

Rediscovery of *Calotes andamanensis* BOULENGER, 1891, and assessment of its generic allocation

(Squamata: Sauria: Agamidae)

Wiederentdeckung von *Calotes andamanensis* BOULENGER, 1891
und die Beurteilung seiner Gattungszugehörigkeit
(Squamata: Sauria: Agamidae)

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KURZFASSUNG

Die nur vom Holotypus bekannte draconine Agame *Calotes andamanensis* BOULENGER, 1891, wurde auf den Andamanen (India) wiedergefunden. Die Autoren legen morphometrische und meristische Daten von sechs Exemplaren von drei Inseln des Andamanen-Archipels vor und machen ergänzende Angaben zur Beschreibung des Typusexemplares. Nach der äußeren Morphologie der Echsen ist ihre Zuordnung zur Gattung *Calotes* nicht zutreffend, vielmehr sollten sie in die Gattung *Pseudocalotes* gestellt werden.

ABSTRACT

The little known draconine agamid lizard *Calotes andamanensis* BOULENGER, 1891, was rediscovered from the Andaman Islands (India). The authors present morphometric and meristic data from six specimens originating from three islands of the Andaman Archipelago, and thereby add information to the description of the type specimen. The lizard's external morphology suggests that its generic assignment to *Calotes* in its present definition cannot be maintained and that this species should better be included in the genus *Pseudocalotes*.

KEY WORDS

Reptilia: Squamata: Sauria: Agamidae; *Calotes*, *Pseudocalotes andamanensis*, lizard, systematics, taxonomy, Andaman Islands, Nicobar Islands, India, Indo-China

INTRODUCTION

The enigmatic agamid lizard *Calotes andamanensis* (BOULENGER, 1891) was described from a single specimen in the collection of the Zoologisk Museum, University of Copenhagen (ZMUC) in Denmark. The specimen was originally collected by Frederick Adolph DE ROEPSTORFF, officer-in-charge of the British camp at Nancowry harbor, Andaman and Nicobar Islands (SMITH 1935; KRISHNAN 2008). BOULENGER (1891) did not elaborate on the affinities of this species, but considered the species to be closely related to the Sri Lankan species *Calotes liolepis* BOULENGER, 1885, and listed the differences between *C. andamanensis* and *C. liolepis* viz., much larger scales and the presence of a pair of spine-like scales on each side of the back of the head in the latter (BOULENGER, 1891). SMITH (1935) followed BOULENGER'S (1891) opinion and placed *C. andamanensis*

in his "liocephalus group", which otherwise included Sri Lankan endemic species. This species was never again reported from the Andaman and Nicobar Islands or elsewhere.

ISHWAR & DAS (1999) assigned a specimen of *Calotes* from the Kalakkad-Mundanthurai Tiger Reserve (KMTR) in the southern part of the Western Ghats in India to *C. andamanensis*, and suggested that the type locality "Andaman Islands" was probably assigned in error. Consequently, it was not listed in a subsequent list of Andaman Island herpetofauna (DAS 1999). However, the specimen from KMTR was later described as *Calotes aurantolabium* KRISHNAN, 2008. In this publication, KRISHNAN (2008) discussed the differences of *C. andamanensis* to other South Asian members of the genus *Calotes* and provided a refined description of its holotype. Moreover, he pointed out that the collector of the type

specimen of *C. andamanensis*, DE ROEPSTORFF, was posted in the Nicobar Islands, thus suggesting that the specimen probably originated from there and not the Andaman Islands. Although there is a submerged mountain ridge running from the Andamans to the Nicobars, i. e., Arakan Yomas to Mentawai Islands, these two island groups are separated by a deep channel known as the Ten Degree Channel, which acts as a zoogeographical barrier (SMITH 1940; DAS 1999). KRISHNAN (2008) also mentioned a specimen in the collection of the Bombay Natural History Society (BNHM 710), iden-

tified as *C. andamanensis*, but added that it is in a bad state of preservation and cannot be diagnosed. This specimen was collected from "Middle Andaman by Dr. GANAPATHY in 1964" (VARAD GIRI, pers. comm.).

Here, the authors report on six draconine lizards from the Andaman Islands, provide morphometric and meristic data on these specimens and compare it with descriptions by BOULENGER (1891) and KRISHNAN (2008), and also with other and especially closely related species, as well as *Pseudocalotes* species.

MATERIALS AND METHODS

The lizards, stored at the Wildlife Institute of India, Vertebrate Collections at Dehra Dun, Uttarakhand, India (WII), originated from three islands of the Andaman group:

WII 001 – Long Island (Middle Andaman Islands), adult male, collected on 9 April, 2010, by Harikrishnan, S. & Chandramouli, S. R.

WII 126 – Rutland, adult female, collected on 21 April, 2011, by Harikrishnan, S. & Chandramouli, S. R.

WII 055 – South Andaman, road to Mt. Harriet National Park, near Hopetown, adult male, collected on 1 March, 2011, by Harikrishnan, S. & Chandramouli, S. R.

WII 056 – South Andaman, road to Mt. Harriet National Park, near Hopetown, adult male, collected on 1 March, 2011, by Harikrishnan, S. & Chandramouli, S. R.

WII 072 – South Andaman, Hopetown, adult female, collected on 8 March, 2011, by Harikrishnan, S.

WII 125 – South Andaman, Hopetown, adult male, collected on 20 March, 2011, by Harikrishnan, S.

The Long Island specimen was collected from a tree trunk at a height of two meters, the Rutland specimen was found on a tree at four meters above ground. Two of the specimens from South Andaman were captured on the ground, one on the trunk of a tree three meters above the ground and one climbing on the outer wall of a building (2.2 m above ground).

Measurements were taken with Mitutoyo® dial vernier calipers to the nearest

0.01 mm, the long distances snout-vent length (SVL), leg length (LL), torso length (TrL), torso width (TrW), torso height (TrH) and tail length (TL) to the nearest 0.1 mm. The following measurements were recorded: snout-vent length (SVL - from tip of snout to anterior edge of cloacal opening); tail length (TL - from posterior edge of cloacal opening to tip of tail); head length (HL - from tip of snout to posterior border of tympanum, following HALLERMANN [2005] as this avoids the potential ambiguity when head length is measured from snout tip to occiput); head width (HW - maximum width of head behind orbit); head depth (HD - height of head behind orbit), snout length (SL - distance between tip of snout and anterior edge of orbit); jaw length (JL - distance from tip of lower jaw to the posterior margin of lower jaw); orbit diameter (OD - distance between anterior and posterior edges of orbit); tympanum diameter (TD - distance between anterior and posterior edges of tympanum); torso length (TrL - distance between axilla and groin); torso width (TrW - width of the body at the middle of TrL); torso height (TrH - height of the body at the middle of TrL); upper arm length (Hum - distance between shoulder joint and elbow); forearm length (Rad - distance between elbow and wrist); length of fingers excluding the claw (F1, F2, F3, F4 & F5 numbered successively); thigh length (Fem - distance between the groin and the knee); shank length (Tib - distance between knee and ankle); length of toes excluding the claw

(T1, T2, T3, T4 & T5 numbered successively); leg length (LL - distance between the groin and the tip of the fourth toe, excluding the claw; measured by stretching the limbs). Scales around the body were counted at half the distance between fore and hind limbs (SMITH, 1935). Canthals were counted along the canthus rostralis between nasal and first supraorbital at the anterior edge of orbit. Only the scales in contact with the mental were regarded as postmentals, excluding the first infralabials.

In the following description of six freshly collected specimens, the character states of the holotype of *C. andamanensis* are indicated in parentheses, if they were

different. Specimen numbers given are the field catalogue numbers in the collection of the Wildlife Institute of India, Dehra Dun. These specimens are part of an ongoing study and will be deposited in the Zoological Survey of India, Kolkata (ZSI) collection on completion of the study. Another specimen, a male found in Wandoor (South Andaman Island) in January 2009, was collected and deposited in the collection of the Zoological Survey of India, Marine Regional Station, Port Blair, Andaman and Nicobar Islands, India (ZSI 10641). This was the first specimen of this species collected by the authors of this paper. Subsequent efforts to locate this specimen were unsuccessful.

RESULTS

Description of the draconine lizard sample (Figs. 1A, 1B, 2A, 2B)

Head elongate (HW:HL = 0.59); posterior part of jaw region swollen, particularly in males; nostril placed within enlarged nasal; rostral in contact with 4-6 scales on snout excluding the first supralabial on either side; 4-5 canthals between nasal and first supraciliary; 7-8 supraciliaries; 3-4 interorbitals; upper head scales obtusely keeled; upper snout scales flattened except the median row which is keeled, becoming progressively keeled towards posterior part of head; rostral in contact with 3 enlarged scales on the tip of the snout; these scales are separated from the nasal by one scale; 3-5 enlarged scales on occiput, their degree of enlargement highly variable; tympanum exposed, its diameter less than half the orbit diameter (TD: OD = 0.39); 3-5 enlarged scales between orbit and tympanum; scales below this also slightly enlarged; 4-5 internasals; 9-10 supralabials; nasal in broad contact with supralabials except in WII 001, in which the nasal is separated from supralabials by a row of small scales; one row of enlarged scales between supralabials and orbit, with one or two rows of smaller scales above and below; 10-12 infralabials; 2 postmentals except in WII 001 which has 3; postmentals followed by a row of enlarged scales separated from the infralabials by a row of slightly smaller scales.

57-62 (67 in the holotype) longitudinal scale rows around midbody; scales of the upper 4-7 rows directed posterodorsally, remaining lateral scales directed posteroventrally; scales of uppermost paravertebral rows enlarged, heterogeneous in shape, posterior ones feebly keeled; the other lateral scales smaller; dorsal and lateral scales smooth except above pelvis; ventrals strongly keeled, slightly irregular, smaller than dorsals but of similar size as laterals; dorsal tail scales weakly keeled; ventral tail scales strongly keeled; nuchal crest well developed, with 11-14 spines on a slightly raised flap of skin (15 in holotype); dorsal crest a mere serrated ridge (in the holotype described as 'a serrated ridge' [BOULENGER 1891] or 'weakly developed' [KRISHNAN 2008]); a shallow antehumeral pit and a weak antehumeral fold, not extending across the throat.

Number of enlarged keeled scales on posterior part of thigh 0-6, scales of this region being of irregular size; 3rd and 4th fingers of similar length; fourth toe longest; 20-23 lamellae underneath third finger; 27-30 lamellae underneath fourth toe; first phalange of third toe with enlarged triangular lamellae (Fig. 3); hind limb relatively long (70-75 % of SVL); tail relatively long (238-265 % of SVL), feebly compressed at the base; a gular pouch present in males, reaching the chest (Fig. 4B).

Coloration in life (Figs. 4A, 4B).- Body pale green above and yellowish

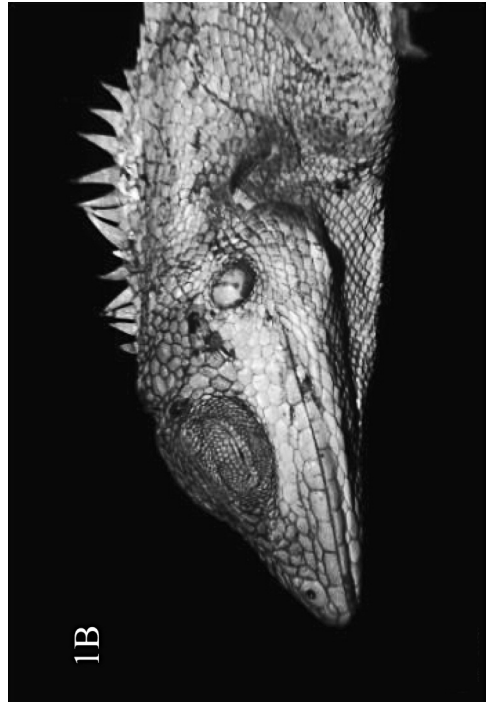
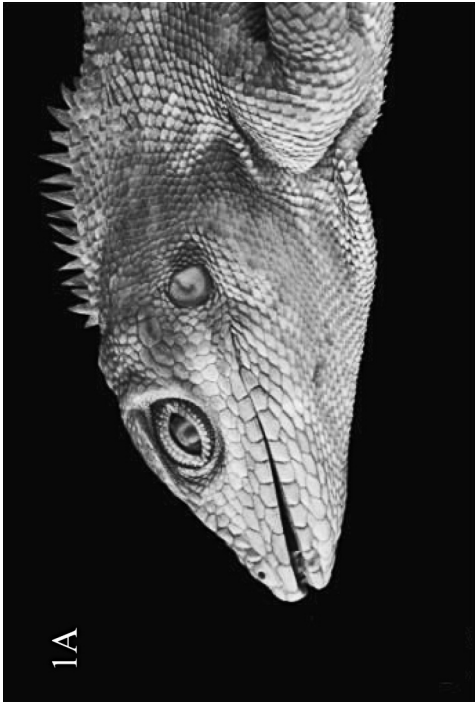
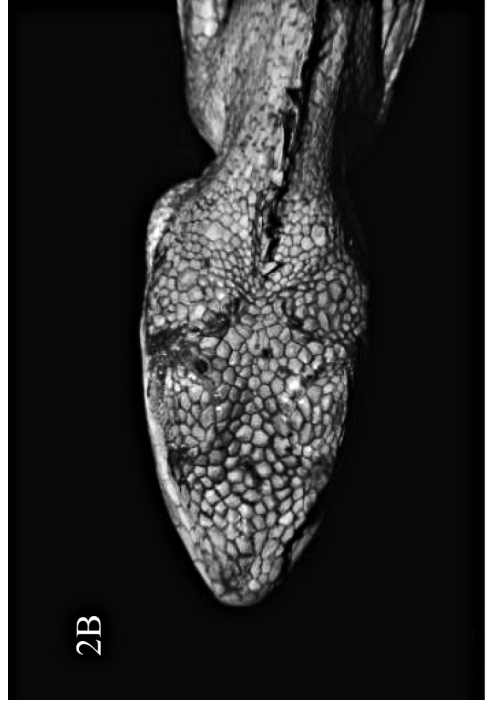


Table 1: Metric data (mm) from six specimens of *Pseudocalotes andamanensis* (BOULENGER, 1891) from the Andaman Islands studied in this paper. Data of the holotype (ZMUC 36944) was taken from KRISHNAN (2008). For definition of measured parameters see Materials and Methods. M – Male, F – Female.

Tab. 1: Metrische Daten (mm) von sechs in dieser Arbeit untersuchten *Pseudocalotes andamanensis* (BOULENGER, 1891) von den Andamanen Inseln. Die Daten des Holotypus (ZMUC 36944) stammen aus KRISHNAN (2008). Die Meßstreckendefinitionen sind in Material und Methoden angegeben. M – Männchen, F – Weibchen.

Parameter	WII 001	WII 055	WII 056	WII 072	WII 125	WII 126	ZMUC 36944
Sex	M	M	M	F	M	F	M
SVL	84.7	86.3	86.9	76.2	83.6	72.4	84.1
TL	207.2	205.4	211.0	220.1	204.2	173.1	-
TW	7.05	7.96	7.20	6.96	7.55	6.00	-
HL	24.23	23.68	23.39	21.55	23.62	19.76	23.69
HW	13.82	13.76	14.14	12.87	13.54	11.68	13.62
HD	13.66	12.81	10.92	12.05	13.10	11.40	12.42
SL	10.44	9.96	10.58	9.24	10.12	8.61	-
JL	25.93	25.47	25.55	23.13	26.99	23.05	-
OD	7.39	7.74	6.66	7.23	7.04	6.30	7.39
TD	3.16	2.85	2.48	2.70	3.03	2.48	2.70
TrL	39.4	39.0	38.1	35.2	38.0	33.1	44.42
TrW	12.6	13.9	11.1	14.9	15.0	17.1	-
TrH	15.0	15.5	16.3	16.6	15.3	16.5	-
Hum	13.83	13.65	14.75	16.74	18.27	15.00	15.44
Rad	14.66	15.56	15.4	15.53	16.21	12.71	15.33
F1	2.78	3.04	3.43	3.85	3.71	3.06	-
F2	5.28	5.68	6.34	6.32	5.80	4.43	-
F3	8.42	8.87	9.45	9.93	8.42	7.05	-
F4	8.38	9.04	9.29	9.97	9.11	7.05	-
F5	4.49	5.26	6.49	5.74	5.33	4.33	-
Fem	19.81	19.05	21.03	19.37	20.54	14.34	19.28
Tib	19.77	19.60	21.16	20.90	21.31	16.33	19.96
T1	2.92	3.58	3.28	4.20	3.58	2.73	-
T2	6.15	6.64	6.03	6.20	5.53	4.62	-
T3	10.32	10.98	11.35	11.59	11.29	9.88	-
T4	13.75	13.84	13.65	14.12	13.10	11.54	-
T5	8.71	9.29	9.63	10.38	9.11	7.68	-
LL	62.3	60.1	64.1	54.0	62.4	54.3	-

below; upper lip white, with a white stripe extending to behind tympanum; body with white spots and vertical bars; tail banded with pale green and white; the green color rapidly disappears when stressed and the whole animal turns brown on capture. Gular pouch white or yellow in males, absent in females. Two of the males found

fighting each other had the inner parts of lips and tongue colored bright yellow. All specimens turned pale bluish-white or brown in alcohol.

This species appears to be arboreal, preferring the crown or canopy of trees. All individuals were sighted during the relatively drier season between January and April.

Figs. 1 - 2 (opposite page) / Abb. 1 - 2 (gegenüberliegende Seite).

Fig. 1: *Pseudocalotes andamanensis* (BOULENGER, 1891) – Lateral view of head.
A - ZMUC 36944, holotype; B - WII 055.

Abb. 1: *Pseudocalotes andamanensis* (BOULENGER, 1891) – Kopf von lateral.
A - ZMUC 36944, Holotypus; B - WII 055.

Fig. 2: *Pseudocalotes andamanensis* (BOULENGER, 1891) – Dorsal view of head.
A - ZMUC 36944, holotype; B - WII 055.

Abb. 2: *Pseudocalotes andamanensis* (BOULENGER, 1891) – Dorsalansicht des Kopfes.
A - ZMUC 36944, Holotypus; B - WII 055.

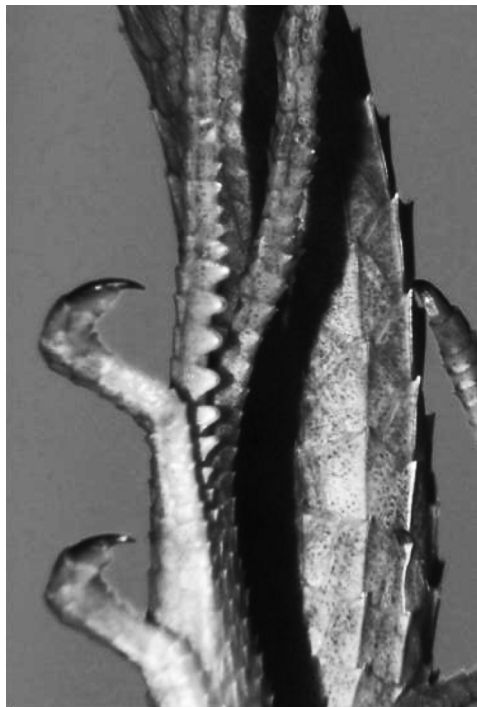


Fig. 3: *Pseudocalotes andamanensis* (BOULENGER, 1891) – Enlarged and modified lamellae on the leading edge of the third toe (WII 126).

Abb. 3: *Pseudocalotes andamanensis* (BOULENGER, 1891) – Vergrößerte umgestaltete Lamellen an der Unterkante der dritten Zehe (WII 126).

Apart from the specimens mentioned here, eight more individuals of this type were observed, all on high branches of trees, up to 30 m above ground. On the ground, they moved clumsily and seemed to be relatively slow moving in the trees also. Nothing else is known about the ecology of this species.

Comments on the type locality of *Calotes andamanensis*

According to the original description (BOULENGER 1891), the holotype of *C. andamanensis* was collected on the Andaman Islands by Frederick Adolph DE ROEPSTORFF. KRISHNAN (2008) stated that DE ROEPSTORFF was posted in the Nicobar Islands and probably never visited the Andaman Islands and,

thus, speculated that the type probably originated in the Nicobar and not in the Andaman Islands. This is however, contradicted by DE ROEPSTORFF himself who reported his interactions with people of the tribe ‘Great Andamanese’ near Port Blair, South Andaman Island (DE ROEPSTORFF 1875). Although DE ROEPSTORFF did not elaborate on the natural history of these islands, the authors believe that mentioning the above interaction is sufficient evidence for DE ROEPSTORFF having visited the Andaman Islands. Also, apart from the type of *C. andamanensis*, there exists a number of other herpetological specimens in the collection of the Zoologisk Museum, University of Copenhagen, collected by DE ROEPSTORFF, and labeled as being from the Andaman Islands. These include *Laticauda colubrina* (SCHNEIDER, 1799), *Ophiophagus hannah* (CANTOR, 1836), *Naja sagittifera* WALL, 1913 (labeled *Naja kaouthia* LESSON, 1831, for synonymy comp. WÜSTER [1998]), *Bungarus andamanensis* BISWAS & SANYAL, 1978 (locality data says “Andaman, South”, presumably South Andaman Island), *Trimeresurus andersonii* THEOBALD, 1868 (labeled *Trimeresurus purpureomaculatus* (GRAY, 1832), of which the Andaman taxon was previously considered a subspecies, comp. MALHOTRA & THORPE [1997]), *Dendrelaphis pictus* (Andaman Islands population now referred to as *Dendrelaphis andamanensis* (ANDERSON, 1871) [VOGEL & VAN ROOIJEN 2011]). The above material is clear evidence that DE ROEPSTORFF did indeed procure specimens collected in the Andaman Islands. Therefore, the type locality, given as “Andaman Islands” is regarded to be correct by the authors of this paper.

Generic allocation of BOULENGER’s (1891) *Calotes andamanensis*

Describing *Calotes andamanensis*, BOULENGER (1891) mentioned that it most closely resembled *Calotes liolepis* GÜNTHER, 1872, a species found in Sri Lanka, but without specifying why he thought so. SMITH (1935) followed BOULENGER’s opinion and placed *C. andamanensis* in his ‘*liocephalus* group’. This concept of *Calotes* has changed since, and members of these

Table 2: Meristic data from six specimens of *Pseudocalotes andamanensis* (BOULENGER, 1891) from the Andaman Islands compared with the holotype (ZMUC 36944). Data of the holotype was taken from BOULENGER (1891) and KRISHNAN (2008). For definition of parameters see Materials and Methods. M – Male, F – Female. The counts on left and right sides of body are separated by a comma.

Table 2: Meristische Daten von sechs in dieser Arbeit untersuchten *Pseudocalotes andamanensis* (BOULENGER, 1891) von den Andamanen sowie die des Holotypus (ZMUC 36944) im Vergleich. Daten des Holotypus aus BOULENGER (1891) and KRISHNAN (2008). Die Meßstreckendefinitionen sind in Material und Methoden angegeben. M – Männchen, F – Weibchen. Rechte und linke Zählwerte sind durch Kommas getrennt.

Parameter	WII 001	WII 055	WII 056	WII 072	WII 125	WII 126	ZMUC 36944
Sex	M	M	M	F	M	F	M
Supralabials	10, 10	10, 10	9, 9	10, 10	10, 10	10, 10	10, 10
Infralabials	10, 11	10, 10	9, 9	12, 11	12, 10	10, 11	10, 13
Internasals	4	5	5	5	5	5	-
Canthals	4	5, 4	5, 4	5	5	5	-
Supraciliaries	8	7	7	8, 7	7, 8	6, 8	-
Interorbitals	4	4	4	4	4	3	4
Postmentals	3	2	2	2	2	2	2
Upper head scales	Keeled	Keeled	Keeled	Keeled	Keeled	Keeled	Keeled
Upper snout scales	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	-
Enlarged scales on temple	3	4	4	4	5	4	5
Scales around midbody	62	58	60	57	57	57	67*)
Nuchal spines	13	14	13	13	11	12	15
Lamellae under 3rd finger	20	22	20	22	23	22	22
Lamellae under 4th toe	29	29	27	29	29	30	28
Enlarged keeled scales on thigh	0	1	3	5/6	4	2	3

*) The original scale count given by BOULENGER (1891) was 63. However, SMITH (1943) and KRISHNAN (2008) reported 67.

groups are now assigned to the genera *Bronchocela* KAUP, 1827, *Pseudocalotes* FITZINGER, 1843 and *Calotes* CUVIER, 1817 (MOODY 1980; HALLERMANN & BÖHME 2000; MAHONY 2010). In their review of *Pseudocalotes*, HALLERMANN & BÖHME (2000) pointed out morphological characters to separate the genera *Pseudocalotes*, *Calotes* and *Bronchocela*. If this classification is accepted, *Calotes andamanensis* is clearly not a member of the genus *Calotes* CUVIER, 1817 due to the lack of postorbital and supratympanic spines, and the presence of a heterogenous body scalation, a relatively long and narrow head and a row of enlarged scales between orbit and supralabials. MAHONY (2010) discussed the importance of certain morphological characters in the systematics of draconine agamids and pointed out that the subocular row of enlarged scales is characteristic of several insular genera as well as *Salea* GRAY, 1845. *Andamanensis* is certainly not a member of the genus *Salea* as it lacks its conspicuous

nuchal, dorsal and caudal crests and enlarged keeled dorsal and lateral scales (SMITH 1935; MAHONY 2010). The absence of a longitudinal skin fold extending from the angle of the jaw to the shoulder, ventrals that are smaller than dorsals and the relatively short tail clearly indicates that *andamanensis* is not a member of the genus *Bronchocela* as defined by HALLERMANN & BÖHME (2000) and HALLERMANN (2005).

In showing a row of enlarged scales between orbit and tympanum, heterogeneous dorsal scales, enlarged triangular lamellae under the third toe and lacking an enlarged tail base in males, this species is most similar to species of the genus *Pseudocalotes*, which are widespread in Southeast Asia (MOODY 1980; HALLERMANN & BÖHME 2000; HALLERMANN & MCGUIRE 2001; HALLERMANN et al. 2009; MAHONY 2010). In having relatively slender and long limbs, the present specimens of the Andaman Islands are most similar to *Pseudocalotes tympanistriga* (GRAY, 1831) from Java and

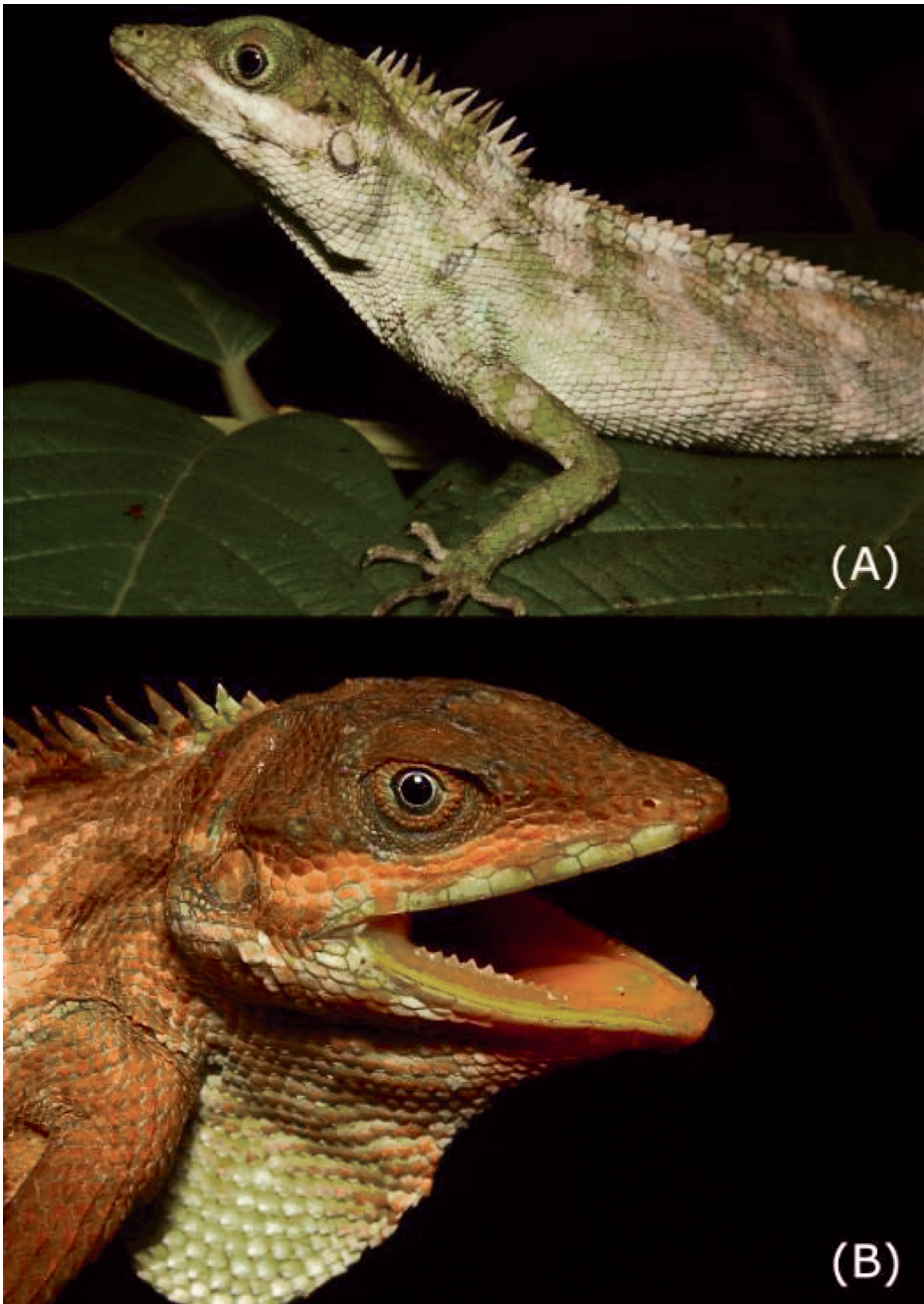


Fig. 4: *Pseudocalotes andamanensis* (BOULENGER, 1891) males in life. A - WII 055; B - WII 056.
Abb. 4: *Pseudocalotes andamanensis* (BOULENGER, 1891). Männchen. A - WII 055; B - WII 056.

Sumatra, whereas it appears closest to *P. microlepis* (BOULENGER, 1888) from the Indo-Chinese Peninsula and *P. larutensis* HALLERMANN & MCGUIRE, 2001 from western Malaysia in mid-body scale counts and scalation (HALLERMANN & MCGUIRE 2001). From *P. tympanistriga*, *P. andamanensis* differs in having a wider head (HW/HL 0.59 in *P. andamanensis*, 0.52 in *P. tympanistriga*), longer hind limbs (70-75 % of SVL in *P. andamanensis*, 68 % in *P. tympanistriga*), 9-10 supralabials and 9-12 infralabials (10-13 supralabials and 9-11 infralabials in *P. tympanistriga*). In having enlarged triangular lamellae on the leading edge of the third toe, this species is similar to the Indo-Chinese species group of *Pseudocalotes*.

It should be remembered that most draconine agamid genera are defined solely based on phenetic characters. In several traits, the species from the Andamans differs from other *Pseudocalotes*, most notably its proportionately longer limbs. Only *P. tympanistriga* is known to have similar limb proportions. In addition, most species of *Pseudocalotes*, except *P. saravacensis* INGER & STUEBING, 1994, are inhabitants of mountain forests, whereas the Andamanese species is known from sea level to about 200 m a.s.l. Moreover, it exhibits a weak antehumeral fold which is otherwise present in genera such as *Calotes* CUVIER, 1817 (some species), *Psammophilus* FITZINGER, 1843, *Gonocephalus* KAUP, 1825, *Japalura* GRAY, 1853, *Acanthosaura* GRAY, 1831, etc. However, in the authors' view, these differences are not sufficiently pronounced to justify the recognition of a new genus for the Andamanese species. In the absence of a molecular phylogeny and based on external morphology alone, it is most appropriate to consider this species as a member of the genus *Pseudocalotes* FITZINGER, 1843, which is a highly diverse genus comprising fourteen species and showing a wide array of characters.

Pseudocalotes andamanensis
(BOULENGER, 1891)
new combination

Chresonyms.- *Calotes andamanensis* - BOULENGER (1891), SMITH (1935), KRISHNAN (2008).

Diagnosis.- relatively long head (HW: HL = 0.59); 56-67 longitudinal scale rows around midbody; dorsals and laterals smooth, sometimes weakly keeled near the sacral region; ventrals strongly keeled; dorsals of 4-7 paravertebral longitudinal rows larger than laterals, of irregular shape, pointing posterodorsally; laterals pointing posteroventrally; laterals and ventrals of similar size; ventrals slightly irregular; a row of enlarged scales between supralabials and orbit, bordered by one or two smaller scale rows; gular scales smaller than ventrals, weakly keeled; gular pouch present in males; antehumeral fold/pit weakly developed; nuchal crest composed of 11-15 lanceolate spines; dorsal crest a denticulate ridge; enlarged conical lamellae under the leading edge of third toe; 27- 30 lamellae under fourth toe; hind limb length 70-75 % of SVL; tail length 238-265 % of SVL, slightly compressed at the base.

Distribution, habits and habitat

Pseudocalotes andamanensis (BOULENGER, 1891) is an arboreal species, usually found on the trunk of trees near the crown, or on branches. This species is known from South Andaman Island, Rutland Island and Long Island. Owing to its arboreal habits, it is rarely sighted and is likely to occur in more islands in the Andaman Islands. The only other native agamid species that occur in the same habitat are species of the genus *Coryphophylax* FITZINGER in STEINDACHNER, 1867, which are primarily inhabiting the understory and easily differentiated from *P. andamanensis* by the strong transverse skin fold across the shoulder and neck. *Calotes* cf. *versicolor* (DAUDIN, 1802), probably an introduced species in Andaman Islands, occurs in North Andaman and the harbor town of Port Blair in South Andaman but is restricted to anthropogenic modified landscapes and not found in forests. *Pseudocalotes andamanensis* is easily distinguished from *C. versicolor* by the regularly arranged, strongly keeled, posterodorsally directed body scales, the relatively short head, and long nuchal and dorsal spines in the latter.

The herpetofauna of Andaman Islands is known to have affinities towards the

Indo-Chinese fauna rather than South Asian fauna (SMITH 1940; DAS 1999). The channel that separates the Andaman Islands from the Irrawaddy River Delta of Myanmar is only about 230 km wide at present, but may have been as narrow as 70 km during the last glacial maxima (VORIS 2000; ALFARO et al. 2004). The possibility of a land connection between the Andaman Islands and Myanmar cannot be completely ruled out, as this is a tectonically, highly active area.

In addition, there are several small islands within this narrow gap that may have acted as stepping-stones for species to colonize the Andaman Islands from Myanmar. It is also likely that increased discharge from the Irrawaddy River during the monsoons could have resulted in a high amount of debris flowing out into the Andaman Sea, that could have acted as rafts for species for colonization (ALFARO et al. 2004).

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APPENDIX: Specimens examined

Acronyms: BNHM – Bombay Natural History Society (Mumbai, India); MNHN – Muséum National d'Histoire naturelle (Paris, France); WII – Wildlife Institute of India, Vertebrate Collections (Dehra Dun, Uttarakhand, India); ZSI – Zoological Survey of India, Marine Regional Station (Port Blair, Andaman and Nicobar Islands, India); ZSIC – Zoological Survey of India (Kolkata, India).

Bronchocela cristatella (KUHL, 1820) – ZSIC 5337, near Tavoy; ZSI 3878-SK04CNC-8, 11, 16, Car Nicobar;

Bronchocela danieli (TIWARI & BISWAS, 1973) – ZSIC 22455 (holotype), Campbell Bay, Great Nicobar, Andaman & Nicobar Islands, India; ZSI 3879-SK03LN-34, Little Nicobar;

Bronchocela rubrigularis HALLER-MANN, 2009 – ZSI 3880-SK03NC1, Nan-cowry;

Calotes aurantolabium KRISHNAN, 2008 – BNHM 1436, (holotype), Kalakkad Mundanthurai Tiger Reserve, Tamil Nadu, India;

Calotes jerdoni (GUNTHER, 1870) – ZSI 6571, Yunnan, southern China;

Calotes mystaceus DUMÉRIL & BIBRON, 1837 – ZSIC 2049, Manipur, India;

Calotes versicolor (DAUDIN, 1802) – ZSI 3876, 16 specimens from Chipo, North Andaman; ZSI 3877, 2 specimens from Chipo, North Andaman;

Pseudocalotes andamanensis (BOULENGER, 1891) – WII 001, Long Island, Andaman & Nicobar Islands, India; WII 055, WII 056, WII 072, WII 125, South Andaman Island, Andaman & Nicobar Islands, India; WII 126 Rutland Island, Andaman & Nicobar Islands, India;

Pseudocalotes austeniana (ANNANDALE, 1908) – (holotype), ZSI 3976, hills near Harmatti, Assam;

Pseudocalotes microlepis (BOULENGER, 1888) – ZSIC 11940, Manipur, India;

Pseudocalotes tympanistriga (GRAY, 1831) – MNHN 6889, 6669, 11-147-148 and 95-475.

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