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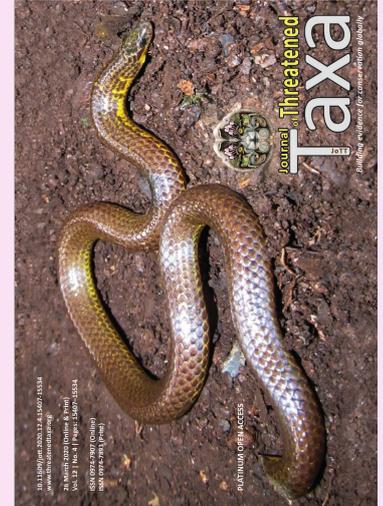
COMMUNICATION

A NEW SPECIES OF SHIELDTAIL SNAKE (REPTILIA: SQUAMATA: UROPELTIDAE) FROM KOLLI HILL COMPLEX, SOUTHERN EASTERN GHATS, PENINSULAR INDIA

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A new species of shieldtail snake (Reptilia: Squamata: Uropeltidae) from Kolli Hill complex, southern Eastern Ghats, peninsular India

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Abstract: We describe a new species of shieldtail (uropeltid) snake, *Uropeltis rajendrani* sp. nov., from the Kolli Hill complex of the southern Eastern Ghats in Tamil Nadu, India. The new species belongs to the *U. ceylanica* group and is differentiated from related species in having 16–17:16–17:15–16 dorsal scale rows; 145–158 ventral scales; 8–11 pairs of subcaudals; dorsum uniform brown, anteriorly powdered with yellow mottling; venter brown, scales outlined with yellow. This endemic species with a restricted range is known only from atop Kolli Hill complex, inhabiting higher elevation (> 900m) evergreen forests, where it is the only known member of this genus.

Keywords: Allopatric species, endemism, isolated massif, *Uropeltis rajendrani* sp. nov., Western Ghats.

Abbreviations: CESS—Centre for Ecological Sciences / Snakes; CSPT—Chennai Snake Park Trust; BNHS—Bombay Natural History Society; MAD—Madras Government Museum Chennai.

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Author contribution: SRG conceived and diagnosed the new species and led the manuscript writing. NSA conducted the field surveys and roadkill specimen collections, examined the type specimens and scored morphological details. SRG diagnosed the new species against the comparative materials' morphology that he had gathered. Both the authors equally contributed in fine tuning and refining the draft and approved the final version.

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INTRODUCTION

Subterranean animals often top the list of undocumented and little-known fauna. Small, unassuming, burrowing snakes such as the shieldtail snakes of the family Uropeltidae Müller, 1832 deservedly fall in the list of under-researched animals. This is the only snake family endemic to the Indian subcontinent (McDiarmid et al. 1999; Wallach et al. 2014) and is surmised to be an evolutionary radiation (Bossuyt et al. 2004; Ganesh 2015). Pyron et al. (2016) provided the latest treatment to this group, decades after a previous detailed study by Rajendran (1985). This family consists of seven genera, of which the genus *Uropeltis* (type genus) is the most diverse and widespread in the Indian peninsula (Beddome 1886; Rajendran 1985; Whitaker & Captain 2004; Pyron et al. 2016).

Until recently, the distribution of the whole genus as such remained unclear, as new studies found that it is restricted to the Indian peninsula and is absent from Sri Lanka (Pyron et al. 2013, 2016). The alpha-taxonomy of the earliest described species in this genus—*Uropeltis ceylanica* Cuvier, 1829—is still unsettled and obscure. Gower et al. (2008) and Ganesh et al. (2014) partly resolved the taxonomic complexities in this species complex by reviving subjective junior synonyms as valid taxa, thereby uncovering cryptic diversity in this group. Just a year ago, a new species of *Uropeltis* was discovered (Jins et al. 2018). In this work, we describe a new *Uropeltis* from one of the emerging centers of herpetofaunal endemism – the southern Eastern Ghats (Aengals & Ganesh 2013; Ganesh & Arumugam 2016; Ganesh et al. 2018).

MATERIALS AND METHODS

This paper is based on the examination of three preserved specimens as well as five wild, uncollected topotypic specimens of the species in question, documented in the field (also see Ganesh & Arumugam 2016). All photos were taken using Nikon D 7000 and Canon Power Shot SX-130-IS model high resolution digital cameras. We recorded morphological details like scalation, measurements and colour patterns with the help of a magnifying hand lens (5X optical zoom). The type series comprises solely road kills that were later identified to be of this new species. We measured the preserved specimens using Mitutoyo dial vernier calipers (LC 0.1mm) except for snout-vent length that was measured with a standard measuring tape (LC 1mm).

We followed Smith (1943) for definition and terminology of morphological characters, except for ventral scales for which Gower & Ablett (2006) counting method was followed. Where damaged, the adjacent coastal scale rows were used as proxies for counting ventral scales in the two paratypes. We provide comparisons and differential diagnosis based on our series of preserved voucher specimens in collections at various museums (see Appendix 1) and also on our perusal of original description papers and subsequent taxonomic treatises (see literature cited).

TAXONOMY

Uropeltis rajendrani sp. nov. (Image 1a–k)

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Uropeltis cf. *ceylanica* (nec Cuvier, 1829) – Ganesh & Arumugam 2016

Holotype: BNHS 3559 an adult male, August 2019, a relatively undamaged specimen found dead on a road, in Bodhamalai, Tamil Nadu State, India, coll. N.S. Achyuthan & N.V. Srikanthan.

Paratypes: BNHS 3560 and BNHS 3561, trampled adults, found dead on a road. Same data as of holotype.

Etymology: Named in honour of Dr. Maria Viswasam Rajendran (2 Nov 1916–6 Aug 1993), ‘MVR’ for short, for his exhaustive studies on shieldtail snakes in Tamil Nadu, next only to Richard Henry Beddome and Frank Wall. Not only was he a professor of zoology at the St. Joseph’s College Palayamkottai (Tirunelveli, Tamil Nadu) but also the director of the Madras (now Chennai) Snake Park (Chennai, Tamil Nadu) during the early 1980s.

Common name: Rajendran’s Shieldtail snake.

Type locality: Bodhamalai Hills near Salem and Namakkal District border, overlooking Panamarathupatti Town (11.535°N 78.221°E; 1,070m), Tamil Nadu State, peninsular India.

Diagnosis: A species of *Uropeltis* from the Kolli Hill complex, characterized by having the following combination of characters: (1) caudal shield truncate, with a distinct thickened circumscribed concave disc; (2) part of rostral visible from above not distinctly longer than its distance from frontal; (3) rostral scale partially separating nasal scales; (4) snout obtusely rounded; (5) eye diameter 3/4th that of ocular shield; (6) dorsal scale rows 16–17:16–17:15–16; (7) ventral scales 145–158; (8) subcaudal scales 8–11 pairs; (9) dorsum deep brown, unpatterned, anteriorly with a few yellow speckles; (10)

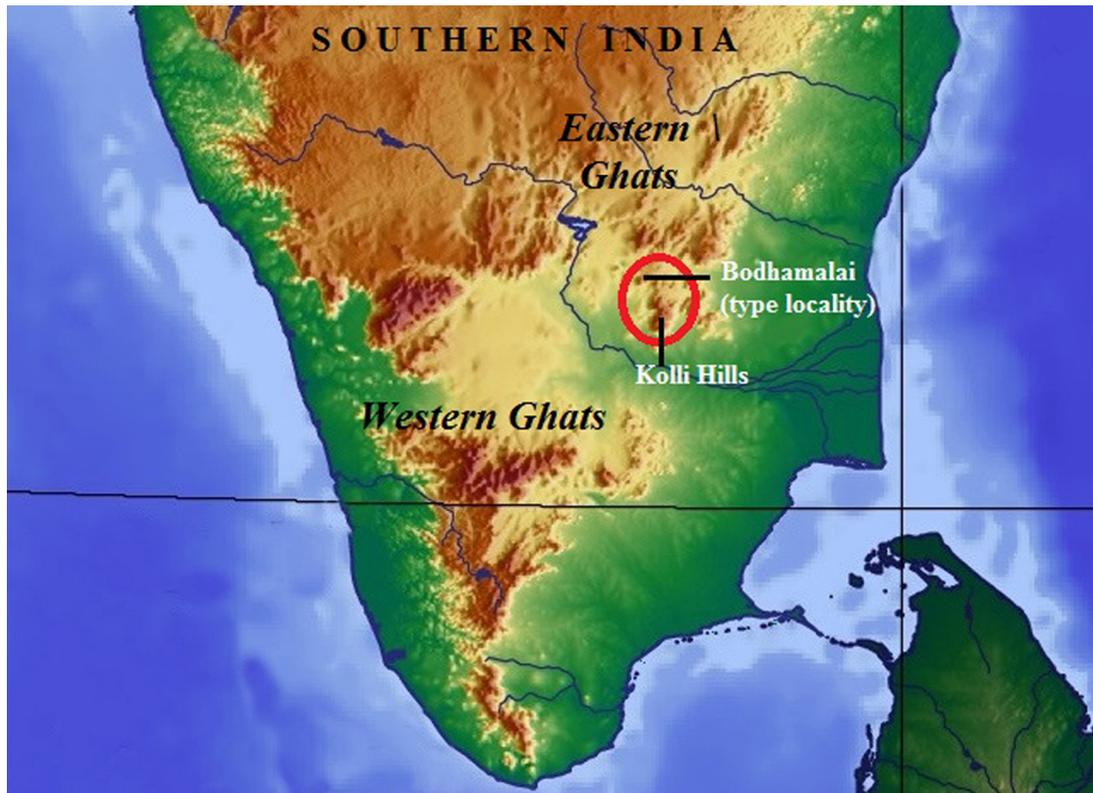


Figure 1. Map of southern India showing the type locality and the general distribution range of *Uropeltis rajendrani* sp. nov.

venter yellow, each scale edged with brown.

Description of holotype

Measurements (in mm, on the left side): Snout-vent length 221mm; tail length 13mm; head length 7.60mm; head width 3.85mm; head depth 3.09mm; body width 5.92mm; vertical eye-diameter 0.45 mm; horizontal eye-diameter 0.41mm; eye-lip distance 0.45mm; eye-nostril distance 1.37mm; eye-rostrum distance 2.29mm; interocular distance 2.32mm; internarial distance 1.15mm; snout-parietal distance 6.10mm; posterior end of rostral to posterior end of parietal distance 4.75mm; tail shield length 8.17mm; tail shield width 3.95mm; tail shield depth 2.60mm; parietal scale length 1.70mm; parietal scale width 1.12mm; frontal scale length 2.4mm; frontal scale width 1.32mm; ocular scale length 1.72mm; prefrontal scale length 1.45mm; midbody ventral scale width 2.50mm; midbody basal coastal scale width 1.23mm.

Scalation: Rostral visible from above, smaller than nasal, not completely separating nasals; nasals in contact with one another posteriorly, prefrontals subequal in size to nasal and ocular scales, not in contact with rostral; nostril piercing nasal scales; nasal scales divided by rostral anteriorly but in contact with

each other posteriorly; prefrontals subequal to frontal, slightly larger than nasals and oculars; frontal longer than broad, smaller than parietal; parietals large, largest of all head scales; supralabials 4, 4 (left, right), 1st and 2nd ones small, 3rd below eye, 4th the largest; infralabials 3, 4 (left, right), elongate, 1st pair slightly curved anteriorly; mental scale small, subequal to 1st infralabial, but as wide as long; body scales imbricate, cycloid; dorsally around body in 17:16:16 rows (one head length after neck: at midbody: one head length before vent); ventrals 148, angulate laterally; cloacal scale divided, each part larger than a dorsal scale; subcaudals 11 pairs + 1 terminal scale; tail shield distinctly truncate above, concave, clearly circumscribed and ridged; covered with bi- and tri-carinate thickened scales; 11 scales across the length and 5 across the width of the tail shield.

Colouration: Dorsum deep brown, rather uniform and unpatterned for the most part, except near neck where it is speckled with yellow spots; venter rich brown each ventral scale and abutting rows of last coastal scales more or less fully bordered with yellow outlines, giving an overall brown-mottled appearance; a pair of yellow stripes extending from last supralabial scale till the anterior 1/3rd of the body, across the first blotch near the neck; cloacal scale and subcaudal scales orange with

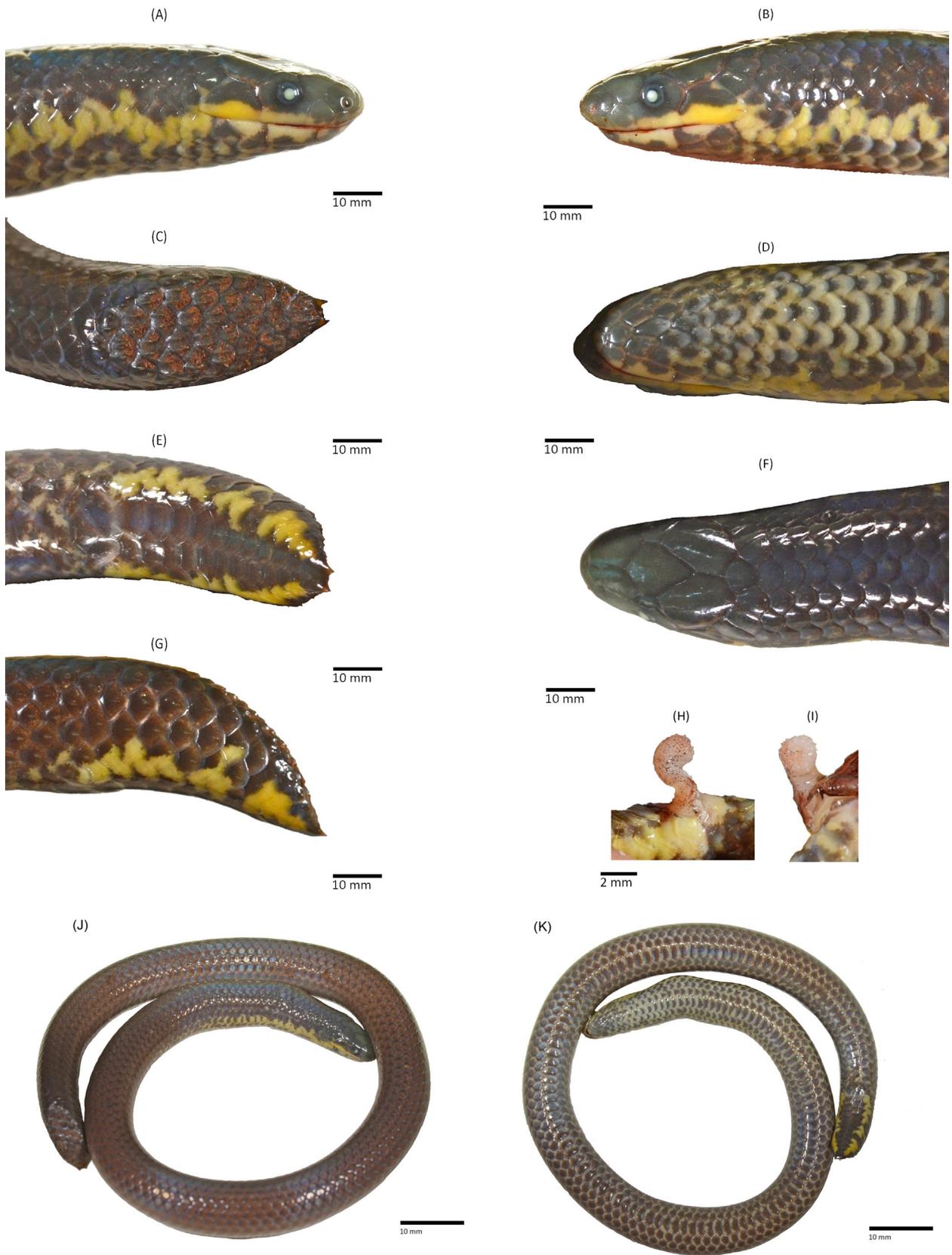


Image 1. Profile close-ups of head and tail shield in lateral, dorsal and ventral views (A–I) and entire, dorsal and ventral views (J–K) of BNHS 3359, holotype of *Uropeltis rajendrani* sp. nov. © N.S. Achyuthan.

smaller blackish-brown spots.

Hemipenis: Everted; organ short (3mm), and fairly stout (1.92mm); extending up to 2nd subcaudal scales; unilobed, not forked at tip; lobe head (2.00mm) wider than pedicel (1.37mm), sulcal lip rounded, spinose with tiny flounces, pedicel in asulcate view plain and smooth; in sulcate view, sulcus spermaticus feebly visible as a reddish groove, extending down to the base from the lobe head.

Dentition: Maxillary (upper jaw) teeth – 8/8 (L/R); Dentary (lower jaw) teeth – 10/9 (L/R). No diastema visible; all teeth present in sockets; teeth apparently equal in size and shape.

Variation: Paratypes (n=2) are topotypic specimens that were more damaged road kills than the holotype, permitting fewer variables to be scored. In general, agreeing with the holotype and showing the following intraspecific variation: dorsal scale rows: 17:16:16; ventrals: 145, 147; subcaudals: 11 pairs; snout-vent length: 163, 183mm, tail length: 12, 13.5mm; body width: 7.07, 7.74 mm (trampled specimens); head length: 7.84, 7.79mm; head width: 5.83, 5.91mm; interocular distance: 2.05, 2.14mm; internarial distance: 2.04, 1.89mm.

Field observations (also see Ganesh & Arumugam 2016): The new species was sighted in and around the type locality and in other parts of the higher slopes (> 900m) with adequate vegetation cover of Kolli Hill complex of Salem and Namakkal. This species has previously been sighted from Semmedu, Solakkadu, Kuzhivalavu, Seekuparai, Thenur Nadu, Selur Nadu, Gundur Nadu settlements (see Ganesh & Arumugam 2016). This is a burrowing snake, like all others of its family and resting individuals have been observed under fallen logs, rocks and stones and have also been dug out during active searches. It is active during night time when the individuals forage out on to land, but was once sighted outside soil surface at 11.00h in a closed canopy forest on a rainy day. A young one (SVL: 70mm) was sighted in July. The new species inhabits evergreen and semi-evergreen forests covering the hill tops and, also, marginally cultivated habitats such as coffee and cardamom plantations. It has never been recorded within other modified monocultures such as pineapple, tapioca, eucalyptus, and silver oak (Ganesh & Arumugam 2016). The new species is regularly killed by vehicular traffic on the ghat roads as attested by the type specimens that are comprised of road kills, especially during the monsoons (June–September). This is a potentially threatened species as its entire geographic range that covers only a single hill range, is outside any

protected area network and is undergoing a continual onslaught of anthropogenic pressures resulting in population declines (see Ganesh & Arumugam 2015).

Comparisons and Differential diagnosis: The new species is here compared with all 24 recognized species of *Uropeltis* (see Pyron et al. 2016; Jins et al. 2018). By having a thickened, circumscribed, concave caudal disc *Uropeltis rajendrani* sp. nov. clearly differs from the following 14 species: *U. bhupathyi*, *U. ellioti*, *U. nitida*, *U. grandis*, *U. aculate*, *U. dindigalensis*, *U. beddomei*, *U. macroryncha*, *U. woodmasoni*, *U. broughami*, *U. aculate*, *U. petersi*, *U. liura*, and *U. pulneyensis*. Further, *Uropeltis rajendrani* sp. nov. also differs from the remaining congeners (after Gower et al. 2008; Ganesh et al. 2014) with a thickened, circumscribed, caudal shield categorized under Smith's (1943) Group II A & B as follows (only opposing suite of character states listed): *U. arcticeps* (southern Western Ghats): dorsal scales lacking a clearly defined yellow scale border; ventral scale counts much lower (127–128); *U. bicatenata* (northern Western Ghats): yellowish scalloping chain-like pattern across both sides of the body; *U. broughami* (southern Western Ghats): 19 midbody scale rows; rostral scale much produced and ridged with a dorsal keel; dorsum brown with distinct small, yellow-black-edged transverse ocelli; ventral scale counts higher (181–230); *U. ceylanica* s. auct. (Western Ghats): anterior dorsum without distinct yellow spots; venter lacking a clearly defined brownish scale border; ventral scale counts much lower (119–146; 130 in holotype – Gower et al. 2008); *U. macrolepis* complex (northern Western Ghats): 15 midbody scale rows; lower ventral scale counts (128–140); dorsum blackish-brown with yellow broken spots forming zig-zag crossbars or annuli or a pair of distinct, thick, yellowish-orange paravertebral stripes extending across most of the body except near neck, where there are two large orange spots; *U. madurensis* (southern Western Ghats): dorsal scales with a clearly defined yellow scale border; *U. myhendrae* (southern Western Ghats): dorsum with brownish-black body, each scale with yellowish posterior border forming more or less complete band or annuli; part of rostral visible from above distinctly longer than its distance from frontal; ventral scales comparatively lower (139–156); *U. phipsoni* (northern Western Ghats): a pair of yellowish lateral streaks along both sides of the body; part of rostral visible from above distinctly longer than its distance from the frontal; ventral scales comparatively lower (138–157); *U. rubromaculata* (southern Western Ghats): presence of two large red caudal spots; much higher ventral counts (127–136); *U. rubrolineata* (southern Western Ghats): presence



Image 2. Live uncollected topotypes (adult and juvenile), view of forest cover at the type locality – the Kolli Hill complex, southern Eastern Ghats, Tamil Nadu. © S.R. Ganesh.

of two ventrolateral red stripes; much higher ventral counts (165–172); *U. shorttii* (southern Eastern Ghats, allopatric): dorsal body brownish or bluish-black, with distinct yellowish annuli or crossbars; ventral counts comparatively lower (141–156).

DISCUSSION

Uropeltis rajendrani sp. nov. is the 25th species in the genus *Uropeltis* to be described. It is the second recently described species in this genus (after *U. bhupathyi* Jins et al., 2018) as well as from this hill complex (after *Rhinophis goweri* Aengals & Ganesh, 2013). This finding of undocumented diversity of uropeltid snakes from the southern Eastern Ghats is in agreement with the discovery of *R. goweri* by Aengals & Ganesh (2013) and the revival of *U. shorttii* (Beddome, 1863) by Ganesh et al. (2014). The new species is sympatric with *R.*

goweri and is allopatric with *U. shorttii* that is endemic to a northerly massif—the Shevaroy (see Ganesh et al. 2014; Ganesh & Arumugam 2016). Taxonomically, this population was discovered only recently and has been previously referred to as *Uropeltis* cf. *ceylanica* by Ganesh & Arumugam (2016). This is in contrast with description of *U. bhupathyi* as it is a long-known taxon, but misrepresented as *U. ellioti* sensu lato (see Jins et al. 2018).

Massifs in the southern Eastern Ghats contain disjunct, elevated (1,400m) hill ranges. This provides an ideal setting for the evolution of a distinct assemblage of hill forest herpetofauna in the upper reaches, as has been discovered by Ganesh & Arumugam (2016) and Ganesh et al. (2018). Precisely, the Kolli Hill complex, is an emerging center of reptile endemism as exemplified by the finding of other range-restricted reptiles such as the new geckoes *Hemiphyllodactylus kolliensis* and *Hemidactylus kolliensis* (see Agarwal et al. 2019a,b),

apart from the pioneering discovery of *Rhinophis goweri* by Aengals & Ganesh (2013) previously, from the same general area. *Uropeltis rajendrani* sp. nov. thus joins an increasing array of point-endemic vertebrates restricted to the Kolli massif complex. This new discovery underscores the need for research and conservation attention to the Kolli Hill complex, and the southern Eastern Ghats in general.

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Appendix 1. List of preserved voucher specimens studied

- Uropeltis ceylanica*:** MAD no number from Perambikulam; another unnumbered specimen from Cochin; MAD 1938 from Attikan (Mysore) E. Barne’s collection, from ca. 1,500m, in June 1938; more unnumbered specimens, from Nilgiris, Cochin and Travancore; CESS 092 from Pakshipathalam, Bramgiri, Kannur District, Kerala; CESS 281, from Coorg, Madikeri District, Karnataka.
- Uropeltis dindigalensis*:** MAD no number from Sirumalai, Madura District.
- Uropeltis ellioti*:** CESS 079, from Chemmunji, Peppara WS, Trivandrum District, Kerala; CSPT/S-81 from Shevaroy, Salem District, Tamil Nadu.
- Uropeltis grandis*:** MAD no number from Anamalai, Coimbatore District.
- Uropeltis liura*:** CSPT/S-3, 2 e.g., from Madurai Hills, Madurai District, Tamil Nadu.
- Uropeltis maculata*:** CESS186 from Anaimudi Shola NP, Idukki District, Kerala; MAD no number from Anamalai, Coimbatore District.
- Uropeltis madurensis*:** CSPT/S-6, 1 e.g. from High Wavys, Theni District, Tamil Nadu.
- Uropeltis myhendrae*:** CSPT/S-5, 1 e.g. from Vannathipparai, Kanyakumari District, Tamil Nadu.
- Uropeltis nitida*:** CESS408 from Nelliampathy RF, Palghat District, Kerala.
- Uropeltis cf. ocellata*:** MAD no number from Perambikulam; more unnumbered specimens from Cochin and Kodaikanal, Palni Hills.
- Uropeltis petersi*:** CSPT/S-7a 1 e.g. from Kodaikanal, Dindigul District, Tamil Nadu.
- Uropeltis pulneyensis*:** MAD 1929 6 e.g., collected by E. Barnes, during April-May, from 1,800–2,040 m, Kodaikanal, Palni hills; CSPT/S-4a, 1 e.g. from Kodaikanal, Dindigul District, Tamil Nadu.
- Uropeltis rubromaculata*:** MAD no number from Anamalai, Coimbatore district; CSPT/S-7 from Anaimalai, Coimbatore district, Tamil Nadu; CESS 322, from Anaimalai WLS, Tirupur District, Tamil Nadu.
- Uropeltis shortii*:** CSPT/S-80, 2 e.g. from Shevaroy Hills, Salem District, Tamil Nadu.
- Uropeltis woodmasoni*:** CSPT/S-4, 1 e.g. from Anaimalai, Coimbatore District, Tamil Nadu.



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