



DESCRIPTION OF A SECOND SPECIES OF *COPHOTIS* (REPTILIA: AGAMIDAE) FROM THE HIGHLANDS OF SRI LANKA

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Abstract

The endemic ovoviviparous Sri Lankan lizard genus *Cophotis* has hitherto been considered to comprise only a single species, *C. ceylanica* Peters, 1861, restricted to tropical montane cloud forests at elevations above ~1,700 m in the southern part of Sri Lanka's central highlands. Here we describe a second species, *Cophotis dumbarae*, from an elevation of ~ 1,400 m in the Dumbara (=Knuckles) Hills, to the north of the central mountains, and separated from them by the Mahaweli River valley (~500 m elevation). The new species is distinguished from *C. ceylanica* by having a greater mid-ventral scale count (111–120 [$n=3$], vs. 74–90 [$n=6$] in *C. ceylanica*); non-carinate, granular (vs. carinate, imbricate) mid-gular scales; smoothly carinate, obtuse (vs. strongly carinate, acuminate) chest scales; triangular (vs. pointed) ventral scales; and a less well-developed (vs. well developed) gular sac. Both species reach approximately the same size (65.2 mm SVL in *C. ceylanica*, 60.0 mm SVL in *C. dumbarae*), and do not appear to differ significantly in mensural characters.

Introduction

The monotypic agamid lizard genus *Cophotis* Peters, 1861 is distinguished from other agamid genera by the presence of a squamous, fleshy bulb on snout; nuchal and dorsal crests; a prehensile tail; large, chaotically arranged dorsal scales; a reduced gular sac; and the absence of a tympanum, and femoral and preanal pores (Smith 1935; Taylor 1953; Deraniyagala 1953; Moody, 1980).

Macey *et al.* (2002), in a mt-DNA-based phylogeny of Agamidae, showed that the sister-genus of *Cophotis* is the monotypic genus *Lyriocephalus*, a distinctive Sri Lankan endemic, also known hitherto from only a single species, *L. scutatus*. *Cophotis* differs from *Lyriocephalus* by lacking a supraciliary ridge (vs. a pronounced ridge terminating in a sharp process in *Lyriocephalus*); possessing a reduced fleshy bulb on snout, covered by a single scale (vs. a pronounced bulb covered with numerous scales); absence of a nuchal hump (vs. presence of a well-developed hump); having all lateral scales large (vs. lateral scales interspersed with rows of minute scales); and having the tail prehensile, oval and tapering in cross-

section (vs. tail not prehensile, strongly compressed, with a bluntly-rounded tip).

With the transfer of *Cophotis sumatrana* Hubrecht, 1879 to *Pseudocalotes* (see Discussion), the genus *Cophotis* has been considered to be monotypic, the only included species being *C. ceylanica*, presently known only from relatively undisturbed patches of tropical montane cloud forest in the highest parts of Sri Lanka's central highlands, at elevations above ~1,700 m.

'*Cophotis ceylanica*' has also been recorded over many years also from the Dumbara Range (often referred to as the Knuckles, in English), a group of hills north of the central mountains and separated from them by the Mahaweli River valley (Deraniyagala 1953; de Silva *et al.* 2005; Goonewardene *et al.* 2006). The Dumbara and central highlands populations have not, however, hitherto been critically compared. Here we show that the Dumbara population differs from that of the Central Mountains in several characters, justifying its recognition as a distinct

species. Although the forests of the Dumbara Hills contain a distinctive biota, they are yet to be awarded a formal conservation status. We hope that the provision of a description and name for the new species will spur conservation efforts for both this species and its habitat.

Material methods

Altitudes are given in meters above mean sea level. Sex was determined by dissection and the presence of hemipenes.

Scale counts. Supralabials were counted from the first scale anterior to that at angle of gape, not including the median scale (when present); infralabials were counted from first scale posterior to mental, to angle of gape; mid-ventrals were counted from first scale posterior to mental, to last scale anterior to vent; circumferential scales were counted from centre of mid-dorsal row forwards and downwards across venter (this count is, however, made unreliable by the unequal size and uneven arrangement of the lateral scales); subdigital scales were counted from base of digit to tip.

External measurements. AG, distance between axilla and groin; ED, eye diameter (horizontal diameter of orbit); EN, distance between anteriormost point of orbit and middle of nostril; ES, snout length (distance between anteriormost point of orbit and tip of snout); FEL, femur length (distance between groin and knee); FL, finger length (distance between tip of claw and the nearest fork); FOL, foot length (distance between heel and tip of longest toe, with both foot and tibia flexed); HL, head length (distance between posterior edge of mandible and tip of snout); HW, head width (maximum width of head); IN, internarial distance (least distance between the inner margins of nares); IO, interorbital width (least distance between the upper margins of orbits); LAL, lower-arm length (distance from elbow to wrist with both upper arm and palm flexed); MBE, mandible–back of eye distance (distance between angle of jaws and posterior-most point of orbit; MFE, mandible–front of eye distance (distance between angle of jaws and anteriormost point of orbit; MN, mandible–nostril distance (distance between angle of jaws and middle of nostril); PAL, palm length (taken from posteriormost margin of palm and tip of longest finger); SA, distance between tip of snout and axilla; SVL, snout–vent length (measured from tip of snout to anterior margin of vent); TAL, tail length (measured from anterior margin of vent to tail tip); TBL, tibia length (distance between knee and heel, with both tibia and tarsus flexed); TL, toe length (distance between tip of claw and nearest fork); UEW, upper-eyelid width (measured from bony edge of supraorbital to outer edge of upper eyelid); UAL, upper-arm length (distance between axilla and angle of elbow).

Abbreviations. WHT, Wildlife Heritage Trust, Colombo, Sri Lanka; ZMB, Zoologisches Museum der Humboldt-Universität zu Berlin, Germany.

Cophotis dumbarae sp. nov.

(Figures 1–3)

Holotype. Male, 55.9 mm SVL, WHT 6788, Riverstone Estate (on road from Matale to Pallegama), Dumbara [Knuckles], elevation 1,435 m (7°24'54.74" N, 80°48'34.76" E), coll. K. Manamendra-Arachchi & S. Karunarathna, 16 May 2002.

Paratypes. Male, 59.3 mm SVL, WHT 6948; female, 51.9 mm SVL, WHT 6789, from type locality, coll. K. Manamendra-Arachchi & S. Karunarathna, 16 May 2002. Juvenile, 29.0 mm SVL, WHT 6790, Kobonilagala, Dumbara, S. Goonewardene & G. Vajira, 18 August 2005.

Diagnosis

Cophotis dumbarae differs from its only congener, *C. ceylanica* Peters, 1861, by having a greater mid-ventral scale count (111–120 [$n=3$], vs. 74–90 [$n=6$] in *C. ceylanica*); smooth, granular (vs. carinate, imbricate) mid-gular scales (see Figs. 1, 2); smoothly carinate, obtuse (vs. strongly carinate, acuminate) chest scales; triangular (vs. pointed) ventral scales; and a less well-developed (vs. well developed) gular sac.

Description

(Based on holotype and mature paratypes: data for paratypes, where different, in square brackets. See Table 1 for measurements.) Head rhomboid in dorsal aspect; profile of snout straight; interorbital concave. Orbital rim not prominent, aperture of eye moderate. Supraorbital ridge with a row of large, carinate scales. Temporal region with 3 large, conical scales. Area between upper temporal fossae convex. Dorsal aspect of rostral appendage oval, the appendage surrounded by the rostral scale and 5 other scales. Cephalic scales irregular, most smaller than mid-dorsal scales, smooth or feebly carinate, sometimes conical, symmetrically arranged. Two contiguous, tuberculated scales dorsally between interorbital and internarial regions. Scales on snout with carinate margins, those on head curved and flat. Two conical clusters of pointed occipital scales, separated by 1–3 rows of short, wide scales. A conical bony process present on upper edge of postorbital rim. Canthus rostralis irregular, with smooth or feebly carinate scales; 3 [2, 3] scales from rostral appendage to posterior margin of nasal; 5 [4, 5] scales from nasal to anterior orbit, in a straight line when viewed laterally. Nostril oval, antero-laterally orientated. Nasal scale large, pentagonal [hexagonal], horizontally orientated, separated from rostral appendage by 3 [2, 3] scales [or in contact with rostral appendage], centred above second and third supralabials; nasal scale separated from supralabials by a row of narrow scales; nasal scales separated from each other by 5 [3, 4] smaller scales. Supraciliary scales carinate, elongate. Second row of scales from inner margins of both upper and lower eyelid large, carinate. Supralabials 9 [9, 10]; infralabials 7 on left,

Table 1. Measurements in mm of holotype (WHT 6788) and two mature paratypes (WHT 6948, WHT 6789) of *Cophotis dumbarae*; and six examples of *Cophotis ceylanica*.

| | <i>Cophotis dumbarae</i> | | | <i>Cophotis ceylanica</i> | | | | | |
|----------------------------|--------------------------|---------------------|-----------------------|---------------------------|----------------------|-----------------------|-----------------------|-----------------------|----------------------|
| | WHT 6788 male | WHT 6948 male | WHT 6789 female | WHT 645 male | WHT 177 female | WHT 5817 female | WHT 5818 female | WHT 5819 female | WHT 516 female |
| Measurements | | | | | | | | | |
| Axilla to groin distance | 32.8 | 31.9 | 28.0 | 31.4 | 28.9 | 30.1 | 28.4 | 32.3 | 29.6 |
| Eye diameter | 3.8 | 4.0 | 3.6 | 5.3 | 4.4 | 4.3 | 4.7 | 5.3 | 3.8 |
| Eye to nostril distance | 4.5 | 4.6 | 3.6 | 4.7 | 4.6 | 4.6 | 5.0 | 4.5 | 4.8 |
| Eye to snout distance | 7.0 | 7.3 | 6.0 | 7.4 | 7.0 | 7.4 | 7.8 | 7.2 | 7.4 |
| Femur length | 8.0 | 8.7 | 8.2 | 10.1 | 8.6 | 9.0 | 12.0 | 10.0 | 9.0 |
| Finger I length | 2.7 | 2.5 | 2.2 | 2.9 | 2.7 | 3.5 | 3.2 | 2.9 | 2.5 |
| Finger II length | 3.9 | 3.4 | 3.3 | 4.5 | 3.7 | 4.9 | 5.0 | 4.5 | 3.8 |
| Finger III length | 4.8 | 4.6 | 4.3 | 5.8 | 5.5 | 6.0 | 6.3 | 5.5 | 5.8 |
| Finger IV length | 5.1 | 4.9 | 4.0 | 6.0 | 5.6 | 6.5 | 6.4 | 5.3 | 5.1 |
| Finger V length | 3.2 | 3.1 | 2.8 | 3.7 | 3.8 | 4.9 | 4.4 | 3.4 | 3.2 |
| Foot length | 11.5 | 11.5 | 10.7 | 12.4 | 11.7 | 12.3 | 13.3 | 12.8 | 11.4 |
| Head length | 15.6 | 17.3 | 14.7 | 18.8 | 16.2 | 15.4 | 19.5 | 18.0 | 17.1 |
| Head width | 8.4 | 9.1 | 8.5 | 9.7 | 9.2 | 9.2 | 9.5 | 10.3 | 8.3 |
| Internarial width | 2.7 | 2.5 | 2.5 | 3.3 | 2.9 | 2.5 | 3.0 | 2.8 | 2.6 |
| Interorbital width | 3.1 | 3.1 | 2.5 | 4.1 | 3.3 | 3.4 | 3.6 | 3.5 | 3.1 |
| Lower-arm length | 8.0 | 8.3 | 6.9 | 8.7 | 8.4 | 8.7 | 9.8 | 9.0 | 8.1 |
| Mandible to back of eye | 5.5 | 6.9 | 5.6 | 7.4 | 6.7 | 6.2 | 7.6 | 7.7 | 6.9 |
| Mandible to front of eye | 9.0 | 10.8 | 8.8 | 11.7 | 10.2 | 10.1 | 11.8 | 11.3 | 10.4 |
| Mandible to nostril | 13.0 | 15.0 | 12.8 | 16.7 | 14.4 | 14.8 | 17.1 | 15.8 | 14.8 |
| Nostril to snout | 2.1 | 2.3 | 2.0 | 2.6 | 2.4 | 2.3 | 2.6 | 2.4 | 2.3 |
| Palm length | 7.7 | 7.6 | 7.3 | 8.9 | 8.1 | 8.7 | 9.4 | 8.8 | 8.4 |
| Snout to axilla | 25.0 | 23.1 | 21.2 | 24.2 | 22.9 | 21.0 | 26.2 | 24.6 | 23.4 |
| Snout to vent length | 55.9 | 59.3 | 51.9 | 61.7 | 57.9 | 55.2 | 57.4 | 65.2 | 56.6 |
| Tail length | 69.6 | 73.6 | 63.0 | 78.9 | 67.3 | 70.3 | 66.0 | 76.3 | 70.2 |
| Tibia length | 8.0 | 9.1 | 7.1 | 9.2 | 8.2 | 8.9 | 10.3 | 9.4 | 9.7 |
| Toe I length | 2.5 | 1.8 | 1.7 | 2.3 | 2.5 | 2.5 | 3.5 | 2.9 | 2.6 |
| Toe II length | 4.0 | 3.3 | 3.2 | 4.0 | 4.0 | 4.2 | 4.5 | 4.2 | 4.0 |
| Toe III length | 6.1 | 6.1 | 5.5 | 5.9 | 6.5 | 6.4 | 7.4 | 7.0 | 6.0 |
| Toe IV length | 6.4 | 6.2 | 6.0 | 7.0 | 6.5 | 7.0 | 8.0 | 7.5 | 6.8 |
| Toe V length | 5.3 | 4.4 | 4.0 | 5.5 | 5.2 | 5.0 | 6.0 | 5.9 | 5.3 |
| Upper eyelid width | 2.1 | 1.8 | 1.4 | 1.0 | 2.0 | 2.0 | 2.3 | 2.5 | 1.8 |
| Upper arm length | 6.9 | 7.3 | 6.2 | 8.5 | 8.6 | 8.1 | 9.9 | 7.1 | 6.8 |
| Scale counts | | | | | | | | | |
| Supralabials | 9 | 9 | 10 | 9 | 9 | 8 | 10 | 9 | 9 |
| Infralabials | 7 | 7 | 8 | 7 | 8 | 7 | 9 | 8 | 8 |
| Mid-ventrals | 120 | 117 | 111 | 81 | 90 | 74 | 88 | 81 | 90 |
| Mid-body (circumferential) | 32 | 38 | 37 | 32 | 37 | 26 | 33 | 35 | 39 |
| Finger I ventral scales | 10 | 9 | 12 | 12 | 11 | 11 | 12 | 9 | 12 |
| Finger II ventral scales | 14 | 14 | 16 | 16 | 16 | 17 | 16 | 15 | 15 |
| Finger III ventral scales | 19 | 19 | 22 | 23 | 23 | 20 | 22 | 21 | 20 |
| Finger IV ventral scales | 22 | 22 | 26 | 23 | 23 | 21 | 24 | 21 | 21 |
| Finger V ventral scales | 17 | 14 | 18 | 18 | 18 | 14 | 17 | 17 | 13 |
| Toe I ventral scales | 7 | 9 | 11 | 11 | 14 | 10 | 12 | 10 | 10 |
| Toe II ventral scales | 15 | 15 | 18 | 19 | 19 | 16 | 18 | 16 | 17 |
| Toe III ventral scales | 23 | 23 | 27 | 26 | 26 | 23 | 28 | 25 | 24 |
| Toe IV ventral scales | 26 | 25 | 27 | 28 | 30 | 24 | 29 | 26 | 28 |
| Toe V ventral scales | 17 | 14 | 22 | 18 | 20 | 16 | 20 | 20 | 14 |
| Nasal above supralabials – | 2 & 3 | 2 & 3 | 2 & 3 | 1 & 2 | 2 & 3 | 1 & 2 | 2 & 3 | 2 & 3 | 2 & 3 |



Figure 1. Ventral aspects of A, *Cophotis dumbarae*, WHT 6788, holotype, 55.9 mm SVL; and B, *Cophotis ceylanica*, ZMB 4240, holotype, 63.0 mm SVL; note the smooth, granular mid-gular scales and smoothly carinate, rounded chest scales of *C. dumbarae*, vs. the carinate, imbricate mid-gular scales and strongly carinate, acuminate chest scales of *C. ceylanica*. (Photo at Fig. 1B courtesy of Rainer Günther.)

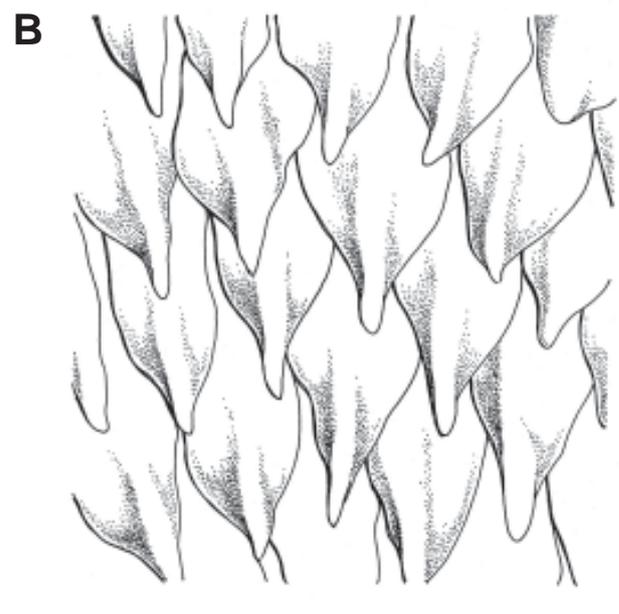
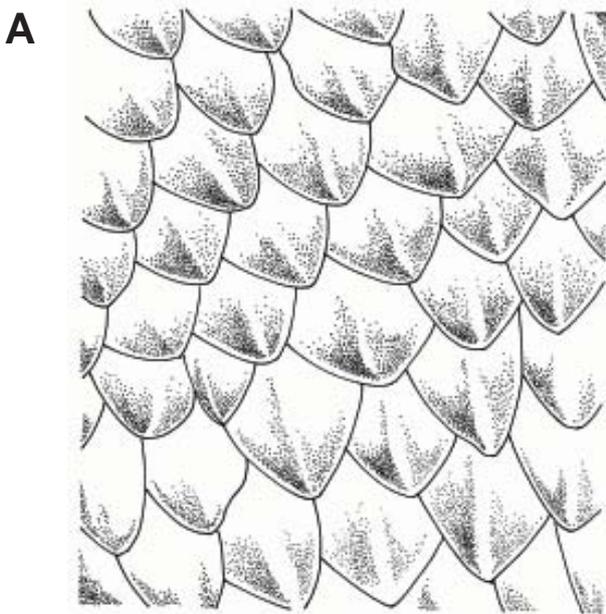


Figure 2. Scales on chest of A, *Cophotis dumbarae*, WHT 6788, holotype, 55.9 mm SVL; and B, *Cophotis ceylanica*, ZMB 4240, holotype, 63.0 mm SVL; note the smoothly carinate, rounded chest scales of *C. dumbarae*, vs. strongly carinate, acuminate chest scales of *C. ceylanica*.



Figure 3. *Cophotis dumbarae*, WHT 6788, holotype, 55.9 mm SVL. (Photo courtesy of Suranjan Karunaratne.)

8 on right [7, 9]. Some cephalic scales, supralabials, infralabials, rostral scale, and scales on rostral appendage and gular area each with between 1 and 16 pores, a sensory seta on each pore. Tympanum subdermal, tympanic membrane not visible. A single ridge of 20 [17] elongate, pointed, distinctly separate, acute scales proceeds from occipital margin along mid-dorsum to pelvic region [ridge comprised of 4 scales in female paratype]. Mental hexagonal, wider [narrower] than rostral scale. First pair of postmentals smaller than mental; postmentals in contact with first or first and second infralabials and separated from them by a pentagonal [or squarish scale]; the second pair in contact with first and second [first, and first and second] infralabials. Gular fold poorly developed [absent]. Gular scales smooth, triangular, smaller than ventrals; mid-gular scales granular, thick, set in regular series. Upper jaw with 5 [4, 5] and lower jaw with 2 incisors; upper and lower jaws each with 2 pairs of caniniform teeth; other teeth trituberculate.

Head longer than wide (HW 53.8 [52.6–57.8] % of HL; HL 27.9 [28.3–29.2] % of SVL). Eye diameter less than [equal to] eye to nostril distance (ED 84.4 [86.9–100.0] % of EN). Eye to snout distance 44.9 [40.8–42.2] % of head length. Interorbital width less than eye diameter (IO 81.6 [69.4–77.5] % of ED). Internarial distance less than [equal to] interorbital distance (IN 87.1 [80.6–100.0] % IO). Upper-eyelid width less than interorbital width (UEW 67.7 [56.0–58.1] % of IO). Nostril-to-snout distance less than internarial distance (NS 77.8 [80.0–92.0] % of IN). Eye-to-snout distance less than that from mandible to front eye

(ES 77.8 [67.6–68.2] % of MFE). Snout-to-axilla length less than axilla-to-groin distance (SA 76.2 [72.4–75.7] % of AG]). Axilla-to-groin distance 58.7 % [53.8–53.9 %] of snout-vent length. Upper-arm length less than lower-arm length (UAL 86.2 [87.9–89.8] % of LAL). Palm length less than [more than] lower-arm length (PAL 96.2 [91.6–105.8] % of LAL). Tibia length less than foot length (TBL 69.6 [66.3–79.1] % of FOL). Snout-vent length less than tail length (SVL 80.3 [80.6–82.4] % of TAL).

Body oval or subtriangular in section. Scales on occipital area smaller than those on mid-dorsum. Dorsal scales more or less equal to lateral scales, smooth or carinate, unequal, irregular, imbricate, triangular, some with rounded tips. Lateral scales larger, irregular, some feebly carinate, bluntly triangular, others rounded, all directed obliquely downward. Chest scales triangular, smoothly uncarinate. Ventral scales uniform, uncarinate, smaller than the larger lateral scales, longer than gular and chest scales, reducing to small, blunt tubercles near cloaca and at base of thigh. Caudals larger than ventrals (except for scales around vent), carinate, smaller posteriorly. Scales on limbs unequal, dorsally mostly carinate, rarely smooth; ventrally mostly smooth or only feebly carinate. Digits covered dorsally and laterally with carinate or smooth, triangular scales. Subdigitals bicarinate. Subdigital squamation as follows: first finger with 10 [9–12], second finger with 14 [14–16], third finger with 19 [19–22], fourth finger with 22 [22–26], fifth finger with 17 [14–18] scales; first toe with 7 [9–11], second toe with 15 [15–18], third toe with 23 [23–27], fourth toe with 26 [25–27], fifth toe with 17 [14–22] scales. Some

dorsal, lateral, caudal, subcaudal and limb-scales, and all ventral scales each with a sensory pore at posterior end, some pores with a sensory seta. Digits laterally compressed or oval in cross-section; claws laterally compressed and slightly curved, pointed, each claw between two scales, one above and one below. Approximately 120 [111–117] scales between mental and vent; 32 [38–37] circumferential mid-body scales. Tail prehensile, oval in cross section. Relative lengths of digits: fingers, 4>3>2>5>1; toes, 4>5>3>2>1.

Measurements of holotype (in mm): AG, 32.8; ED, 3.8; EN, 4.5; ES, 7.0; FEL, 8.0; FL I, 2.7; FL II, 3.9; FL III, 4.8; FL IV, 5.1; FL V, 3.2; FOL, 11.5; HL, 15.6; HW, 8.4; IN, 2.7; IO, 3.1; LAL, 8.0; MBE, 5.5; MFE, 9.0; MN, 13.0; NS, 2.1; PAL, 7.7; SA, 25.0; SVL, 55.9; TAL, 69.6; TBL, 8.0; TL I, 2.5; TL II, 4.0; TL III, 6.1; TL IV, 6.4; TL V, 5.3; UEW, 2.1; UAL, 6.9.

Colour in life of holotype male (Fig. 3): upper lip light greenish yellow, lower lip dark greenish black. A light greenish-yellow band extends from tip of snout to axilla. Loreal and temporal regions black with light greenish-yellow scales. Pupil black. Iris black with golden pigments, its inner rim golden. Dorsal crest black with light-green patches. A yellowish-brown bar on anterior part of

interorbital. Upper arm with 1, lower arm with 3, thigh with 2 and tibia with 3 indistinct light greenish-yellow bands. A vague, dark-brown bar on flank immediately behind axilla, and another anterior to groin, 2–3 scales wide. Middle of throat reddish orange. Tail with 7 greenish yellow and seven black cross-bands. Three greenish yellow cross-bands on fingers and 3 or 4 on toes. Ventral scales black with buff-brown tips.

Female with throat pale buff with longitudinal brown streaks. Both upper and lower lips light brown with black patches. Venter and subcaudals uniform buff brown. Ventral areas of limbs pale buff brown. Tail with 7 greenish-buff and 8 dark-brown cross bands. Female overall paler than males.

Colour in preservative (based on holotype): head dorsally and laterally dark brown, an oval white patch on occipital. Mid-dorsal scales brownish ash, with a few white scales especially in the temporal region. Lateral scales brown. Gular and throat scales brown, mid-gular scales white. Several narrow, dark-brown streaks on throat. Scales on chest and mid-abdomen brown with white patches. Abdomen mostly whitish, with brown patches. Limbs dorsally dark brown with ashy-blue scales. Scales on tail dorsally ashy brown, distal half of tail uniform ashy brown.



Figure 4. Distribution in Sri Lanka of *Cophotis dumbarae* (triangles) and *C. ceylanica* (circles); the respective type localities are indicated by open symbols.

Description of juvenile: head length, 8.5 mm; snout–vent length, 29.0 mm; tail length, 29.2 mm. Dorsal scales on head, body and limbs smooth; lateral scales on head and body smooth. Dorsal crest with 12 scales. Gular, chest and ventral scales smooth. Ventral scales on limbs smooth. Caudal and subcaudals carinate. Coloration in preservative: dorsally ashy brown, gular pale brown with black longitudinal streaks, venter pale brown with black spots, subcaudals white with black spots.

Etymology

The species-name is an eponym for the region it inhabits, the Dumbara Hills of Sri Lanka, formed here as a noun in the genitive case.

Discussion

The generic allocation of *Cophotis sumatrana* Hubrecht, 1879, was followed uncritically for a century (e.g., Boulenger 1885, Smith 1930) and cited as a biogeographic conundrum (e.g., Darlington 1957, Das 1996) until Moody (1980) showed that it was not closely related to the Sri Lankan taxon and stated that a manuscript describing a new genus for it was in preparation by himself and W. Böhme. With no reference to Moody's work, however, Manthey & Grossmann (1997) erected the genus *Pseudocophotis* for this taxon, differentiating it from *Cophotis* by the structure and arrangement of the subdigital scales and the fact that it is oviparous, not ovoviviparous as is *C. ceylanica*, the type species of *Cophotis*. Subsequently, Hallermann & Böhme (2000) synonymised *Pseudocophotis* with *Pseudocalotes* Fitzinger, 1843 on the basis of several synapomorphies, pointing out also that the additional distinguishing character mentioned by Manthey & Grossmann (1997)—the concealed tympanum—occurs adaptively in several agamid genera. *Cophotis* has since been considered monotypic and endemic to Sri Lanka.

Although the Dumbara population of *Cophotis* has long been known (Deraniyagala 1953, Manamendra-Arachchi & Liyanage 1994, de Silva *et al.* 2005, Goonewardene *et al.* 2006), it has not previously been compared critically with that of the Central Hills (unfortunately, the specimens from Gammaduwa in the Dumbara Hills, deposited by Deraniyagala in the National Museum of Sri Lanka, Colombo, have since been lost). In addition to the type locality, *C. dumbarae* has been recorded also from four other localities in the Dumbara hills (see Fig. 4): Dotalugala (7°18'29.9" N, 80°51'07.0" E, elevation 1550 m: Goonewardene *et al.* 2006), Gammaduwa (7°34' N, 80°42' E, elevation ~1,000 m: Deraniyagala 1953), Kobonilagala (7°21'21.2" N, 80°50'16.0" E, elevation 1,400 m: Goonewardene *et al.* 2006) and Rangala (7°21' N, 80°46' E, elevation 1,400 m: A. de S., pers. obs.).

The holotype of *Cophotis ceylanica* (ZMB 4240), was collected from 'near Rambodde', by [John] Nietner (R. Günther, *in litt.*). In his original description, Peters (1860)

gave the following measurements for this specimen: total length, 136 mm; head length, 18 mm; tail, 75 mm; forelimb, 23 mm; hind limb, 27 mm; head width, 8 mm. While these measurements are consistent with both *C. ceylanica* and *C. dumbarae*, the ventral scalation (see Figs. 1,2) serves immediately to show that the holotype of *C. ceylanica* belongs to the Central Mountains population and not that from the Dumbara Hills. The vicinity of Rambodde (now spelt Ramboda) is at an elevation of about 1,600 m, and is no longer habitable by *Cophotis*, with the forest having given way to tea plantations. Ramboda is, however, only about 3 km from the Pidurutalagala Forest Reserve, which rises to 2,524 m, and in which *C. ceylanica* is still recorded. The best-known population of *C. ceylanica* however, is in Horton Plains National Park (elevation 2,100) and its environs.

The two species of *Cophotis* are distinguished essentially by their ventral scalation (see diagnoses in species accounts, above). Principal components analysis and discriminant function analysis of a set of 32 measurements taken from the sexually mature holotype and paratype of *C. dumbarae* and six examples of *C. ceylanica* of approximately the same size range (see Table 1) show that the two species do not separate unambiguously in mensural characters. The maximum size reached by the series of *C. ceylanica* examined by us was 65.2 mm SVL, whereas the largest *C. dumbarae* was 59.3 mm SVL (the largest of the six specimens of *C. dumbarae* measured and released by Goonewardene *et al.*, 2006, was 60.0 mm SVL).

While reproduction has not yet been observed in *C. dumbarae*, it would be surprising if it were not ovoviviparous, as is *C. ceylanica*. Ovoviviparity in the latter species has been known for a century (Willey 1906), and reported on more recently also by Tyron (1977). The habitat, ecology and conservation status of *C. dumbarae* have been detailed by Goonewardene *et al.* (2006).

The Dumbara Hills contain a biota with a close affinity to that of the Central Mountains, but with several distinctive, endemic elements. In addition to several angiosperm species, these include eight species of anurans (genera *Philautus* and *Nannophrys*), a horned agamid lizard (*Ceratophora tennentii*), three cyprinid fishes (genera *Puntius* and *Labeo*) and five parathelphusid crabs (genera *Perbrinckia* and *Ceylonthelphusa*). Some of these are clearly vicars of Central Hills taxa (see Meegaskumbura & Manamendra-Arachchi 2005). The lowlands (elevation ~500 m) of the Mahaweli River, which separates the Dumbara Hills from the Central Mountains, appears to have served as a barrier to the dispersion of highland species between the two mountain ranges, though no attempts have yet been made to date this divergence or relate it to the island's climatic or geological histories. Schulte *et al.* (2002) showed, however, that *Lyriocephalus* diverged from *Cophotis* ~10.8 mya, and that the populations of *Lyriocephalus scutatus* of the Knuckles and Sri Lanka's south-western lowlands diverged ~4.3 mya.

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Comparative material

Lyriocephalus scutatus, WHT 175, female, 115.7 mm SVL, Koskulana (Panapola).
Cophotis ceylanica, WHT 177, female, 57.9 mm SVL, Horton Plains; WHT 5817, female, 55.2 mm SVL, Diyagama Estate, Diyagama; WHT 5818, female, 57.4 mm SVL, Diyagama Estate, Diyagama; WHT 645, male, 61.7 mm SVL, Horton Plains; WHT 5819, male, 65.2 mm SVL, Diyagama Estate, Diyagama; WHT 516, male, 56.6 mm SVL, Horton Plains; ZMB 4240, holotype, 61.0 mm SVL, Rambodde [Ramboda].

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