarks.** – A single juvenile has an olive-brown dorsum with whitish, lateral transverse bars connected across the vertebrae by black bars; a white upper lip with black triangular-shaped markings pointing ventrally, white lip stripe extending posteriorly to form a white chevron-shaped marking outlined in black on the base of the neck; venter whitish with a black spot at the outer margin of the ventrals and subcaudals; 9 supralabials, fourth, fifth and six touching the eye; 3 postoculars; and 2 anterior temporals.

The specimen was collected during the day (1520 hrs.) on a rocky bank 1.5 m from a 3 m wide intermittent stream with no current.

Saint Girons (1972a) reported the species from Kirirom, in the mountains of southwestern Cambodia.

***Sibynophis triangularis* Taylor & Elbel**

**Material examined.** – O'Rang: FMNH 263023, hilly evergreen forest, 12°20'05.8"N 107°02'26.2"E, 500 m elev., 12 Dec.2003.

**Remarks.** – The single male agrees with Taylor and Elbel's (1958) original description by having 10 supralabials, the tenth much the largest; the parietal in contact only with the upper of two postoculars, which is nearly square; a black triangular nuchal spot bordered by a white stripe continuous with the white supralabials; and a black spot on the outer edge of the ventrals.

The specimen was killed in the morning (0900 hrs.) by a local resident on a human trail in the forest.

This is the first report of the genus from Cambodia, and the first report of the species outside of the type locality in Chon Buri Province, southeastern Thailand, although Taylor (1965) provisionally referred literature records from Annam (central Vietnam) by Smith (1943) to this species.

**Elapidae**

***Bungarus candidus* (Linnaeus)**

**Material examined.** – O'Rang: FMNH 263015, hilly evergreen forest, near 12°16'24.6"N 107°03'53.1"E, 350 m elev., 10 Dec.2003.

**Remarks.** – A single female has a white dorsum and venter with 27 black saddle-like markings on the dorsum, the first in contact with the head, becoming narrower posteriorly; nine black saddle-like markings on the tail, and a black tail tip; head black above; supralabials and infralabials white; black

spotting on some white interspaces between dorsal black saddles; enlarged vertebral scales; 15 longitudinal scale rows at mid-body; 218 ventral scales; 45 subcaudal scales with scattered, dark brown spotting; and the tail ending in a point.

The specimen was collected at night (1845 hrs.) crawling over large rocks 3 m from a small (<1 m wide) rocky stream.

Saint Girons (1972a) reported the species from Bokor, in the Elephant Mountains of southwestern Cambodia.

## Viperidae

### *Calloselasma rhodostoma* (Boie)

**Material examined.** – Pichrada: FMNH 259196, at base of Phnom Nam Lyr Mountain on rock hill, near 12°32'16"N 107°32'10"E, 700 m elev., 18 Jun.2000.

**Remarks.** – A single subadult has smooth scales; two prefrontals; two internasals; 21 longitudinal scale rows at midbody; pointed, upturned snout tip; brownish-gray dorsum flecked with dark brown, with alternating, triangular-shaped dark brown markings; light brown stripe edged in black from tip of snout, above eye, to rear of jaw; and underparts dirty-whitish heavily powdered with brown.

The specimen was found at night (2030 hrs.) curled at the base of a grass clump on a rock hill.

Saint Girons (1972a) reported the species from several localities throughout Cambodia.

### *Trimeresurus albolabris* Gray

**Material examined.** – O'Rang: FMNH 263013, grass and disturbed evergreen forest along road, 12°19'18.5"N 107°05'53.5"E, 550 m elev., 9 Dec.2003.

**Remarks.** – A single male has 11 supralabials; internasals in contact; supraocular narrow, equal in width to about two scales on top of the head, 9 scales separating supraoculars; the vertical eye diameter less than the distance from the ventral edge of eye to ventral edge of upper lip; the side of the head below eyes lighter in colouration than the rest of the head; 21 longitudinal scale rows at midbody; a uniformly yellow (in life) lateral stripe; 163 ventrals; 68 subcaudals; dorsal surface of tail reddish; and hemipenis long, papillose at base. Smith (1943) stated that the first supralabial is "more or less completely united with the nasal," but in this specimen the first supralabial on both sides is separated from the nasal by a weak suture.

The specimen was taken at night (2000 hrs.) crawling on a dirt road.

Saint Girons (1972a) reported the species from central and southwestern Cambodia.

### *Trimeresurus macrops* Kramer

**Material examined.** – O'Rang: FMNH 262717, hilly evergreen forest, waterfall on O Ngeugn Stream, 12°18'50.5"N 107°06'03.4"E, 500 m elev., 11 Dec.2003; FMNH 262718, hilly evergreen forest, O Kamen Stream, near 12°19'35.3"N 107°05'33.4"E, 500 m elev., 1 Nov.2003; FMNH 262719, 262721, hilly evergreen forest, O Doeung Por Stream, near 12°18'08.4"N 107°03'08.1"E, 500 m elev., 2-6 Nov.2003; FMNH 262720, hilly evergreen forest, O Ronas Stream, 12°17'30.7"N 107°03'06.0"E, 450 m elev., 3 Nov.2003.

Siem Pang: FMNH 262715-16, evergreen mixed with bamboo forest, waterfall of O Chhay Stream, tributary of O Chay Stream, 14°15'49.6"N 106°31'46.0"E, 200 m elev., 5 Dec.2003.

**Remarks.** – These have short, broad heads; 9-11 supralabials, the first partly fused with the nasal; internasals in contact; the supraocular broad, equal in width to about three scales on top of the head; the vertical eye diameter greater than the distance from the ventral edge of eye to ventral edge of upper lip; 21 longitudinal scale rows at midbody; males with 161-163 ventrals (mean ± SD 162.2 ± 0.9, N = 4), females with 164-173 ventrals (mean ± SD 170.0 ± 5.2, N = 3); and hemipenis long, papillose at base.

In life, male FMNH 262717 had a reddish-orange eye; baby-blue wash on scales on side of head, especially infralabials; chin scales baby-blue, flanked with white; dark green dorsals; scales of first body scale row on anterior half of body with white marking, those on posterior half of body also having a reddish-brown marking on the ventral edge, forming a ventrolateral stripe; ventrals on anterior 1/3 of body baby-blue, remaining ventrals bright green; and dorsal and lateral surface of tail rusty-red.

Specimens were collected at night (1810-2040 hrs.) on the soil bank, herbaceous plants, bushes, tree roots, and tree branches within 10 m of swift, rocky streams, often near waterfalls. The species was collected together with *T. vogeli* (see below); for example, FMNH 262717 was captured within 3 m of a *T. vogeli* (FMNH 263025).

This is the first report of the species from Cambodia.

### *Trimeresurus vogeli* David, Vidal & Pauwels

**Material examined.** – O'Rang: FMNH 263025, hilly evergreen forest, below waterfall on O Ngeugn Stream, 12°18'50.5"N 107°06'03.4"E, 500 m elev., 11 Dec.2003; FMNH 263026-28, hilly evergreen forest, O Ngeugn Stream, Mok Romum Waterfall, near 12°18'58"N 107°05'59"E, 550 m elev., 31 Oct.-5 Nov.003.

**Remarks.** – Four males agree with David et al.'s (2001) original description by having the first supralabial separated from the nasal; a short spinose hemipenis; fewer than 174 ventrals (160-166, mean ± SD 163.7 ± 2.6, N = 4); white vertebral spots (in three of four specimens); and a mostly green tail with a dark gray or brown tail tip.

In life, FMNH 263025 had a tan-yellow eye; dark green dorsals, some with baby-blue outer edges; bright green

ventrals; baby-blue wash on supralabials and scales on side of head; chin scales green with baby-blue outer edges; small white spots widely spaced on vertebrals; upper 2/3 of scale in first body scale row white, lower 1/3 of scales reddish-brown, forming a ventrolateral stripe; baby-blue wash on subcaudals and to a lesser extent on dorsal surface of tail; and tail tip dark gray-brown.

All specimens were taken at night (1815-1900 hrs.) next to a swift rocky stream with large waterfalls. Two were crawling on vines 2-3 m above the ground and two were crawling on rocks along the stream bank. The species was collected together with *T. macrops* (see above).

Malhotra et al. (2004) reported the species from Pursat and Kampot Provinces in southwestern Cambodia.

### DISCUSSION

This collection of 30 species of amphibians and 42 species of reptiles contains major additions to the herpetofauna of Cambodia. A new species each of *Leptobrachium* and *Ophryophryne* are described. Of the remaining amphibians, 11 species (39.3%) are reported from Cambodia for the first time, including the first example of the Order Gymnophiona. Of the snakes, seven species (33.3%) are reported from Cambodia for the first time. Most of the 20 species of lizards appear to be first definitive records for the country as well, but the lack of any published treatises on the lizard fauna of Cambodia makes this statement difficult to quantify.

Four species in the collection are reported here for the first time in Cambodia since Günther (1861, 1864) originally described them from Henri Mouhot's Cambodian collection: *Bufo galeatus*, *Bronchocela smaragdina*, *Acanthosaura capra* and *A. coronata*. The distribution of the last species is unclear, as it has been treated in the literature as a junior synonym of *A. lepidogaster* since Smith (1935). However, the first three species are now known to occur in the Annamite Mountains in adjacent central and southern Vietnam (Smith, 1921; Inger et al., 1999; Liu et al., 2000; Hallermann, 2004; Kalyabina-Hauf et al., 2004). It is very likely that these four species were obtained by Mouhot during his single trip through eastern Cambodia in 1859 (to "Brelum," located in extreme eastern Mondolkiri Province, Cambodia or just over the border in present-day Vietnam; see Introduction), and have not been reported from Cambodia since their original descriptions owing to a lack of herpetological study in the hilly eastern parts of the country.

Two collections of frogs have been recently reported from mountainous areas flanking hilly eastern Cambodia: a collection from the Kontum Plateau of central Vietnam by Inger et al. (1999) and a collection from the Cardamom Mountains of southwestern Cambodia by Ohler et al. (2002). Of the nine species of frogs reported here as characteristic of anthropogenically-modified environments (Table 2), seven were reported from the Kontum Plateau (Inger et al., 1999)

and all nine were reported from the Cardamom Mountains (Ohler et al., 2002; *H. rugulosus* as *H. chinensis* and *O. martensii* as *Phrynoglossus martensii* in Ohler et al., 2002). Of the 21 species of frogs reported here as characteristic of undisturbed environments, 14 (66.7%) were reported from the Kontum Plateau (Inger et al. 1999; *Ophryophryne hansii* as *O. poilani*, *Limnonectes poilani* as *Rana* cf. *blythii*, *Rana banaorum* as *R. livida*, and *Rana morafkai* as *R. livida* in Inger et al., 1999), but only five (23.8%) were reported from the Cardamom Mountains by Ohler et al. (2002): *Kalophrynus interlineatus*, *Microhyla berdmorei*, *Rana macrodactyla*, *Rana taipehensis*, and *Theloderma asperum*. There are limitations in comparing these three collections owing to differences in the methods, lengths, and times of year of sampling. Nonetheless, two reasonably sound conclusions can be made from these comparisons. First, the frog species characteristic of anthropogenically-modified environments are rather ubiquitous in southern Indochina. Second, intact areas in eastern Cambodia contain a frog fauna that is similar to that of the mountains of adjacent Vietnam (of which the uplands in eastern Cambodia are the lower slopes), but very different from that in the mountains of southwestern Cambodia.

This finding of two very different frog faunas in the two major upland areas of Cambodia has implications for national-level biodiversity conservation strategies. Recent publications on the herpetofauna of the Cardamom Mountains and their low-lying river valleys (e.g. Daltry & Wüster, 2002; Ohler, et al., 2002; Platt et al., 2003a, b) have attracted conservation attention. Owing to the stark faunal differences in at least the frogs, such attention to the uplands of eastern Cambodia is clearly warranted.

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