



Two new species of *Rhinophis* Hemprich (Serpentes: Uropeltidae) from Sri Lanka

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Abstract

Two new species of uropeltid (shieldtail) snake are described from Sri Lanka; *Rhinophis lineatus* **sp. nov.** from Harasbedda, near Ragala, and *Rhinophis zigzag* **sp. nov.** from Bibilegama, near Passara. The new species are distinguished from congeners in morphometric and meristic external characters, and in having very distinctive colour patterns. Scale-row reduction data are presented for the two new species; this is a new development for uropeltid systematics, and its potential utility is highlighted. The nature of the overlap between the two anal scales is also highlighted as a potentially useful character. The two new species were included in previous phylogenetic analyses of allozyme and albumin immunological data, but their phylogenetic relationships are not yet well resolved.

Key words: Alethinophidia, India, shieldtail, snake, systematics, taxonomy

Introduction

Rhinophis Hemprich, 1820 comprises about 13 nominal species of burrowing uropeltid snake endemic to the Western Ghats region of peninsular India and, mostly, Sri Lanka (e.g., McDiarmid *et al.*, 1999; Wickramasinghe *et al.*, 2009). The taxonomy of uropeltids (*sensu* McDiarmid *et al.*, 1999) has been fairly stable over the last century, but probably due in large part to lack of attention rather than prior completion of a well-founded framework (Gower *et al.*, 2008). Recently, Wickramasinghe *et al.* (2009) described a new species of *Rhinophis* from Sri Lanka and suggested that the uropeltid fauna of that country remained under-studied and incompletely known. Here we describe two additional new species.

Material and methods

The new species described here were first identified from specimens deposited in the collection of the Wildlife Heritage Trust of Sri Lanka (WHT), now transferred to the Department of National Museums, Colombo, Sri Lanka (= Colombo National Museum of Sri Lanka: NMSL). We were aware that similar material from the same localities had been collected previously by Carl Gans and some of his Sri Lankan colleagues, and so we also examined relevant specimens from Gans's collections deposited in the California Academy of Sciences, San Francisco, USA (CAS). Relevant type and comparative material was examined in NMSL and the Natural History Museum, London, UK.

Total length was measured to the nearest 1 mm using a ruler or tape measure. Circumference was measured to the nearest 1 mm using a piece of thread and a ruler. All other measures were taken under stereo dissecting microscopes with vernier calipers to 0.1 mm. Ventral scale counts include all midventral scales between the mental and anal scales, following Gower & Ablett (2006). Dorsal scale-row reduction formulae are based on Dowling (1951; see Appendix). Selected specimens were sexed by observing oviducts and/or ova for females and epididymis and/

or testes for males through an approximately midventral incision into the coelom. Uropeltid taxonomy follows McDiarmid *et al.* (1999).

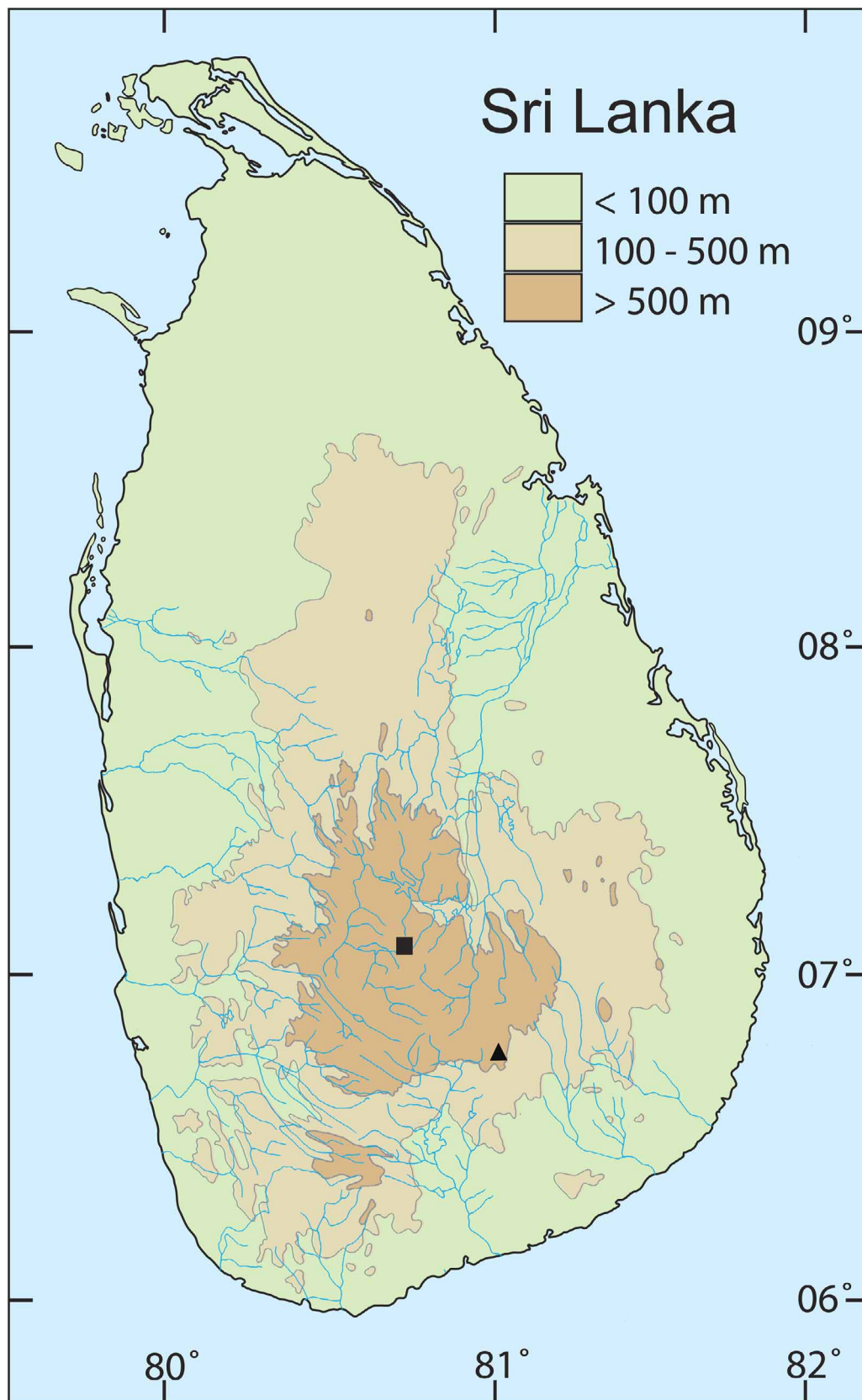


FIGURE 1. Map of Sri Lanka showing the type (and only known) localities of *Rhinophis lineatus* **sp. nov.** (square) and *R. zigzag* **sp. nov.** (triangle).

***Rhinophis lineatus* sp. nov.**

(Figs. 1–5; Table 1; Appendix)

Rhinophis drummondhayi Wall, 1921: de Silva (1990: plate 1F)

Rhinophis sp. 1: Cadle *et al.* (1990)

Holotype. CAS 226024, female, Harasbedda (07°03'N, 80°52' E, alt. 1,460 m, Fig. 1), near Ragala, Central Province, collected 26–30 October 1976 by Lalith Jayawickrama. Photographs presented in Figs. 2–4.



FIGURE 2. Holotype of *Rhinophis lineatus* sp. nov. (CAS 226024).

Paratypes. 18 specimens, all from the type locality: CAS 225806; CAS 226025–226035 (11 specimens); CAS 226042–226044 (all CAS specimens same dates and collector as holotype); WHT 5208 and 5218, males, collected by M. M. Bahir, 04 and 10 November 2000, respectively; WHT 5788, male, collected by S. V. Nanayakkara, 20 November 2002.



FIGURE 3. Holotype of *Rhinophis lineatus* sp. nov. (CAS 226024). Scale in mm.

Diagnosis. A *Rhinophis* distinguished from *R. dorsimaculatus*, *R. oxyrhynchus*, *R. porrectus*, *R. punctatus* and *R. zigzag* by having fewer than 200 ventral scales, and from the first four of these species by its middorsally transversely rounded rostral (*vs* a distinctly crested/carinate rostral). The new species differs from *R. blythii*, *R. erangavirajei*, *R. travancoricus* and *R. tricolorata* by having more than 170 ventral scales. The Indian *R. fergusonianus* and *R. sanguineus* differ from *R. lineatus* in having much larger tail shields, and rostrals that separate the prefrontals along less than half their length. In addition, *R. lineatus* lacks the conspicuous (but low) carinae on the distal ends of the scales on the underside of the tail of *R. sanguineus*, and is less attenuate than the only known specimen of *R. fergusonianus* (midbody width in length ca. 30–40 *vs* 42). *Rhinophis philippinus* has a much larger tail shield (longer than the shielded part of the head) than *R. lineatus*. In common scalation characters, *R. lineatus* resembles *R. drummondhayi* and *R. homolepis* most closely, but it differs from both these species substantially in its colour pattern; regular, narrow, longitudinal pale/dark stripes around and along almost the entire body (*R. lineatus*) *vs* striped venter but unstriped dorsum with short pale and middorsally incomplete cross bars (*R. homolepis*) or mottled venter and dark dorsum with lateral/dorsolateral yellow, dorsally tapering bars (*R. drummondhayi*). Indeed, *R. lineatus* is the only species in the genus characterised by a colour pattern of multiple, narrow longitudinal stripes around and along most of the body, a feature occurring in all known specimens.

Description of holotype. See Table 1 for morphometric and meristic data. Head small; snout pointed. Rostral pointed, trihedral anteriorly, longer than wide, dorsally rounded and slightly raised/arched (in lateral and anterior views), without sharp dorsal crest (though with rounded longitudinal ridge); rostral widest at level of anterior superior corner of first supralabials. Rostral several times longer (in dorsal view) than rostral-frontal gap. Frontal irregularly hexagonal, slightly wider than long, anterolateral (ocular) margins slightly converging posteriorly, posterolateral margin straight; anterolateral (ocular) margin shortest, anterior edges longest. Frontal shorter, wider than rostral. Paired nasals separated from each other by posterior half of rostral. External naris small, subcircular, slightly countersunk within small depression, located in anteroventral corner of nasal. Nasal contacts supralabials 1 and 2. Prefrontals briefly (for less than 25% of their length) in contact with each other along midline, separating frontal from rostral. Prefrontals wider than long, shorter than frontal. Supralabials four, first smallest, making the least contribution to margin of mouth; second larger but only slightly longer; fourth much the largest. Ocular contacts supralabials 3 and 4. Eye small but distinct, diameter less than one third length of ocular, located near anteroventral corner of ocular, bulging slightly from ocular surface, pupil appears subcircular. Paired parietals about as long as frontal, posteriorly broadly rounded (a little > 90°). Opposite parietals in brief midline contact, left overlapping right. Parietals substantially wider than long, wider than frontal and rostral. Each parietal contacts four scales other than head shields and infralabials. Three infralabials, first and third subequal in length, notably shorter than second. First infralabials very briefly in midline contact, separating small, slightly prominent mental from first midline ventral scale. First and second ventrals longer than wide, third about as long as wide, fourth and subsequent ventrals wider than long.

Seven maxillary and eight mandibular teeth on each side. Teeth simple, pointed, distinctly retrorse, straight, evenly spaced. Mandibular teeth hidden deeper in gingivae. Antermost maxillary tooth aligned approximately with halfway along lower margin of second supralabial, posteriormost maxillary tooth close to posterior edge of lower margin of third supralabial; mandibular row similar in length and alignment, with antermost member a little further forward than maxillary row.

Body subcylindrical to slightly dorsoventrally compressed. Head and body scales macroscopically smooth, lacking keels. Body scales generally evenly sized on dorsum and along body except for those involved in dorsal scale row reductions. Midline ventral scales between mental and anal of even size though anterior- and posteriormost ones gradually narrow. Ventrals 186, at midbody approximately 1.1 times as broad as exposed part of adjacent first dorsal scale row. Dorsal scale rows 19 anteriorly, reducing to 17 along most of body.

4+5 (45)	+5 (52)	3+4 (64)
Scale reduction: 19 -----	17 -----	19 ----- 17
4+5 (40)	+5 (49)	3+4 (62)

Dorsal scale rows 13 at base of tail. Paired anal scales (right overlying left) considerably larger than posteriormost ventrals and subcaudals. Distal margin of each anal overlaps three other scales in addition to anteriormost subcaudals. Subcaudals 7 (left), 6 (right), all but posteriormost paired/divided. Tail scales macroscopically smooth though with two to six inconspicuous keels on posterior portion of posteriormost subcaudals (increasingly promi-

nent posteriorly). Caudal 'shield' conical, forming tip of tail, about as long as wide in dorsal view, distinctly shorter than shielded part of head, visible from below and especially above, base (not as wide as base of tail) surrounded by last (unpaired) subcaudal and 12 other scales. In posterior view shield broad oval to slightly egg-shaped, wider ventrally than dorsally, widest point about halfway up. Shield surface covered with small spines in approximately radial distribution, generally subequal though perhaps slightly larger close to midline. In parts, a thin halo around base of shield glossy and without spines.



FIGURE 4. Holotype of *Rhinophis lineatus* **sp. nov.** (CAS 226024). See Fig. 3 for scale.

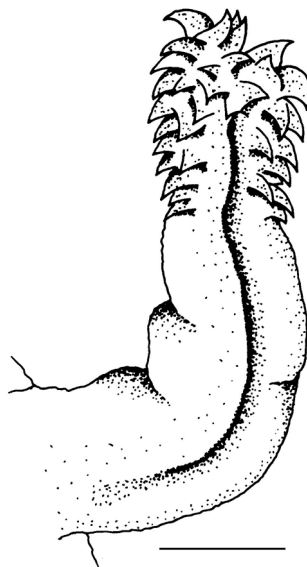


FIGURE 5. Hemipenis of paratype (WHT 5208) of *Rhinophis lineatus* **sp. nov.** Scale bar = 1 mm.

In alcohol, background body colour yellowish to pale tan. A darker (pale brown) longitudinal line present on each dorsal scale row, collectively forming multiple stripes along length of body, interrupted only at scale reductions. Stripes widest dorsally; brown stripes darker and background tan paler posteriorly so that contrast between stripe and background colour weakest anteriorly; stripes very wide anteriorly on dorsum, almost merging, but ventrally much thinner and more intermittent. Ventrals with darker blotches mostly restricted to proximal part of scale, together forming broken additional stripe. Head brownish, about as dark as anterior of body; fairly uniform except for paler posteroventral part of fourth supralabial and slightly paler, more orange rostral. Anals yellowish with mottled brown posteromedial margins. Subcaudals brown with small yellowish flecks medially; dorsalmost 7+ scale rows and ventralmost row on tail brown; irregular yellowish lateral stripe one to three scales wide. Tail shield matt brown with yellowish apex.

Variation. See Table 1 for meristic and morphometric details. Supra- and infralabials always as holotype except four infralabials on right of CAS 226043. Relative size and shape of dorsal shields of head somewhat vari-

able; for example, frontal notably small relative to parietals and prefrontals in CAS 226026; rostral and frontal in contact in CAS226028; second of four (from midline) scales contacting each parietal generally does so more briefly than in holotype, so that in some specimens (e.g. CAS 226026, 226028) each parietal superficially appears to contact only three non-head-shield scales. Mental generally narrowly separated from first ventral; very briefly in contact in CAS 226029, 226034. Ventrals 180–195; subcaudals 4 to 7 on each side, between one (always the posteriormost) and four of which are undivided/single. Left anal overlaps right only in CAS 225806, 226026, 226033, and WHT 5218. Dorsal scale rows always 19 anteriorly, 17 at midbody and immediately in front of anus (perhaps 16 rows here in CAS 226044); however, considerable variation in scale-row reductions although pattern seen in holotype seemingly average (see Appendix). Shield shape variable in posterior view; much wider ventrally than dorsally in CAS 226025, little wider ventrally than dorsally in CAS 226026, little wider dorsally than ventrally in CAS 226028 and 226044. Not all specimens were dissected to determine sex but available data do not indicate clear sexual size dimorphism (Table 1). Males perhaps tend to have longer tails, but number of subcaudals is not a reliable indicator of sex.

TABLE 1. Merisitic and morphometric data for holotype (CAS 226024) and all paratypes of *Rhinophis lineatus* sp. nov. Dimensions in mm. Bilateral values given as left, right. (1) sex, (2) ventral scales, (3) subcaudal scales (number unpaired), (4) supralabials, (5) infralabials, (6) disposition of two anal scales, (7) number of small scales overlapped by annals, excluding first subcaudals, (8) maxillary teeth, (9) mandibular teeth, (10) total length, (11) tail length, (12) tail length as % of total length, (13) midbody width, (14) width at vent, (15) midbody circumference, (16) total length/midbody width, (17) number of scales (excluding subcaudals) surrounding base of tail shield, (18) base to tip of tail shield, (19) maximum width of tail shield, (20) maximum diameter of tail shield. (21) exposed width of ventral scales at midbody, (22) exposed width of first scale row at midbody, (23) width of ventral/first dorsal scale rows, (24) diameter of eye, (25) maximum L of ocular, (26) ocular/eye, (27) distance between eyes, (28) distance between eye-naris, (29) L frontal, (30)W frontal, (31) distance between snout tip-posterior edge 4th supralabial, (32) total length/HL, (33) head width level with corner of mouth, (34) distance between nares, (35) maximum longitudinal L of prefrontal scales, (36) L parietal scale = distance between posterior tip of parietal and posterior end of suture between frontal-ocular, (37) W parietal scale = distance between posterior tip of ocular and posterior tip of frontal, (38) L midline suture between parietals, (39) distance rostral-frontal, (40) distance between tip of snout and posterior edge of rostral, (41) distance between tip of snout and posterior limit of midline suture between parietals, (42) maximum width of rostral, viewed ventrally, (43) distance between snout tip-naris, (44) distance between snout tip-eye. Abbreviations: L = length, W = width, HL = head length as measured by character 31. Abbreviations: r = right, l = left.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CAS 226024	f	186	7, 6 (1)	4,4	3,3	r/l	3,3	7,7	8,8	286	7	2.4	8.2	7.5
CAS 225709														
CAS 225806		195	4,4 (1)	4,4	3,3	l/r	3,3			281	5.6	2.0	7.7	6.9
CAS 226025	m	187	6,6 (3)	4,4	3,3	r/l	3,3	7,7	8,8	233	6.0	2.6	6.9	5.9
CAS 226026	m	186	6,6 (1)	4,4	3,3	l/r	3,3	7,7	8,8	237	7.2	3.0	6.9	6.4
CAS 226027	m	184	6,6 (2)	4,4	3,3	r/l	3,3	7,7	7,8	232	7.2	3.1	5.8	5.7
CAS 226028	f	195	4,4 (1)	4,4	3,3	r/l	3,3	7,7	8,8	262	5.2	2.0	6.9	6.0
CAS 226029				4,4	3,3			6,6	8,8				7.0	
CAS 226030		186	7,6 (5)	4,4	3,3	r/l	3,3	?,7	?,8	230	12.6	5.5	6.1	6.0
CAS 226031			5,5 (2)	4,4	3,3	r/l	3,3			225	5.6	2.5	6.6	6.3
CAS 226032		184	6,5 (0)	4,4	3,3	r/l	3,3			198	5.7	2.9	5.7	4.9
CAS 226033		183	5,5 (4)	4,4	3,3	l/r	2,3	?,7	?,8	158	4.5	2.8	5.1	4.9
CAS 226034		182	5,6 (0)	4,4	3,3	r/l	3,3			114	3.4	3.0	4.0	3.3
CAS 226035		194	4,4 (3)	4,4	3,3	r/l	3,3	?,7	?,8	249	5.7	2.3	7.2	5.7
CAS 226042	m	185	6,6 (4)	4,4	3,3	r/l	3,3	7,7	9,8	259	8.1	3.1	7.9	7.3
CAS 226043		180	5,6 (3)	4,4	3,4	r/l	3,3	7,6	8,8	249	6.4	2.6	7.4	7.4
CAS 226044	m		6,5 (1)			r/l	3,3	6,6	6,8	239	8.7	3.6	7.5	6.2
WHT 5208	m	187	7,6 (1)	4,4	3,3	r/l	3,3	7,7	8,8	273				
WHT 5218	m	183		4,4	3,3	l/r				285				
WHT 5788	m	190		4,4	3,3	r/l				218				

continued.

	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
CAS 226024	25	34.9	13	5	4.2	5.5	2.6	2.3	1.1	0.5	1.7	3.4	2.9	2.1	2.1
CAS 225709															
CAS 225806	25	36.5	11	4.9	4.2	5.6	2.4	2.1	1.1	0.5	1.6	3.2	2.3	2	2.1
CAS 226025	24	33.8	12	4.6	3.7	4.8	2.1	1.7	1.2	0.4	1.5	3.8	2.3	1.8	1.8
CAS 226026	23	34.3	13	4.9	4.0	5.1	2.2	1.9	1.2	0.4	1.5	3.8	2.5	1.9	1.7
CAS 226027	22	40.0	14	4.4	3.8	4.6	2.0	1.8	1.1	0.4	1.3	3.3	2.3	1.8	1.9
CAS 226028	22	38.0	12	3.8	3.4	4.4	2.4	2.0	1.2	0.5	1.5	3.0	2.4	1.8	2.0
CAS 226029	21						2.2	2.0	1.1	0.4	1.4	3.5	2.5	1.9	2.0
CAS 226030	18	37.7	12	4.4	3.3	4.6	2.0	1.8	1.1	0.5	1.4	2.8	2.2	1.7	1.8
CAS 226031	20	34.1	12	4.1	3.9	4.3	2.2	1.9	1.2	0.5	1.4	2.8	2.2	1.7	1.9
CAS 226032	18	34.7	13	3.5	3.1	3.8	1.7	1.6	1.1	0.5	1.3	2.6	2.1	1.5	1.8
CAS 226033	17	31.0	10	3	2.7	3.3	1.6	1.4	1.1	0.4	1.1	2.8	2.0	1.4	1.4
CAS 226034	13	28.5	13	2.4	2.2	2.8	1.3	1.0	1.3	0.5	1.1	2.2	1.9	1.3	1.6
CAS 226035	19	34.6	13	4.7	3.8	4.9	2.3	2.0	1.2	0.4	1.5	3.8	2.4	1.9	2.0
CAS 226042	24	32.8	12	4.8	4.1	5	2.6	2.1	1.2	0.3	1.5	5.0	2.5	1.9	1.8
CAS 226043	25	33.7	12	4.2	3.7	4.7	2.4	2.0	1.2	0.4	1.6	4.0	2.6	1.9	1.9
CAS 226044	23	31.0	12	4.1	3.8	4.5	2.3	2.0	1.2	0.5	1.5	3.0	2.2		2.0
WHT 5208			13												
WHT 5218															
WHT 5788															

continued.

	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
CAS 226024	2.3	7.2	39.7	4.5	1.8	1.6	2.2	2.3	0.7	0.2	3.1	6.1	1.6	1.4	3.8
CAS 225709															
CAS 225806	1.9	6.8	41.3			1.4	1.9	1.7	0.5	0.1	3.2	5.9	1.4	1.4	3.6
CAS 226025	1.8	6.1	38.2	3.8	1.5	1.4	1.8	1.8	0.5	0.3	2.7	5.2	1.5	1.2	3.2
CAS 226026	1.8	6.3	37.6	4.1	1.5	1.4	1.9	1.9	0.6	0.4	2.8	5.4	1.5	1.4	3.5
CAS 226027	1.8	6.1	38.0	3.6	1.4	1.3	1.8	1.7	0.6	0.1	2.8	5.3	1.4	1.3	3.3
CAS 226028	1.9	6.1	43.0	3.8	1.5	1.4	1.8	1.8	0.6	0	2.8	5.3	1.4	1.3	3.3
CAS 226029	2.0	6.4		4.0	1.4	1.5	1.7	1.7	0.5	0.1	3.0	5.5	1.4	1.4	3.5
CAS 226030	1.8	5.7	40.4	4.0	1.4	1.1	1.8	1.8	0.4	0.2	2.4	5.1	1.2	1.1	3.1
CAS 226031	1.9	5.9	38.1	3.9	1.4	1.3	1.6	1.9	0.4	0.2	2.7	5.0	1.3	1.3	3.2
CAS 226032	1.7	5.1	38.8	3.3	1.4	1.1	1.6	1.7	0.4	0	2.4	4.7	1.3	1.1	2.8
CAS 226033	1.6	5	31.6	3.2	1.2	1.0	1.5	1.7	0.3	0.2	2.2	4.2	1.2	0.9	2.6
CAS 226034	1.4	4.6	24.8	3.0	1.2	1.0	1.6	1.5	0.4	0.2	1.9	3.9	1.1	0.8	2.4
CAS 226035	2.1	6.3	39.5	4.1	1.5	1.2	2	2.1	0.5	0.2	2.8	5.4	1.3	1.2	3.4
CAS 226042	2.0	6.4	40.5	4.3	1.5	1.2	1.8	1.9	0.6	0.1	2.9	5.3	1.6	1.3	3.5
CAS 226043	2.0	6.1	40.8	3.9	1.6	1.3	1.9	1.9	0.6	0.2	2.7	5.4	1.5	1.3	3.3
CAS 226044	1.9	5.9	40.5				2	1.8	0.4	0.2	2.7	5.1			3.1
WHT 5208															
WHT 5218															
WHT 5788															

Colour pattern generally constant and matching holotype. Intensity/brightness of orange tinge of rostral somewhat variable (bright in e.g., CAS 226043). Paler lower part of posterior supralabials extends further forwards in some specimens (e.g., onto second supralabial of CAS 226025).

Hemipenes (based on everted organs of WHT 5208, Fig. 5) moderately long (ca. 4 mm), slender, deeply forked: a single, subcylindrical organ, densely ornamented with large, curved, closely spaced spines on their distal one-third; proximal two-thirds smooth. Sulcus spermaticus shallow, its walls smooth and free of spines along distal third of hemipenis.

Colour in life. A colour photograph presented by de Silva (1990: plate 1f) depicts the species in life, identified as *R. drummondhayi*. The background body colour appears to be orange-brown, and the longitudinal stripes dark brown. The same photograph, also labeled as *R. drummondhayi*, appears on a 2001 poster “Snakes of Sri Lanka” authored by de Silva, though here the background body colour appears a paler and less reddish brown.

Etymology. The species name is an allusion to the distinctive multiple longitudinal stripes. The specific epithet is considered a noun in apposition.

Suggested common name. Striped Rhinophis (English).

Distribution, natural history and conservation. *Rhinophis lineatus* is known only from the type locality, Harasbedda, in the Wet Zone of the central hills of Sri Lanka. As far as we are aware, all known specimens were collected from soils in agricultural habitats. Although the exact range of the species is unknown it is unlikely to be large (e.g. across a substantial part of the central hills) based on its absence in reasonably large collections of uropeltids from across the region (BMNH, CAS, WHT). Given its small probable range and very few known localities (not known to include protected areas), *R. lineatus* is likely to fall into one of the IUCN’s threatened categories.

Remarks. In terms of common scale counts, *Rhinophis lineatus* resembles *R. drummondhayi* (and *R. homolepis*) most closely among Sri Lankan snakes, and this probably led Carl Gans to refer specimens of *R. lineatus* to *R. drummondhayi* in his photographic (de Silva, 1990: plate 1F) and specimen collection (CAS electronic catalogue, accessed February, 2009) records. However, there are profound colour pattern differences (narrow, regular pale/dark longitudinal stripes in *R. lineatus*; dark dorsum, ventral mottles, and pale dorsolateral bands anteriorly in *R. drummondhayi*), and we expect more extensive studies of *R. drummondhayi* to further reveal morphometric and meristic differences. Carl Gans later recognized that *R. lineatus* was an undescribed species (“*Rhinophis* sp. 1”, Cadle *et al.*, 1990)

Based on reliable locality records and morphological and molecular analyses (e.g. Cadle *et al.*, 1990; Bossuyt *et al.* 2004; unpublished data) Sri Lankan species of Uropeltidae do not occur in India or *vice versa*. *Rhinophis lineatus* is readily distinguished from the three congeneric Indian species. The new species also differs clearly from the non-*Rhinophis* Sri Lankan uropeltids that, although currently classified in other genera (*Pseudotyphlops*, *Uropeltis*, e.g., McDiarmid *et al.*, 1999), possibly form part of the Sri Lankan uropeltid radiation together with Sri Lankan *Rhinophis* (Cadle *et al.*, 1990; Bossuyt *et al.*, 2004). *Rhinophis lineatus* differs (beyond in its distinctive colour pattern) from *Pseudotyphlops philippinus* and *Uropeltis melanogaster* in having more than 170 ventrals, and from *U. phillipsi* in having fewer than 197 ventrals. Additionally, compared with *R. lineatus*, *P. philippinus* has a substantially larger, almost flat tail shield, and *U. melanogaster* and *U. phillipsi* smaller, narrower tail shields that are shorter (*vs* longer) than the part of the head anterior to the frontal. *Uropeltis ruhunae* has keels rather than spines on its tail shield.

***Rhinophis zigzag* sp. nov.**

(Figs. 1, 6–8; Table 2; Appendix)

Rhinophis dorsimaculatus Deraniyagala, 1941: Somaweera (2006: 235, photograph A)

Rhinophis sp. 2: Cadle *et al.* (1990)

Holotype. CAS 226306, male, “Bibilegama Rd.”, near Passara, Province of Uva, collected May 1974 by C. Gans. Photographs presented in Figs. 6–8. There are no precise coordinates for the locality, though Bibilegama is at 06°54’N, 81°08’ E and approximately 1,000 m altitude.

Paratypes. 13 specimens, all from the type locality: CAS 225690 (Bibilegama, 20 November 1974), 225691 (Bibilegama, 20 November 1974), 225902 & 225903 (Bibilegama, 1050 m, 4 May 1976, C. Gans), 225967, 225968 & 225969 (Bibilegama, 28 July 1976, L. Jayawickrama), 226014, 226015 & 226016 (Bibilegama, lower

section, 31 July 1976, L. Jayawickrama), 226307 (Bibilegama, 28 May 1974, C. Gans); WHT 5243 and WHT 5284 (Bibilegama, 2 and 13 November 2000, M. M. Bahir and C. Gans).

Diagnosis. In having more than 200 ventral scales, *R. zigzag* (207–221) differs from all other *Rhinophis* except *R. dorsimaculatus*, *R. oxyrhynchus*, *R. punctatus*, *R. porrectus*, *R. homolepis*, and *R. sanguineus*. Of these six species, *R. punctatus*, *R. porrectus*, and *R. dorsimaculatus* have more than 230 ventrals whereas *R. zigzag* has fewer than 230, and the former three species plus *R. oxyrhynchus* have a dorsally crested/carinate rostral scale vs the dorsally rounded rostral of *R. zigzag*. *Rhinophis homolepis* has a notably smaller head and its tail shield lacks the heterogeneity in the size of the spines seen in *R. zigzag*. *Rhinophis sanguineus* also lacks notable spine heterogeneity on the tail shield, and differs from *R. zigzag* also in having a much larger shield, conspicuous (but low) multiple carinae on the distal edges of scales on the underside of the tail, and in having a shorter rostral that barely interjects between the prefrontal scales. *Rhinophis zigzag* also differs from all congeners in its distinctive and consistent colour pattern of a dark middorsal, meandering/zigzag stripe.

Description of holotype. Some morphometric and meristic data are given in Table 2. Head small; snout and rostral pointed. Rostral trihedral anteriorly, with clear but rounded ridge dorsally (sharp crest absent), arched in lateral and anterior views. Rostral much longer than wide, maximum width at the level of anterodorsal corner of first supralabials. Rostral several times longer than rostral-frontal gap. Frontal longer than wide, six-sided, anterolateral (ocular) margins shortest and slightly converging posteriorly, posterolateral margins longest. Frontal shorter, wider than rostral. Paired nasals separated by posterior of rostral. Small subcircular external naris slightly countersunk within small depression in anteroventral corner of nasal. Prefrontals wider/taller than long, shorter than frontal, very briefly in midline contact between frontal and rostral. Four supralabials; first smallest; second a little longer, much larger; fourth much the largest. Ocular contacts supralabials 3 and 4; about five times longer than diameter of small, slightly bulging eye (pupil subcircular) in anteroventral corner. Paired parietals shorter and wider than frontal; posterior margins forming a rounded right angle; briefly in midline contact (left overlaps right). Posterior edge of each parietal contacts fourth supralabial plus four temporal-region scales. Infralabials three: first shortest, third a little and second notably larger. Small, slightly prominent mental just contacts first midventral scale. First and second ventrals longer than wide, these proportions subequal in third; fourth and subsequent ventrals wider than long.

Seven teeth in each maxillary row, seven or eight in mandibular rows. Teeth simple, pointed, retrorse, straight. Spacing of teeth even in all rows. Dentary teeth hidden deeper in gingivae and less prominent than maxillary rows. Anteriormost maxillary teeth approximately just behind ventral end of suture between first and second supralabials, posteriormost tooth approximately level with posterior lower margin of third supralabial. Dentary row of similar length and alignment.

Body subcylindrical to slightly dorsoventrally compressed. All head and body scales lack keels, macroscopically smooth. Dorsal body scales generally evenly sized around and along body, except for those involved in dorsal scale row reductions. Midline ventral scales between mental and anal generally evenly sized except for gradually narrowing anterior- and posteriormost members. Ventrals 209, at midbody 1.3 times as broad as exposed part of adjacent, first row of dorsals. Anteriorly 19 dorsal scale rows, reducing to 17 rows by midbody.

4+5 (48)	+5 (53)	4+5 (77)
Scale reduction: 19 -----	17 -----	19 -----
3+4 (36), +4 (37), 4+5 (41)	+5 (49)	4+5 (72)

Paired anals (right overlaps left) considerably larger than posteriormost ventrals and anterior subcaudals; distal margin of each overlaps three scales in addition to anteriormost subcaudals. Base of tail with 14 scale rows in addition to first pair of subcaudals. Six subcaudals on each side, anteriormost four paired/divided. Tail scales macroscopically smooth though with two to seven macroscopically inconspicuous keels on posterior portion of posteriormost caudals (increasingly prominent posteriorly). Caudal shield conical, forming tip of tail (shield base not as wide as body); oval in posterior view; a little shorter than shielded part of head; surrounded by last (undivided) subcaudal scale and 13 caudal scales (14 total); readily visible from below and especially from above. Shield surface covered by spines except for very narrow, glossy ring around shield base and narrow dorsal midline strip towards and at shield apex; spines distinctly larger (up to 0.4 mm long) in pair of single paramedian rows flanking spineless strip. Spines with laterally compressed tips and broad bases.

In preservative, background body colour yellowish to pale tan/beige. Slightly irregular dorsal longitudinal zigzag pattern along whole body formed by darker (pale brown) patches generally on dorsalmost five or six scale



FIGURE 6. Holotype of *Rhinophis zigzag* sp. nov. (CAS 226306).



FIGURE 7. Holotype of *Rhinophis zigzag* sp. nov. (CAS 226306). Scale in mm.

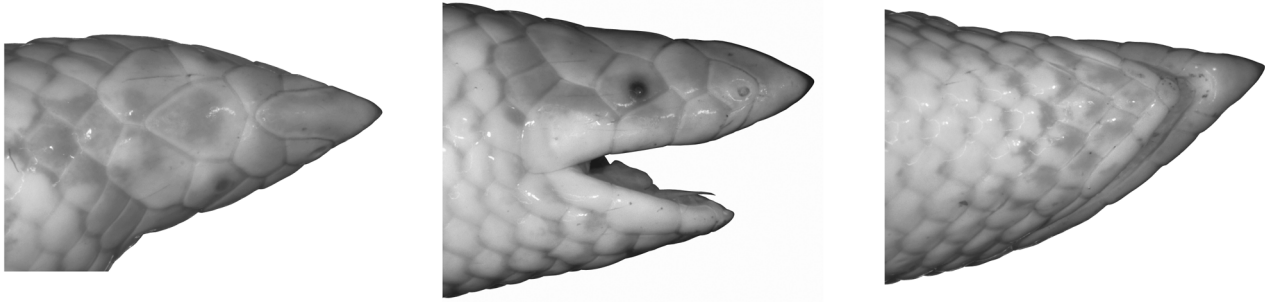


FIGURE 8. Holotype of *Rhinophis zigzag* sp. nov. (CAS 226306). See Fig. 6 for scale.

rows. Contrast between paler background and darker patches less marked anteriorly. Some other body scales pale brown, either singly or forming intermittent narrow stripe on fourth dorsal scale row (not anteriorly, strongest at midbody). Ventrals and lowermost dorsals yellowish with occasional pale brown flecks. Anals and last three ventrals yellow/cream without brown marks. Subcaudals brown laterally, yellowish medially (forming irregular mid-ventral yellowish stripe). Five dorsal-most scale rows on tail entirely brown; irregular pale lateral stripes below this across up to 3.5 scale rows each. Caudal shield mostly brown (continuation of dorsal tail colour) with irregular yellow-orange midline stripe towards and at apex. Broad spine bases orange-yellow, laterally-compressed tips orange-brown. Head yellowish, slightly darker than background body colour; low-contrast brown stripe on upper edge of fourth and third supralabial extending across lower edge of ocular (and eye). Brown spot across anterior edge of prefrontal, anterodorsal edge of second supralabial, nasal and posterior of rostral; additional brown blotches on parietals and mid-posterior of frontal. Ventral scales on anterior of body and infralabials and mental unblemished, but small brown flecks present on anteriormost chin shields (and one on right second infralabial).

Variation. See Table 2 for morphometric and meristic data. Scale-row reductions match holotype with minor variation (Appendix). Slight indication of longer heads in males (Table 2), but sample size small; little difference in relative tail length but males only sex to have up to 6 subcaudals. Shape of tail shield in posterior view fairly consistently similar to holotype. Colour pattern generally matches holotype with minor variation. For example: last two (CAS 226014, 225902) or four (CAS 225967) ventrals entirely pale, or with brown flecks (CAS 226015); anals flecked in CAS 225690, 225967; middorsal zigzag broken into patches anteriorly in WHT 5243, CAS 225690 and 225967; contrast between paler and darker regions stronger in some specimens (e.g., WHT 5284); scales between infralabials brown in CAS 225690, 225967 226015; brown spots not clear on prefrontals of CAS 225690; tail shield more orange than brown in CAS 226014, more yellow in WHT 5284.

Colour in life. The dorsal surface of a fresh specimen (misidentified as *R. dorsimaculatus*) in a photograph presented by Somaweera (2006: 235, photograph A) shows the pale colour (pale tan in preservation) to be a dull yellow and the darker dorsal zigzag (brown in preservation) to be a pale lilac-brown.

Etymology. The species name is an allusion to the distinctive zigzag dorsal stripe, present in all known specimens. The specific epithet is considered a noun in apposition.

Suggested common name. Zigzag Rhinophis (English).

Distribution, natural history and conservation. *Rhinophis zigzag* is known only from the type locality, Bibilegama, in the Wet Zone of the central hills of Sri Lanka (06°54'N, 81°08' E, alt. 1,067 m). As far as we are aware, all known specimens were collected from soils in agricultural habitats. Although the exact range of the species is unknown it is unlikely to be large based on its absence in reasonably large collections of uropeltids from across the region (BMNH, CAS, WHT). Given its small probable range and very few known localities (not known to include protected areas), *R. zigzag* is likely to fall into one of the IUCN's threatened categories.

Remarks. In basic scale counts, *Rhinophis zigzag* resembles *R. homolepis* and *R. sanguineus* most closely among congeners, but differs clearly from these species in its tail shield (smaller and with heterogeneity in its spines). *Rhinophis zigzag* also differs clearly from the other Sri Lankan uropeltids that are currently assigned to other genera (*Pseudotyphlops*, *Uropeltis*, e.g., McDiarmid *et al.*, 1999), not only in its distinctive colour pattern but also, for example, *P. philippinus* has a much larger and almost flat tail shield, and *U. phillipsi* and *U. melanogaster* have much smaller tail shields that are shorter vs longer than the part of the head anterior to the frontal. *Uropeltis ruhunae* has keels rather than spines on its tail shield.

TABLE 2. Meristic and morphometric data for holotype (CAS 226306) and all paratypes of *Rhinophis zigzag* sp. nov. Dimensions in mm. Bilateral values given as left, right. (1) sex, (2) ventral scales, (3) subcaudal scales (number unpaired), (4) supralabials, (5) infralabials, (6) disposition of two anal scales, (7) number of small scales overlapped by annals, excluding first subcaudals, (8) maxillary teeth, (9) mandibular teeth, (10) total length, (11) tail length, (12) tail length as % of total length, (13) midbody width, (14) width at vent, (15) midbody circumference, (16) total length/midbody width, (17) number of scales (excluding subcaudals) surrounding base of tail shield, (18) base to tip of tail shield, (19) maximum width of tail shield, (20) maximum diameter of tail shield. (21) exposed width of ventral scales at midbody, (22) exposed width of first scale row at midbody, (23) width of ventral/first dorsal scale rows, (24) diameter of eye, (25) maximum L of ocular, (26) ocular/eye, (27) distance between eyes, (28) distance between eye-naris, (29) L frontal, (30)W frontal, (31) distance between snout tip-posterior edge 4th supralabial, (32) total length/HL, (33) head width level with corner of mouth, (34) distance between nares, (35) maximum longitudinal L of prefrontal scales, (36) L parietal scale = distance between posterior tip of parietal and posterior end of suture between frontal-ocular, (37) W parietal scale = distance between posterior tip of ocular and posterior tip of frontal, (38) L midline suture between parietals, (39) distance rostral-frontal, (40) distance between tip of snout and posterior edge of rostral, (41) distance between tip of snout and posterior limit of midline suture between parietals, (42) maximum width of rostral, viewed ventrally, (43) distance between snout tip-naris, (44) distance between snout tip-eye. Abbreviations: L = length, W = width, HL = head length as measured by character 31. Abbreviations: r = right, l = left.

	1	2	3	4	5	6	7	8	9	10	11	12	13
CAS 226306	m	209	6,6 (2)	4,4	3,3	r/l	3,3	7,7	8,8	338	10.5	3.3	8.3
CAS 225690	f	217	4,4 (2)	4,4	3,3	l/r	2,2	7,7	8,8	327	6.9	2.1	7.4
CAS 225691	f	219	5,4 (1)	4,4	3,3	l/r	2,3			388	7.8	2.0	10
CAS 225902		209	5,5 (1)	4,4	3,3	l/r	3,3	7,6	7,7	177	5.2	2.9	5.2
CAS 225903		211	5,5 (1)	4,4	3,3	l/r	3,3			200	5.7	2.9	5.7
CAS 225967	f	217	4,3 (1)	4,4	3,3	l/r	3,3	7,7	8,7	362	5.9	1.6	9.2
CAS 225968		212	6,5 (1)	4,4	3,3	r/l	3,3			272	6.7	2.5	7.1
CAS 225969		207	6,5 (1)	4,4	3,3	l/r	3,3	7,7	?,8	303	6.3	2.1	7.4
CAS 226014	m	210	6,6 (3)	4,4	3,3	l/r	3,3	7,?	8,9	353	9.7	2.7	8.6
CAS 226015	f	220	5,5 (1)	4,4	3,3	l/r	2,3	7,7	8,7	384	7.6	2.0	8.4
CAS 226016	m	214	6,6 (0)	4,4	3,3	r/l	3,3			118	3.9	3.3	3.3
CAS 226307		221	5,4 (0)	4,4	3,3	l/r	3,3			318	5.8	1.8	7.9
WHT 5243	f	218	4,4 (0)	4,4	3,3	r/l	3,3			382			8.7
WHT 5284			4,5 (1)				2,2						

continued.

	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
CAS 226306	7.9	28	40.7	14	6.6	5.3	6.5	2.9	2.2	1.3	0.4	2.0	5.0	3.0	2.4
CAS 225690	8.0	26	44.2	12	5.8	5.3	6.1	2.5	2.1	1.2	0.5	1.7	3.4	2.6	2.2
CAS 225691	8.8	29	38.8	11	6.3	5.7	6.8	3.0	2.6	1.2	0.4	1.9	4.8	3.0	2.5
CAS 225902	4.6	17	34.0	13	3.4	3.2	3.6	1.5	1.2	1.3	0.5	1.3	2.6	2.1	1.6
CAS 225903	4.9	17	35.1	12	3.7	3.2	3.7	1.6	1.4	1.1	0.4	1.4	3.5	2.2	1.5
CAS 225967	8.3	29	39.3	13	6.3	5.9	7.2	2.8	2.3	1.2	0.4	1.8	4.5	2.9	2.4
CAS 225968	6.6	23	38.3	12	5.1	4.0	5.3	2.2	1.9	1.2	0.4	1.7	4.3	2.5	1.9
CAS 225969	7.3	25	40.9	13	5.5	4.8	5.8	2.6	2.0	1.3	0.4	1.6	4.0	2.6	2.1
CAS 226014	8.3	23	41.0	13	6.2	5.0	6.7	2.6	2.1	1.2	0.5	2.1	4.2	3.4	2.8
CAS 226015	8.9	29	45.7	12	6.9	6.4	7.3	2.8	2.3	1.2	0.4	2.1	5.3	3.1	2.6
CAS 226016	3.3	10	35.8	13	2.8	2.7	3.0	1.2	0.9	1.3	0.4	1.4	3.5	2.0	1.5
CAS 226307	6.8	22	40.3	13	6.3	5.5	6.5	2.4	2.0	1.2	0.5	2.0	4.0	2.8	2.3
WHT 5243				14											
WHT 5284				13											

continued.

	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
CAS 226306	2.7	2.2	8.1	41.7	5.3	1.6	1.5	2.5	2.6	0.5	0.2	3.4	6.8	1.7	1.7	4.3
CAS 225690	2.6	2.2	7.6	43.0	4.3	1.5	1.3	2.3	2.0	0.5	0.4	3.1	6.6	1.6	1.6	4.0
CAS 225691	2.7	2.2	8.6	45.1	5.7	1.7	1.6	2.5	2.5	0.6	0.2	3.9	7.5	1.8	1.8	4.6
CAS 225902	2.0	1.7	5.4	32.8	3.4	1.2	1.1	1.8	1.2	0.4	0.2	2.3	5.0	1.2	1.1	2.8
CAS 225903	1.9	1.7	5.6	35.7	3.5	1.2	1.0	1.8	1.9	0.5	0.2	2.4	5.0	1.2	1.1	2.8
CAS 225967	2.9	2.2	8.1	44.7	4.9	1.6	1.7	2.7	2.2	0.6	0.3	3.6	7.3	1.7	1.7	4.4
CAS 225968	2.3	2.0	6.9	39.4	4.5	1.4	1.3	2.1	2.2	0.5	0.3	3.0	5.9	1.5	1.4	3.5
CAS 225969	2.4	2.2	7.2	42.1	4.7	1.5	1.3	2.4	2.3	0.6	0.3	3.2	6.4	1.6	1.5	3.9
CAS 226014	3.2	2.4	8.6	41.0	5.4	2.2	1.8	2.7	2.6	0.6	0.4	3.7	7.8	1.8	2.1	5.0
CAS 226015	2.8	2.2	8.7	44.1	5.4	1.7	1.7	2.8	2.5	0.5	0.2	4.0	7.5	1.8	1.9	4.7
CAS 226016	2.0	1.6	5.1	23.1	3.4	1.1	1.0	1.7	1.8	0.3	0.2	2.1	4.4	1.2	1.0	2.6
CAS 226307	2.9	2.1	8.1	39.3	5.3	1.8	1.4	2.5	2.2	0.4	0.2	3.2	6.7	1.7	1.8	4.2
WHT 5243																
WHT 5284																

Somaweera (2006: 235, photograph A) misidentified a specimen of *R. zigzag* as *R. dorsimaculatus*. The latter is a poorly known species (two documented specimens; Deraniyagala, 1941) but is clearly differentiated from *R. zigzag* by having more than 230 ventral scales (*vs* 207–221), a dorsally carinate (*vs* rounded) rostral, and black, mostly discontinuous paravertebral blotches *vs* a more or less continuous, non-black zigzag. Carl Gans recognized that *R. zigzag* represented an undescribed species (“*Rhinophis* sp. 2”, Cadle *et al.*, 1990).

Discussion

Scale-row reductions have not, to the best of our knowledge, been reported in detail in any other studies of uropeltids. Indeed, influential taxonomic treatments of these snakes have generally reported only a single (presumably midbody) number of dorsal scale rows (e.g., Smith, 1943). This is perhaps because scale reductions have been considered unimportant in uropeltid systematics, and/or because their fairly uniformly cylindrical bodies of these snakes were assumed to be associated with largely invariant scale rows along most of the body. Our data for the two new species demonstrates that there is often an anterior reduction to 17 rows (by about the 40th ventral) followed by an increase to 19 rows again before settling on the 17 rows generally found at midbody. However, there are differences between the two species, especially in the much greater degree of fluctuation in the number of scale rows in *R. lineatus*. We suggest that scale-row reductions should be paid closer attention also in other uropeltids. Another character not previously used in uropeltid systematics is whether the right anal scale overlaps the left or *vice versa*. The two new species described here present contrasting conditions with most (ca. 80%) *R. lineatus* having the right over left pattern and most (ca. 70%) *R. zigzag* the left over right. Gower *et al.* (2008) reported no variation of this character (all right over left) in small samples of eight species of Indian *Uropeltis*. We are unaware of this character being used in the taxonomy of other snake groups, but suggest that it be reported in future studies of uropeltids.

Although Gower *et al.* (2008) suggested that at least some parts of uropeltid taxonomy were in serious need of revision (see also Comeaux *et al.*, 2010), we believe that the current state of the taxonomy of Sri Lankan species (especially of *Rhinophis*) is not too chaotic. Several of the factors that complicate Indian uropeltid taxonomy are not a substantial issue for Sri Lanka, given that locality data are often better, but especially because Sri Lankan uropeltids were largely spared the intense period of taxonomic action (mostly new-species descriptions and frequent ‘revisions’ in brief synonymy lists) that occurred for Indian uropeltids in the late 19th and early 20th centuries. There might also be an intrinsic feature of (at least Sri Lankan) *Rhinophis* species that constrained earlier taxonomic action and prevented subsequent major confusion, in that they mostly appear to have distinctive and consis-

tent colour patterns (noted also by Deraniyagala, 1941) and relatively small distributions. We are satisfied that these narrowly geographically restricted colour pattern morphs generally represent valid species because they are congruent with variation in other (mostly scalation) characters. Current knowledge suggests to us that taxonomic revision of Sri Lankan uropeltids at the species level might be needed most among those less distinctively coloured species (e.g., *R. philippinus*), and particularly among those species with larger presumed distributions (e.g., *R. oxyrhynchus*). Although we expect the number of future synonymies or ‘resurrections’ of species to be fairly small for Sri Lankan uropeltids, we agree with Wickramasinghe *et al.* (2009) that new species likely remain to be discovered. In addition to new fieldwork, existing collections need to be studied further to better characterize currently nominate valid species using increased individual and character sampling.

Cadle *et al.*'s (1980) allozyme and albumin immunological data support the phenotypic distinctiveness of the two new species from other uropeltids. In their preferred phylogenetic hypothesis from analysis of allozyme distance data, Cadle *et al.* (1990: fig. 2) recovered a clade comprising *R. blythii*, *R. drummondhayi*, *R. lineatus* (“*Rhinophis* sp. 1”) and *R. zigzag* (“*Rhinophis* sp. 2”). The two new species were not included in Bossuyt *et al.*'s (2004) phylogenetic analyses of mitochondrial DNA sequence data, but they did recover a sister-group relationship between *R. blythii* and *R. drummondhayi*. Several relationships in the phylogenies of Bossuyt *et al.*'s (2004) and Cadle *et al.*'s (1990) studies are not well supported, and the same is true of the somewhat incongruent results from osteological data (Rieppel & Zaher, 2002; Comeaux *et al.*, 2010). Additionally, taxon sampling is far from complete in these studies, and further phylogenetic analyses of uropeltids are warranted.

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APPENDIX

Scale row formulae (based on Dowling, 1951) for most CAS paratypes of the two new species of *Rhinophis*. Some incomplete or poorly preserved specimens not included. See main text for holotype formulae. Upper and lower values for right and left side, respectively. Identifying which row 'reappears' following a short-lived row loss/fusion is often arbitrary so that here "+6" indicates reappearance of row 5 or 6, "+5" indicates reappearance of row 4 or 5, and "+4" indicates reappearance of row 3 or 4.

Rhinophis lineatus sp. nov.

CAS 226025:	19	-----	17
		3+4 (72), +4 (74), 3+4 (75)	
		5+6 (44), +6 (47), 4+5 (72), +5 (73), 4+5 (74)	
CAS 226026:	19	-----	17
		4+5 (47), +5 (52), 3+4 (71)	
		4+5 (38), +5 (48), 4+5 (65), +5 (67), 3+4 (72)	
CAS 226027:	19	-----	17
		4+5 (36), +5 (37), 4+5 (38), +5 (40), 3+4 (62)	
		4+5 (39), +5 (42), 4+5 (74)	+5 (82), 4+5 (88), +5 (99), 4+5 (100), +5 (105), 4+5 (106), +5 (110), 4+5 (112)
CAS 226028:	19	-----	17
		3+4 (65)	
		3+4 (65)	
CAS 226029:	19	-----	17
		+5 (25), 4+5 (27), +5 (32), 4+5 (34), 4+5 (72)	
		+5 (16), 4+5 (33), 4+5 (71), +5 (76), 3+4 (81)	
CAS 226030:	19	-----	17
		4+5 (46), +5 (47), 3+4 (70)	
		4+5 (40), +5 (42), 4+5 (44), +5 (50), 3+4 (67), +4 (72), 3+4 (74)	
CAS 226032:	19	-----	17
		4+5 (39), +5 (52), 4+5 (54), +5 (57), 3+4 (65)	
		4+5 (39), +5 (58), 4+5 (63)	
CAS 226033:	19	-----	17
		3+4 (44), +5 (60), 3+4 (66)	
		3+4 (37), +4 (55), 3+4 (59)	
CAS 226034:	19	-----	17
		4+5 (36)	+5 (48)
		3+4 (37)	+4 (59)
			3+4 (64)
			3+4 (66)
CAS 226035:	19	-----	17
		3+4 (38), +5 (57), 3+4 (65)	
		4+5 (35), +5 (48), 3+4 (62)	
CAS 226042:	19	-----	17
		3+4 (79)	
		4+5 (82), +5 (84), 3+4 (88)	

+5 (21), 5+6 (25), 3+4 (64)

CAS 226043: 19 ----- 17
3+4 (64), +4 (66), 3+4 (69), +4 (70), 3+4 (71)

***Rhinophis zigzag* sp. nov.**

CAS 226014: 19 ----- 17 ----- 19 ----- 17
4+5 (44) +5 (59) 3+4 (73)
4+5 (40) +5 (57) 3+4 (70)

CAS 226015: 19 ----- 17 ----- 19 ----- 17
4+5 (40) +5 (56) -5 (58), +5 (61), -3 (73)
4+5 (39) +5 (59) -4 (70)

CAS 226016: 19 ----- 17 ----- 19 ----- 17
4+5 (42) +5 (57) 3+4 (80)
4+5 (40) +5 (42), 4+5 (43), +5 (52), 4+5 (53), +5 (56) 3+4 (67), +4 (70), 3+4 (74)

CAS 226307: 19 ----- 17 ----- 19 ----- 17
4+5 (45) +5 (55) 3+4 (79)
4+5 (40) +5 (52) 3+4 (74)

CAS 225690: 19 ----- 17 ----- 19 ----- 17
4+5 (40) +5 (61) -4 (71)
4+5 (39) +5 (57) -4 (65)

CAS 225691: 19 ----- 17 ----- 19 ----- 17
3+4 (45) +4 (49), 4+5 (51), +5 (60) 3+4 (76)
3+4 (42) +4 (61) 3+4 (73)

CAS 225902: 19 ----- 17 ----- 19 ----- 17
4+5 (46) +5 (57) -5 (60), +5 (61), -5 (72), +4 (75), -4 (78)
4+5 (41) +5 (54) -4 (70)

CAS 225903: 19 ----- 17 ----- 19 ----- 17
4+5 (42) +5 (57) 3+4 (66)
4+5 (40) +5 (50) 3+4 (75)

CAS 225967: 19 ----- 17 ----- 19 ----- 17
4+5 (40) +5 (47) 4+5 (75)
4+5 (40) +5 (48) 4+5 (?)

CAS 225968: 19 ----- 17 ----- 19 ----- 17
4+5 (47) +5 (55) 3+4 (74)
4+5 (52) +5 (53) 3+4 (73), +4 (75), 4+5 (80)

CAS 225969: 19 ----- 17 ----- 19 ----- 17
4+5 (43) +5 (44) 4+5 (70)
4+5 (42) +5 (43) 4+5 (70)