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A new species of *Rhinophis* Hemprich, 1820 (Serpentes: Uropeltidae) from the Wayanad region of peninsular India

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Abstract

A new species of the shieldtail snake genus *Rhinophis* is described based on a type series of seven recently collected specimens from the Wayanad region of the Western Ghats of peninsular India. *Rhinophis melanoleucus* **sp. nov.** is diagnosed based on a combination of 15 dorsal scale rows at (or just behind) midbody, more than 215 ventral scales and a long rostral. The new species also has a distinctive (mostly black and white) colouration. A new key to the identification of Indian species of *Rhinophis* is provided.

Key words: identification key, shieldtail, snakes, taxonomy, Western Ghats

Introduction

Uropeltidae is a lineage of fossorial snakes endemic to peninsular India and Sri Lanka. Systematic assessments underpinned by molecular phylogenetic analyses have confirmed that the family is monophyletic and have classified the currently recognized 56 nominal species into eight genera—*Brachyophidium* Wall, 1921, *Melanophidium* Günther, 1864, *Platyplectrurus* Günther, 1868, *Plectrurus* Duméril *in* Duméril & Duméril, 1851, *Pseudoplectrurus* Boulenger, 1890, *Rhinophis* Hemprich, 1820, *Teretrurus* Beddome, 1886, and *Uropeltis* Cuvier, 1829 (Bossuyt *et al*. 2004, Pyron *et al*. 2016, Cyriac & Kodandaramaiah 2017). All eight genera occur in India, with only *Rhinophis* also occurring in Sri Lanka (Pyron *et al*. 2016).

Rhinophis is currently represented by 20 nominal species, with 16 of these endemic to Sri Lanka, and only four currently recognized species occurring in (and endemic to) India. Of the four species found in India, three are restricted to the central and southern Western Ghats (*R. sanguineus*, Beddome, 1863, *R. travancoricus* Boulenger, 1893, *R. fergusonianus* Boulenger, 1896) and one species is known to occur in the southern part of the Eastern Ghats (*R. goweri* Aengals & Ganesh, 2013). Here we describe a new Indian species of *Rhinophis* on the basis of recently collected specimens from the Wayanad region of the Western Ghats.

Materials and methods

In addition to specimens of the new species deposited in the Bombay Natural History Society, Mumbai, India

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(BNHS), and the Western Ghats Regional Centre of the Zoological Survey of India, Kozhikode (ZSI/WGRC), we examined uropeltid material in the Natural History Museum, London, UK (BMNH), the Muséum national d'Histoire naturelle, Paris, France (MNHN), Muséum fuïr Naturkunde, Berlin, Germany (ZMB), Museìum d'Histoire naturelle, Geneva, Switzerland (MHNG), Museum of Comparative Zoology, Harvard University, USA (MCZ), California Academy of Sciences, San Francisco, USA (CAS), American Museum of Natural History, New York, USA (AMNH), and Smithsonian National Museum of Natural History, Washington, USA (USNM). Comparative material of Indian *Rhinophis* is reported in Appendix 1. Taxonomy and taxon spellings follow McDiarmid *et al*. (1999) and Pyron *et al*. (2016).

Ventral scale counts were recorded following Gower & Ablett (2006). Scale row reductions were recorded following Dowling (1951). All measures were taken with dial calipers to the nearest 0.1 mm, except for total length and circumference, which were taken to the nearest 1 mm using a ruler and a piece of thread plus ruler, respectively. Snout-vent length was calculated by subtracting tail length from total length. Bilateral measures were taken on the right side of each specimen, unless that side was damaged. Tooth counts were made from wet specimens, these are estimates because it is often not possible to see or feel presence or absence of teeth among gingivae without error. Sex was determined by observing everted hemipenes, or by examining urogenital systems in situ through small ventral incisions in the body wall. Following Gower *et al*. (2008), Gower & Maduwage (2011) and Jins *et al*. (2018), we made an effort to examine non-traditional characters for uropeltid taxonomy.

***Rhinophis melanoleucus* sp. nov.**

Figs. 1–7; Table 1

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Holotype (Figs. 1–3)**.** BNHS 3534, adult female, Wayanad Wild resort, Lakkidi, Wayanad district, Kerala state, India (11.515071° N, 76.036644° E; 825 m elevation: Fig. 4). Collected by Surya Narayanan and Pavukandy Umesh, 5 September 2018.

Paratypes (n = 6). BNHS 3535 (male), Kerala Veterinary and Animal Sciences University, Pookode, Wayanad district (11.53336° N, 76.024821° E; 760 m elevation), Vivek Philip Cyriac, 8 October 2011; BNHS 3536 (male), Kerala Veterinary and Animal Sciences University, Pookode, Wayanad district (11.53336° N, 76.024821° E; 760 m elevation), Nithin Divakar, Ashok Kumar and Vivek Philip Cyriac, 31 October 2014; ZSI/WGRC/IR/V/3100 (sex not determined), Vythiri road, Pookode, Wayanad district (11.53357°3 N, 76.025864° E; 760 m), Nithin Divakar and Vivek Philip Cyriac, 2 September 2014; ZSI/WGRC/IR/V/3101 (female), Kerala Veterinary and Animal Sciences University, Pookode, Wayanad district (11.53336° N, 76.024821° E; 760 m elevation), Gnana Kumar, Nithin Divakar and Vivek Philip Cyriac, 14 June 2015; BNHS 3537 (male: Figs. 5–6), Lakkidi (11.514941° N, 76.033989° E; 815 m), Surya Narayanan, 26 April 2017; BNHS 3538 (female: Figs. 5–6), Lakkidi (11.513941° N, 76.037782° E; 850 m), Surya Narayanan, 12 June 2017.

Referred specimens (n = 1). BNHS 3539 (sex unknown), Lakkidi (same locality and coordinates as holotype), Surya Narayanan, 11 November 2017. This is a referred rather than type specimen because the posterior part of the body and tail are missing.

Diagnosis. *Rhinophis melanoleucus* **sp. nov.** differs from all other species of *Rhinophis* except *R. sanguineus* and *R. fergusonianus* in having 15 dorsal scale rows at (or just behind) midbody (versus 17 or 19 in other congeners). *Rhinophis melanoleucus* **sp. nov.** differs from *R. fergusonianus* in having > 215 ventrals (known range 218–236) versus 195 in the only known specimen of *R. fergusonianus*. *Rhinophis melanoleucus* **sp. nov.** differs from *R. sanguineus* in having more ventral scales (218–236 versus 181–214 in specimens examined here – see Discussion for comment on Wall's 1919 report of ventral counts in *R. sanguineus* of up to 218), in having dark blotches (versus spots) on the ventral surface, and in having a proportionately longer rostral shield: 40.8–42.9% (n = 7; mean 42.0%) versus 32–39.3% (n = 17; mean 36.9%) of head length (= distance between snout tip and posterior edge of fourth supralabial). Only a single nomen is currently considered a synonym of any Indian *Rhinophis* species—*R. microlepis* Beddome, 1863 is a subjective junior synonym of *R. sanguineus* (e.g. Beddome 1886, Smith 1943, Gans 1966, McDiarmid *et al*. 1999, Pyron *et al*. 2016). The holotype of *R. microlepis* differs from the type series of the new species in having a mottled or speckled rather than blotched venter, in having fewer than 218 ventrals (214), and in having a shorter rostral shield (35.8% of head length versus 41% or more).

Identification. The new uropeltid species is referred to *Rhinophis* because it has an eye that lies within an ocular scale (eye distinct from adjacent scales in *Platyplectrurus*), has a clearly discrete tail 'shield' comprising a single, enlarged terminal scute (absent in *Melanophidium*, *Brachyophidium*, *Platyplectrurus*, *Plectrurus* and *Teretrurus*), lacks a mental groove (present in *Melanophidium*), lacks supra- or postoculars or temporals (at least one of which is present in *Brachyophidium*, *Platyplectrurus*, *Plectrurus* and *Teretrurus*), and lacks midline contact between the nasals (present in *Brachyophidium*, *Melanophidium*, *Platyplectrurus*, *Plectrurus*, *Pseudoplectrurus* Boulenger, 1890, *Teretrurus*, and almost all *Uropeltis* [those *Uropeltis* that lack nasal-nasal contact have small terminal scutes and > 15 dorsal scales rows at, or just behind, midbody]).

Description of holotype (Figs. 1–3)**.** See Table 1 for morphometric and meristic data. Good condition; midventral incision (for removal of tissue biopsy) 17 mm extending back from 125 mm from snout tip. Head small, snout pointed. Rostral pointed, longer than wide, without dorsal crest but with narrow, rounded dorsal ridge; in lateral view with slightly convex ventral and (more strongly) dorsal margins; widest at level of anterior upper corner of first supralabials. Rostral many (>12) times longer (in dorsal view) than rostral-frontal gap. Frontal irregularly hexagonal, longer than wide, lateral (ocular) margins slightly converging posteriorly; lateral (ocular) margin shortest, posterolateral edges longest. Frontal much shorter, wider than rostral. Nasals separated from each other by posterior half of rostral. External naris small, subcircular, slightly countersunk within small depression, located at anteroventral corner of nasal. Nasal contacts supralabials 1 and 2. Prefrontals only briefly in contact with each other along midline (left overlapping right), separating frontal from rostral [rostral post-nasal longer than prefrontal midline contact]. Prefrontals wider than long, shorter than frontal. Supralabials four; first smallest, making the least contribution to margin of mouth; fourth largest. Ocular contacts supralabials 3 and 4. Eye distinct, diameter approximately 0.2 times length of ocular, located near anteroventral corner of ocular (closer to lower than anterior edge), only very slightly (at most) bulging slightly from ocular surface, pupil subcircular. Paired parietals longer than wide, approximately as long as but much wider than frontal, posteriorly broadly rounded, angle between posteromedial and posterolateral edges approximately 90°. Parietals in brief midline contact (longer than midline contact between prefrontals), left overlapping right. Each parietal contacts four scales other than head shields. No mental groove; mental pentagonal, slightly wider than long, smaller than infralabials, contacting first infralabials but not first ventral; three pairs of infralabials, second largest, first smallest. First and second ventrals longer than wide, third approximately as long as wide, fourth and subsequent ventrals wider than long. Four (fourth slightly smaller than first three) maxillary and five (fourth and fifth slightly smaller than first three) mandibular teeth on each side. Teeth simple, pointed, distinctly retrorse, straight, evenly spaced.

FIGURE 1. Dorsal and ventral view of the holotype (BNHS 3534) of *Rhinophis melanoleucus* **sp. nov**. Scale bar 25 mm. Photographs by VPC.

Body cylindrical. Head and body scales macroscopically smooth. 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 anteriormost ones gradually narrow. At midbody, exposed part of ventrals approximately 1.4 times wider than scales in first dorsal row. Ventrals 231. Dorsal scale rows 19 anteriorly, reducing to 17 by level with 41st ventral and to 15 rows by 125th ventral, maintained thereafter until close to the vent; Scale row reduction formula:

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      4 + 5 (41)          4 + 5 (120) +4 (122) -4 (125)
19 ---------------- 17 ---------------------------------------- 15
      4 + 5 (38)                    4+5 (113)
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FIGURE 2. Views of the head (left) and tail (right) of the holotype (BNHS 3534) of *Rhinophis melanoleucus* **sp. nov.**, shown in dorsal (upper), lateral (middle) and ventral (lower) views. Not to same scale; see Table 1 for size of specimen. Photographs by VPC.

Dorsal scale rows (i.e., excluding subcaudals) 15 at level of first subcaudals. Paired anal scales (right overlying left) considerably larger than posteriormost ventrals and subcaudals. Distal margin of each anal overlaps four (left) and three (right) small scales in addition to anteriormost subcaudals. Six subcaudals on each side, the posteriormost undivided. Some scales at posterior end of specimen bear low, short parallel ridges, towards posterior edges—on last few ventrals, small scales overlapped by anals, lower two or three dorsal scale rows of posterior of body and

of tail, and on subcaudals. Last ventrals and subcaudals each bear three or four ridges, last undivided subcaudal bears seven. Tail 'shield' large, forming tip of tail, visible from below and especially clearly from above, flattened to slightly concave on anterior end of upper surface, domed posteriorly, longer than wide in dorsal view, wider than depth of tail (at base of shield), larger than head (longer than distance between snout tip and back of fourth supralabial), base surrounded by 15 scales (including last subcaudal). Shield surface roughened, bearing narrow, discontinuous ridges (longer, more continuous stretches located laterally towards shield base), receding and somewhat converging towards tip; evenly spaced, subparallel, approximately straight; low projections but no ridges at (just dorsal to) shield apex.

Colour in alcohol (Figs. 1–2)**.** Rostrum pale orange brown at tip, becoming greyish black posteriorly on the dorsal surface. Head shields greyish black. Supralabial scales greyish black with pale whitish yellow markings, especially towards posterior and/or lower margins. Dorsal body colour uniformly blackish. Ventral surface blackish overall, more greyish on anterior quarter of body. Lateral sides each with approximately 56 obvious, irregular yellowish-white blotches occupying three to five ventralmost dorsal scale rows, many of these blotches taper irregularly dorsally. Ventral scales mostly greyish black, a small number of ventrals with yellowish white marks, typically only on left or right. Subcaudals black. Tail shield black with elongate pale yellowish orange patches on each lateral side, continuous with pale (more whitish, less or not yellowish) markings on ventrolateral surface of tail.

Colour in life (Fig. 3). Dorsal surface uniformly glossy blackish and somewhat iridescent. Lateral and ventral pale blotches on body whitish, more purely so on mid and posterior of body than anteriorly (where whitish scales appear translucent so that darker spots beneath scales slightly visible). Head scales blackish except for paler, orange-brownish rostral and whitish lower and/or posterior parts of supralabials. Ventral surface of tail blackish except for whitish ventrolateral markings. Pale elongate markings on tail shield pale orange, paler and more whitish anteriorly than posteriorly.

FIGURE 3. Holotype (BNHS 3534: total preserved length 461 mm) of *Rhinophis melanoleucus* **sp. nov.** in life. Photograph by SN.

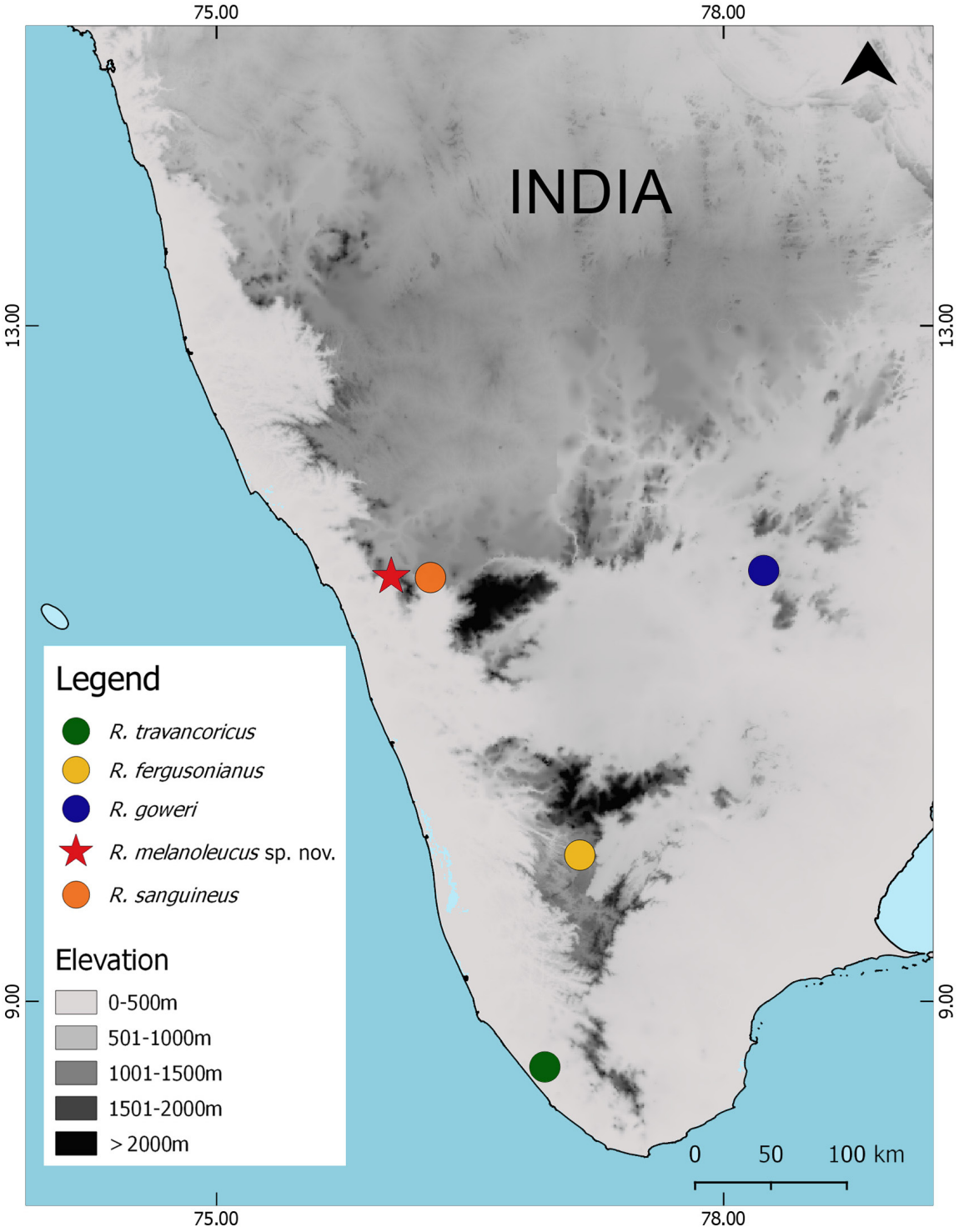

FIGURE 4. Map of southwestern peninsular India showing location of type localities of Indian species of *Rhinophis*. The precise type locality of *R. fergusonianus* is not known, so an approximate position for "Cardamom Hills" is shown.

Paratypes. All paratypes in good condition, BNHS 3535 and BNHS 3536 a little dehydrated with convoluted spines, the latter specimen's head slightly crushed. Meristic and morphometric data are provided in Table 1. The number, arrangement and overlapping of head shields are similar to the holotype with the following exceptions. In BNHS 3537 and BNHS 3538 (Fig. 6) the parietals are each wider than long, slightly shorter than the frontal, and with somewhat scalloped rather than broadly rounded posterior margins. The prefrontals in ZSI/WGRC/IR/V/3100, BNHS 3537 and BNHS 3538 make more substantial midline contact than in the holotype, so that the length of rostral behind the nasals is shorter than the rostral-frontal distance. Tooth counts same as in holotype, where examined

(BNHS 3535, BNHS 3536, ZSI/WGRC/IR/V/3100). Rostral length from approximately 5 (ZSI/WGRC/IR/V/3100) to 14 (ZSI/WGRC/IR/V/3101) times distance between rostral and frontal. Eye diameter approximately 0.2–0.25 times length of ocular shield.

FIGURE 5. Two (of six) paratypes of *Rhinophis melanoleucus* **sp. nov**. Upper row BNHS 3537, lower row BNHS 3538; left column dorsal view, right column ventral view. Not to same scale; total length of BNHS 3537 303 mm, of BNHS 3538 357 mm. Photographs by SN.

Ventrals 218–236, subcaudals 6–8. Minor variation in how many of the anteriormost ventrals are longer than wide, for example only the first ventral in BNHS 3538. Dorsal scale rows in all specimens reduce from 17 to 15 by between the 100th (ZSI/WGRC/IR/V/3100) to 139th (BNHS 3537) ventral (see Appendix 2), by or just behind midbody. Dorsal scale rows at the anterior of the tail 12–15; scales around base of tail 'shield' 13–15 including last subcaudal(s). Terminal subcaudal in all types undivided. ZSI/WGRC/IR/V/3101 resembles holotype in having all other subcaudals paired (divided), while in other paratypes paired and unpaired subcaudals are mixed along length of tail. Anal shields each overlap three small scales on each side in all paratypes. Scales on the underside of the pos-

terior region of the body and the tail bear short parallel ridges that are variable in their exact distribution (e.g. only on last subcaudal in ZSI/WGRC/IR/V/3101; on last ventrals, anals and subcaudals in BNHS 3536), number (3–9 per scale) and prominence, least prominent in BNHS 3538, ZSI/WGRC/IR/V/3101 and ZSI/WGRC/IR/V/3100. Colour pattern similar to holotype except that the lateral and ventral blotches are pale pinkish in smaller individuals. Number of lateral pale blotches 55 (BNHS 3535), 52 (BNHS 3538), 47 (ZSI/WGRC/IR/V/3101; BNHS 3537), 46 (BNHS 3536), 44 (ZSI/WGRC/IR/V/3100), with lower numbers typically occurring in specimens in which anteriormost blotches are greatly elongate, extending 20–25 scales back from posteriormost surpalabial.

Everted hemipenes of BNHS 3537 (Fig. 6) short (ca. 2.5 mm), stout (ca. 1.0 mm wide at base). Interpreted as unilobed but with substantial medial lobe-like process (lacking any sign of sulcus spermaticus) ca. 1.0 mm from tip of organ. Medial process shorter and more slender than lobe, with irregular longitudinal folds. Lobe subcylindrical, ornamented densely with small spines throughout; shallow sulcus spermaticus terminating at base of lobe with large flap and several globular folds.

Sexual dimorphism. There is no clear evidence of sexual dimorphism in number of ventral scales in the types, with the three females having 225–235 and three males having 218–236 (Table 1). Males tend to have proportionately slightly longer tails (2.6–3.5 % of total length) than females (2.3–2.8 %) and have more subcaudals (7,7 or 8,8) than females (6,6 or 6,7). Both females and males have ridges on scales on the underside of the tail and posteriormost part of the body, but these are more prominent in males.

FIGURE 6. Heads and tails of two (of six) paratypes of *Rhinophis melanoleucus* **sp. nov**. Two left columns are BNHS 3537, two right columns BNHS 3538. Shown in dorsal (upper row), ventral (middle row) and lateral (lower row) views. Lateral views are of right (head) and left (tail) sides. Scale bars 10 mm. Photographs by SN.

FIGURE 7. Habitat in the vicinity of Lakkidi, Wayanad district, Kerala, India, the type locality of *Rhinophis melanoleucus* **sp. nov**. Left photograph shows general habitat of upland moist forest and grassland, right photograph shows floor of forest where *R. melanoleucus* have been found. Photographs by SN.

TABLE 1. Meristic and metric data for holotype (*) and paratypes of *Rhinophis melanoleucus* **sp. nov.**, the holotype of *R. fergusonianus*, and the lectotype of *R. sanguineus*. Measures given in mm. SL4 = fourth supralabial; DSR1 = first dorsal scale row; hyphen (-) indicates shortest distance between two points.

	melanoleucus BNHS 3534*	*melanoleucus* BNHS 3535	*melanoleucus* BNHS 3536	*melanoleucus* ZSI/WGRC/ IR/V/3100	*melanoleucus* ZSI/WGRC/ IR/V/3101	*melanoleucus* BNHS 3537	*melanoleucus* BNHS 3538	*fergusonianus* BMNH 1946.1.16.77	*sanguineus* BMNH 1946.1.16.54
Sex	female	male	male		female	male	female	female	male
Total length	461	348	279	244	293	303	357	323	309
Tail length	11.2	9.1	7.3	5.6	6.6	10.5	9.9	9.8	11.6
Midbody width	8.1	6.9	6.8	7.4	6.6	7.7	7.5	7.2	7.5
Midbody circumference	22	22	20	21	20			23	22
Snout tip-posterior edge SL4	9.1	8.1	6.6	7.1	6.6	6.8	7.6	7.8	8.1
Head width at posterior edge SL4	5.4	4.4	5.4	5.7	4.1	4.4	5.3	4.4	5.2
Maximum rostral length	4.9	3.4	2.8	3.0	2.8	2.8	3.1	3.3	2.7
Rostral-frontal	0.4	0.5	0.3	0.6	0.2	0.5	0.5	0.6	0.6
Frontal length	3.1	2.9	2.4	2.1	2.3	2.3	2.4	2.4	2.6
Frontal width	2.7	2.2	2.3	2.2	2.1	2.0	2.0	2.3	2.0
Snout tip-eye	4.9	4.4	3.5	3.9	3.7	3.7	4.2	4.3	4.3
Ventral scale width at midbody	3.6	3.3	2.4	2.8	2.0	2.8	3.0	2.7	3.2
DSR1 scale width at midbody	2.5	2.1	1.6	1.9	1.6	1.9	2.1	2	2.1
Tail shield width at base	7.9	6.8	5.7	6.0	5.5	6.0	7.0	6.7	6.2
Tail shield height at base	9.6	8.1	7.2	7.4	6.9	6.7	7.6	8.4	7.4
Tail shield middorsal length	10.1	8.2	7.3	7.5	7.3	6.9	8.0	8.5	7.2
Tail shield midventral length	1.3	1.4	1.5	1.2	1.3	1.3	1.5	1.7	1.3
Ventral scales	231	222	218	226	235	236	225	195	198
Subcaudal scales (number unpaired)	6,6 (1)	7,7(4)	8,8(6)	6,6(3)	6,7(1)	8,8(3)	6,6(2)	5,5(1)	9,9(4)
Supralabial scales	4,4	4,4	4,4	4,4	4,4	4,4	4,4	4,4	4,4
Infralabial scales	3,3	3,3	3,3	3,3	3,3	3,3	3,3	3,3	3,3
Scales surrounding terminal scute	15	13	14	13	14	15	14	10	15

Etymology. From the Ancient Greek mélas (black) and leukós (white), in reference to the unusual (for uropeltids) black and white colouration. For nomenclatural purposes, the species name *melanoleucus* is a noun in the genitive case.

Distribution, habitat, natural history and conservation status. *Rhinophis melanoleucus* **sp. nov.** is known only from the vicinity of Lakkidi in the Wayanad District of Kerala state, at approximately 750–850 m elevation in the evergreen hills of the Western Ghats. The habitat in the vicinity of the type locality is shown in Fig. 7. We suspect that the new species has a larger distribution, at least in the Wayanad region, but it is not widespread and/or frequently encountered enough to have been previously collected or reported. The new species is likely to qualify for Data Deficient status under IUCN Red List criteria, at least until new field surveys are undertaken and/or additional specimens from other localities can be found in other collections.

The holotype was found at 08:00, moving on the surface of a forest track alongside a stream and close to an adjacent tea plantation. Paratypes BNHS 3537 and BNHS 3538 were found at 15:00 and 09:00, respectively, the former dead on a paved road, and the latter on the ground surface in an abandoned coffee plantation. Referred specimen BNHS 3539 was dug from a depth of approximately 0.5 m during excavations for a road extension in mid-elevation wet-evergreen forest (rainfall approximately 5,000 mm per year) with trees including *Cinnamomum malabatrum* (Burm. f.) J.Presl*, Meliosma simplicifolia* (Roxb.)*, Actinodaphne malabarica* Balakr. and *Elaeocarpus tuberculatus* Roxb. in addition to farmed coffee. Paratypes ZSI/WGRC/IR/V/3100 and ZSI/WGRC/IR/V/3101 were found at approximately 07.00 and 18.30 respectively, moving among grass on the side of a tarred road inside the Veterinary and Animal Sciences University campus, Pookode. Paratypes BNHS 3535 and BNHS 3536 were found dead on a tarred road between 07.00 and 08.00.

In a few days of temporary captivity, BNHS 3538 refused to feed on live earthworms provided. When handled, none of the individuals in the type series attempted to bite. They showed an inclination to burrow in soil and in the hand. At the localities reported here, *Rhinophis melanoleucus* **sp. nov.** occurs broadly sympatrically (within a radius of ca. 15 km) with other uropeltids including at least *R. sanguineus, Uropeltis* cf. *nilgherriensis, Teretrurus hewstoni, Melanophidium bilineatum* and *M. wynaudense*.

Key to the species of *Rhinophis* from India

Aengals & Ganesh (2013) provided a key to the identification of Indian species of *Rhinophis*. We provide a new key here that incorporates the new species and that takes into account that *R. fergusonianus* has 15 rather than 17 dorsal scale rows at midbody.

1	Number of dorsal scale rows just behind midbody, 17 2
-	Number of dorsal scale rows just behind midbody, 15 3
2	Ventral scales fewer than 160 . . . . . *R. travancoricus*
-	Ventral scales more than 180 . . . . . *R. goweri*
3	Ventral surface with substantial amount of red colour, with any blackish colour restricted to spots; rostral shield length typically 32–39% of distance between snout tip and posterior end of fourth supralabial. . . . . *R. sanguineus*
-	Ventral surface with dark blotches and without substantial regions of red colour; rostral shield length typically 41% or more of distance between snout tip and posterior end of fourth supralabial 4
4	Only known specimen a female with 195 ventral and 5,5 subcaudal scales (from Cardamom Hills of Western Ghats, South of Palghat Gap) . . . . . *R. fergusonianus*
-	Ventral scales more than 215; subcaudals 6 or more (from Wayanad region of Western Ghats, north of Palghat Gap) . . . . . *R. melanoleucus* **sp. nov.**

Discussion

Rhinophis fergusonianus has long been reported to have 17 dorsal scale rows at midbody (e.g., Boulenger 1896, Smith 1943, Pyron *et al*. 2016) but the holotype (and only known specimen) has been re-examined during this study and it has 15 rows from approximately (slightly after) midbody up to close to the vent (Appendix 2). At least some specimens of *R. melanoleucus* **sp. nov.** could be argued to have 17 midbody dorsal scale rows because the transition to 15 rows occurs approximately at midbody, but *R. melanoleucus* **sp. nov.** is more like *R. sanguineus* and *R. fergu-*

sonianus in that all specimens have 15 rows by shortly behind midbody versus the condition in most other *Rhinophis* spp., which have 17 rows from anterior to midbody up to (close to) the vent.

Understanding of the taxonomy and distribution of Indian *Rhinophis* is somewhat hampered by the minimal or very small sample sizes available for *R. fergusonianus* and *R. goweri*, and by lack of verification of some historical locality and scalation data. For example, Wall (1919) reported a collection of 40 *R. sanguineus* from Rockwood Estate in Wayanad with ventral scale numbers ranging from 214–218 in 16 females and 200–213 in 19 males, but the identification and scalation counts for these specimens (including more pronounced sexual dimorphism and higher ventral counts than we or others have recorded for *R. sanguineus*) cannot be verified because the whereabouts of these specimens is unknown. In another example, Hutton (1949) reported three *R. sanguineus* from High Wavy (Meghamalai), but no specimens were found here by Chandramouli & Ganesh (2010) and this locality is ca. 250 km south and on the other side of the Palghat Gap from all verified records of the species; again, the whereabouts of Hutton's specimens is unknown.

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APPENDIX 1

Comparative material examined of Indian *Rhinophis* spp.

Specimen numbers with a VP and MW prefix are field tags on specimens due to be permanently deposited in BNHS (Mumbai), NCBS (Bangalore) and/or ZSI (Kozhikode, Kerala).

Rhinophis fergusonianus

BMNH 1946.1.16.77 (formerly BMNH 95.7.29.1) holotype, Cardamom Hills, "Travancore" [probably Kerala]

Rhinophis goweri

BNHS 3465, near Solakkadu, Kolli Hills, Namakkal district, Tamil Nadu

Rhinophis sanguineus

BMNH 1946.1.16.54 (formerly BMNH 64.3.9.2) lectotype (see Pyron *et al*. 2016), Cherambady, Wayanad district, Kerala

BMNH 1946.1.16.76 (formerly BMNH 74.4.29.110) holotype of *R. microlepis*, Wayanad district, Kerala

BMNH 74.2.29.695–697, Wayanad district, Kerala

MNHN 1897.246 and MNHN 1895.75, "Sri Lanka" [in error]

ZMB 10358, Wayanad district, Kerala

ZMB 5536, Cherambady, Wayanad district, Kerala

MCZ 3865 and MCZ 3854b, "Madras" (probably the historical administrative region of Madras Presidency)

VPRS0918092 and VPRS0918093, Meppadi, Wayanad district, Kerala

BNHS3153, Anakkamoil, Wayanad district, Kerala

Rhinophis travancoricus
BMNH 92.10.5.2, holotype, 6 miles along Trivandrum-Vambayam road, Thiruvananthapuram district, Kerala
BMNH 1903.4.7.1–2 and BMNH 99.11.16.1, Trivandrum, Thiruvananthapuram district, Kerala
BMNH 94.3.15.1, Piermed [Peermade, Peermedu], Idukki district, Kerala
CAS 244341, Sakrapani Mukku, near Kulithurai river, Kanyakumari district, Tamil Nadu
CAS 39620, Trivandrum, Thiruvananthapuram district, Kerala
MW219 and MW221, Palod, Thiruvananthapuram district, Kerala
MW 2180, MW 2182, MW 2183 and MW 2184, Maramalai, Kanyakumari district, Tamil Nadu
VPRT1115073, near Konni, Pathanamthitta district, Kerala

APPENDIX 2

Dorsal scale row reductions in holotype (*) and paratypes (all other specimens) of *Rhinophis melanoleucus* **sp. nov.,** holotype of *R. fergusonianus* and lectotype of *R. sanguineus.* Dorsal scale rows were not counted anterior to approximately the tenth ventral scale, or adjacent to approximately last five ventrals anterior to the vent.

***Rhinophis melanoleucus* sp. nov.**

BNHS 3534* (female)
4+5 (41) 4+5 (120), +4 (122), -4 (125)
19 ---------- 17 ---------- 15
4+5 (38) 4+5 (113)

BNHS 3535 (male)
3+4 (43) 3+4 (71), +4 (72), 3+4 (119), +4 (125), 3+4 (130)
19 ---------- 17 ---------- 15
4+5 (39) 3+4 (112)

ZSI/WGRC/IR/V/3100 (sex not determined)
4+5 (40) 4+5 (100), +4 (101), 3+4 (104)
19 ---------- 17 ---------- 15
4+5 (34) 4+5 (100)

ZSI/WGRC/IR/V/3101 (female)
3+4 (44) 4+5 (95), +4 (107), 3+4 (117)
19 ---------- 17 ---------- 15
3+4 (37) 4+5 (102)

BNHS 3536 (male)
4+5 (36) 4+5 (69), +4 (71), 3+4 (102), +4 (109), -4 (113), +4 (117), 3+4 (119)
19 ---------- 17 ---------- 15
4+5 (33) 3+4 (70), +4 (71), 3+4 (124)

BNHS 3538 (female)
4+5 (49) 3+4 (120)
19 ---------- 17 ---------- 15
4+5 (44) 4+5 (108), +4 (110), 3+4 (112)

BNHS 3537 (male)
4+5 (62) 3+4 (139)

19 ---------- 17 ---------- 15
4+5 (61) 4+5 (117), +4 (120), 3+4 (135)

Rhinophis fergusonianus

BMNH 1946.1.16.77 (formerly 95.7.29.1), holotype (female)

4+5 (36) -4 (103)
19 ---------- 17 ---------- 15
4+5 (36) 4+5 (93)

Rhinophis sanguineus

BMNH 1946.1.16.54 (formerly 63.3.9.2), lectotype (male)

3+4 (40) 3+4 (92), +3 (98), 3+4 (100), +4 (104), 3+4 (106)
19 ---------- 17 ---------- 15
3+4 (39) 3+4 (83), +4 (86), 3+4 (89)