

SPECIES RICHNESS OF MONTANE HERPETOFAUNA OF SOUTHERN EASTERN GHATS, INDIA: A HISTORICAL RESUME AND A DESCRIPTIVE CHECKLIST

S. R. Ganesh¹ and M. Arumugam¹

Submitted November 14, 2014.

We examined the amphibian and squamate reptilian species richness of Southern Eastern Ghats based on a long term-field survey with nearly two years of field days. We surveyed high elevation slopes (>900 m a.s.l.) of four select hill ranges namely Jawadi, Shevaroys, Kolli, and Sirumalai hills which comprehensively represented full geographical and spatial coverage. We present a descriptive species-account with basic morphological data supported by voucher photographs. We summarize the history of herpetological explorations in this landscape and also comment on some of the major previous works in the region. Our study revealed the presence of 62 species in the montane zones, including 32 (51%) new records involving all the three target taxa (frogs, lizards and snakes) and all the four hill ranges that testify the poor knowledge on the region's herpetofauna till date. Lastly, we remark on the unresolved taxonomic status of some species recorded in the present study. We recommend specimen-based revisionary works in the nearby Western Ghats, where such taxa are much more diverse, to enable taxonomic studies in this region.

Keywords: amphibians; hill range; elevation; reptiles; south India; wet forests.

INTRODUCTION

The Eastern Ghats (10 – 21° N 77 – 86° E; 1680 m a.s.l.) is a series of discontinuous hill ranges situated approximately along the east coast of peninsular India (Jayakumar et al., 2008). Herpetological studies in the southern part of the Eastern Ghats, the region of interest for the present work, began during the colonial period, in the mid 19th century. Apart from the many widespread species that were described since Linnaeus' days, first, Jerdon (1853) described Mysore day gecko *Cnemaspis mysoriensis* from Bangalore. Beddome (1863) surveyed Shevaroys and described Shortt's shieldtail snake *Uropeltis shorttii* and recorded some more snakes such as Elliot's shieldtail *Uropeltis ellioti*, montane trinket snake *Coelognathus helena monticollaris* and striped-neck snake *Liopeltis calamaria*. Later, Beddome (1870) described many new geckoes namely Kollegal ground gecko *Cyrtodactylus kollegalensis* from Balarangams and Yellundur near Mysore, Erode ground gecko *Cyrtodactylus speciosus* from Erode, golden gecko *Calodactylodes aureus* from Tirupathur, worm gecko *Hemiphyllodactylus aurantiacus* from Shevaroys and reticulated

gecko *Hemidactylus reticulatus* from Kollegal. Beddome (1877) described Dindigal shieldtail *Uropeltis dindigalensis* from Sirumalai hills. Two more species were reported (Smithy, 1935; 1943) to be described from Sirumalai — Brougham's shieldtail *Uropeltis broughami* by Beddome (1878) and Günther's cat skink *Ristella guentheri* by Boulenger (1887).

In the 20th century, fewer new taxa were described. Smith (1943) described Beddome's coral snake *Calliophis beddomei* from Shevaroys and also listed, without substantial evidence, many, typical, Western Ghats venomous snakes like striped coral snake *Calliophis nigrescens* and pitvipers such as *Trimeresurus malabaricus*, *T. macrolepis*, and *T. strigatus* from Shevaroys. Then, after over half a century, in the late 1990s, a series of papers on the subject appeared. Daniels and Ishwar (1994) undertook a pioneering work in an attempt to evaluate the conservation status of Southern Eastern Ghats herpetofauna whence many hills like Amirthi, Gingee, Jawadi, Kalrayan, Kolli, Mettur, and Shevaroys were surveyed, albeit briefly. They reported Kerala cricket frog *Fejervarya keralensis* from Jawadi and Shevaroy hills. Dutta (1997) based on extensive museum studies reported typical, Western Ghats frogs such as Triangle-spotted frog *Ramanella triangularis* and Nilgiris bush frog *Raorchestes signatus* from Yercaud. Later, Daniels and Kumar

¹ Department of Zoology, University of Madras, Guindy Campus, Chennai 600025, India;
e-mail: snakeranglerr@gmail.com; marumugam7@hotmail.com

(1998) and Kumar and Daniels (1999) based on field surveys, reported the herpetofauna of Kolli hills, the first ever dedicated works in this massif. They reported many typical Western Ghats species such as bush frogs *Raorchestes* sp., *Pseudophilautus* sp., golden-backed frog *Indosylvirana* sp., day gecko *Cnemaspis* sp., flying lizard *Draco dussumierii*, and hump-nosed pitviper *Hypnale hypnale* from Kolli hills.

In this century, Das and Bauer (2000) described two new day geckoes *Cnemaspis otai* and *C. yercaudensis* from Vellore and Yercaud respectively. In perhaps the only available work on herpetofauna of Sirumalai, Vanak et al. (2001) undertook an inventory of an estate in Sirumalai and provided a checklist. Notable records from Sirumalai include several range-restricted taxa such as bush frogs *Pseudophilautus* sp., bronze frog *Indosylvirana* sp., hill cricket frog *Fejervarya brevipalmata*, day geckoes *Cnemaspis* sp., rock gecko *Hemidactylus prashadi* (sic), worm gecko *Hemiphyllodactylus aurantiacus*, and pitviper *Trimeresurus gramineus*. Murthy and Aengals (2008) presented a reptile checklist for Eastern Ghats. Vogel and Rooijen (2011) described the tree snake *Dendrelaphis girii*, including specimens from Sirumalai collected during the estate inventory (Vanak et al., 2001). Lastly, Gower's shieldtail *Rhinophis goweri* was described from Bodamalai hills.

The few available detailed long-term works are those from the more northern stretches of the Eastern Ghats (Rao et al., 2005; Srinivasulu and Das, 2008) and the southern ranges still remain largely under-explored. Moreover, some of the earlier records from Eastern Ghats, of typical Western Ghats species, for reasons unknown, got omitted due to lack of recent, soundly-verified field sightings from Eastern Ghats. Such omitted records include Dutta's (1997) *Ramanella triangularis* from Shevaroyas that was not included by Biju (2001), Kumar and Daniels' (1999) records of *Draco dussumierii* and *Hypnale hypnale* from Kolli hills which were not mentioned by Daniel (2002), Das (2002), Gumprecht et al. (2004), Whitaker and Captain (2004) and Vogel (2006) as well as Smith's (1943) mention from Shevaroyas of *Trimeresurus malabaricus* that was not mentioned by Gumprecht et al. (2004), Whitaker and Captain (2004) and Vogel (2006); of *T. macrolepis* that was not mentioned by Gumprecht et al. (2004) and Vogel (2006) and of *T. strigatus* that was not mentioned by Vogel (2006). Likewise the skink *Ristella guentheri* and the snake *Uropeltis broughami* that were mentioned to be from Sirumalai (Smith, 1935; 1943) were never re-sighted there (Rajendran, 1985; Vanak et al., 2001), but were sighted and reported from Tenmalai and Palnis, in the Western Ghats, respectively by Annandale (1909) and Roux (1928).

Therefore, the proper herpetofaunal richness, particularly of the range-restricted montane taxa inhabiting the Southern Eastern Ghats is still unclear. In this paper, the richness of amphibians and reptiles inhabiting the montane regions (i.e., higher slopes >900 m a.s.l.) of four, select hill ranges is presented. We present a reappraisal of the (revised) species richness that is compared and contrasted with that reported earlier. Since many of our observations form new range records and even species, we present ample morphological accounts along with photographic vouchers for range-restricted taxa. Furthermore, we restrain from accepting certain unsubstantiated/dubious records from Eastern Ghats, of some typical Western Ghats species that were not encountered in this, the most comprehensive long-term herpetological survey ever conducted in the Southern Eastern Ghats till date.

STUDY AREA (Fig. 1)

Southern Eastern Ghats (after Jayakumar et al., 2008; also see Daniels and Ishwar, 1994) extend from Jawadi hills in the northeast till Sirumalai hills to the southwest. We surveyed four select massifs that were chosen a priori such that they are spatially-discrete montane isolates which rise above a considerable elevation (>900 m a.s.l.; max. 1620 m a.s.l.), represent distinct hill complexes, cover all latitudinal blocks in the landscape and span across the many intervening rivers present. Some adjacent, easterly, lower hill ranges that are fully or partly conjoined with the chosen hill ranges were not included in the survey since their fauna was a nested subset of that of the chosen ones (pers. observation.). The chosen hill ranges are Jawadi (= Tirupathur) hills (12°15' – 32' N 78°35' – 46' E; 1200 m a.s.l.) in Vellore district; Shevaroy hills (11°43' – 56' N 78°07' – 21' E; 1620 m a.s.l.) in Salem district; Kolli hills (11°11' – 27' N 78°16' – 28' E; 1400 m a.s.l.) in Namakkal district and Sirumalai hills (10°06' – 17' N 77°55' – 78°06' E; 1400 m a.s.l.) in Dindigul district, all politically situated in Tamilnadu state. The dominant natural climax vegetation type in the higher slopes (>900 m a.s.l.) is tropical evergreen forest (Jayakumar et al., 2008). Cash crop plantations, mainly coffee (except Jawadi) and Silver Oak, and mixed fruit orchards form a major part of contemporaneous landscape. Since all these four hill ranges currently lack any protected areas, human disturbances to the landscape was comparatively high. As regards seasons, January – February is cold, March – May is hot and June – August (southwest monsoon) as well as September – December (northeast monsoon) are wet. Average annual air temperature ranges between 13 and 34°C (55 – 84°F) and aver-

age annual rainfall averages around 1500 mm in the wet zone (see Jayakumar et al., 2008 and references therein).

METHODOLOGY

Hill slopes and plateaus in the study area above 900 m a.s.l., having tropical evergreen forest (after Jayakumar et al., 2008) or montane cloud forest (after Doumenge et al., 1993) as the natural climax vegetation, were surveyed. This also included anthropogenic habitats like fruit orchards, coffee and spice plantations. Diurnal Time Constrained Searches (DTCS, after Ribiero-Junior et al., 2008) involving active searches during daytime in prospective microhabitats to detect both active (diurnal) and dormant (nocturnal) animals and, to some extent, Nocturnal Visual Encounter Survey (VES, after Crump and Scott, 1999) for more elusive nocturnal animals were employed to obtain comprehensive field sightings of the target taxa. Data for the present work was collected during field excursions between 2011 and 2014, and further updated during 2015. Around 5 to 6 months were spent in each hill range, with about 4 to 5 man-h of fieldwork per day, accounting to about 100 hours per month and 500 man-h of fieldwork per hill range. In each hill range about 16 to 19 intensive sampling sites were marked by GPS such that two sampling sites were at least 1 km apart by straight line, and surveyed. Diurnal surveys from 6:00 to 17:00 h were predominantly done in all study sites. Night surveys from 18:30 to 21:30 h were largely restricted to sites close to camping sites due to logistic constraints and personal safety from large mammals. Geographic coordinates (in DMS format) and elevation in meters above mean sea level were found out using Garmin Etrex 10 GPS using a WGS-84 map datum.

Individuals sighted were examined and photographed *in situ*. Measurements in mm were taken using slide calipers and measuring tape. Gross body measurements including snout-vent length, tail length, head length, head width, body width, axilla-groin distance and limb length were measured to the nearest mm in the field. Scalation details were noted using magnifying hand lenses. Measurement protocols (for the above-mentioned parameters) and morphological terminologies were after Dutta and Manamendra-Arachchi (1996) for amphibians, Somaweera and Somaweera (2009) for lizards and Whitaker and Captain (2004) for snakes, except for counting ventral scales of uropeltids, for which we followed Gower and Ablett (2006). Amphibian larvae were staged according to Gosner (1960). For juvenile specimens, fewer measurements were scored to avoid distress. Coloration notes were noted by observing live or freshly dead individuals. For each species, No. of individuals

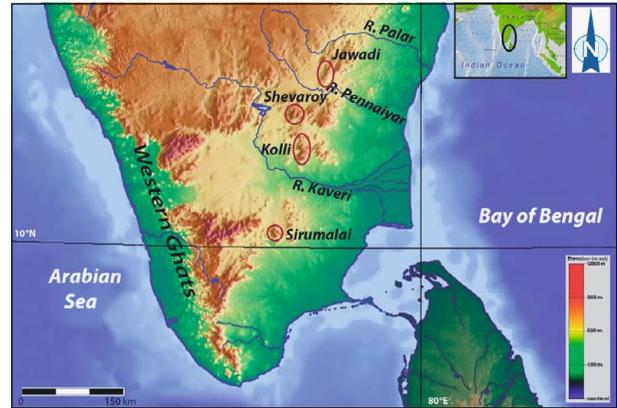


Fig. 1. Physical map of south India depicting the Southern Eastern Ghats, mentioning the studied hill ranges and the rivers present in the region.

examined among the many more examples sighted is mentioned here as “n” (i.e., sample size). Taxa that stand unresolved down to the species level are mentioned here either as “sp.” or with a prefix “cf.” before their most-conferring nominate species. Those with “cf.” prefix are excluded from the chresonymy and distribution of their respective nominate taxa. No specimens were collected for preservation and deposition in museums owing to lack of collection permits. Instead, voucher photographs were taken using a high-resolution digital camera. For most species, particularly the range-restricted montane elements, detailed photography was done for each species from each hill range. Opportunistic sightings and road-kills or other dead specimens were also considered in the checklist. Sampling adequacy was estimated using species-accumulation curves. Other aspects studied including relative abundance, community structure and distribution patterns will be presented elsewhere (Ganesh and Arumugam, in preparation).

SPECIES ACCOUNTS

Amphibia. Anura. Bufonidae *Duttaphrynus melanostictus* (Schneider, 1799)

Morphology. Specimens typical of the species.

Recorded from. All the four ranges.

Rhacophoridae

Pseudophilautus cf. *wynaadensis* (Jerdon, 1853)

Morphology ($n = 10$). Snout-vent length: 20 – 28 (subadult 16 – 18), head length: 6 – 11, head width: 6 – 12, head depth: 5 – 6, body width: 10 – 14, axilla-groin distance: 11 – 18 (subadult 8), fore limb length: 9 – 11, hind limb length: 21 – 31; adpressed tibio-tarsal articulation reaches between eye and nostril. Skin smooth; supra-

tympanic fold slightly evident; dorsally uniform whitish fawn to mild reddish brown; groin and inguinal pits unpatterned; a distinct black eye steak across postocular and supratympanic regions; iris golden above, darker below, with black horizontal pupil.

Recorded from. Kolli and Sirumalai hills.

Remarks. Nominotypical species *Pseudophilautus wynaadensis* is known only from parts of Western Ghats, including lower Nilgiris and Anaimalai ranges (Biju and Bossuyt, 2009). Mention of *Philautus variabilis* from Kolli hills by Daniels and Kumar (1998) and Kumar and Daniels (1999) may refer to this species. This species was previously recorded from Sirumalai (Vanak et al., 2001).

***Raorchestes cf. leucolatus* Vijayakumar, Dinesh, Prabhu et Shankar, 2014**

Morphology ($n = 9$). Snout-vent length: 21 – 32, head length: 8 – 11, head width: 8 – 12, head depth: 6 – 10, body width: 8 – 11, axilla-groin distance: 11 – 18, fore limb length: 8 – 12, hind limb length: 22 – 35, adpressed tibio-tarsal articulation reaches eye. Skin slightly granular; supratympanic fold slightly evident; dorsally light to dark brown with a darker chevron-shaped or hour-glass marking on the back; presubocular, postocular and tympanic regions distinctly dark brown; limbs barred with darker brown; groin and inguinal pits dark brown with distinct large white blotches; iris golden above, darker below, with a black horizontal pupil.

Recorded from. Kolli and Shevaroy hills.

Remarks. Nominotypical species *Raorchestes leucolatus* is known only from parts of Western Ghats, in Siruvani-Elivalmalai hills (Vijayakumar et al., 2014). It is likely that Satyamurti (1967), Dutta (1997), Daniels and Kumar (1998), Kumar and Daniels (1999) and Daniels (2005) mentioned this species from Shevaroy and Kolli hills either as “*Philautus variabilis*” or “*P. signatus*” following a now-obsolete taxonomic arrangement.

Microhylidae

***Microhyla cf. sholigari* Dutta et Ray, 2000**

Morphology ($n = 10$). Snout-vent length: 24 – 26, head length: 6 – 7, head width: 6 – 7, fore limb length: 9 – 10, hind limb length: 26 – 28, adpressed tibio-tarsal articulation reaches eye. Skin smooth with some minute pustules; tympanum hidden; dorsally orange-brown with a black chevron-shaped marking on the back; dorsal mark uniform dark brown without much alternate black and white outlines, converging anteriorly to just forward to axillary midline and diverging forward to meet eyelids; posteriorly, diverging near loin into two arms on each side, such that they coincide with the hindlimb bars

when limbs folded as at rest; lateral body and facial regions light gray; limbs brown above barred with darker brown outlined in black; belly bright white; limbs and gular region pale pink below; iris dark brown, pupil circular, black with yellow outline.

Recorded from. Jawadi hills.

Remarks. Although superficially similar to the widespread *M. ornata*, this high-elevation population is much larger, as big as *M. rubra*. Nominotypical species *Microhyla sholigari* is known only from Bilgiri Rangan hills (Dutta and Ray, 2000).

Ranidae

***Indosylvirana sreeni* (Biju, Garg, Mahony, Wijethilaka, Senaviratne et Meegaskumbura, 2014)**

Morphology ($n = 19$). Snout-vent length: 46 – 80 (subadults 15 – 16), head length: 19 – 30, head width: 13 – 22, head depth: 8 – 15, axilla-groin distance: 26 – 50 (subadults 7 – 9), fore limb length: 21 – 49, hind limb length: 101 – 121. Skin smooth all throughout; dorsally golden to fawn brown, with two distinct yellow dorsolateral skin folds extending from eye to posterior trunk; laterally of a darker shade, more so in males; adult females of a uniform color dorsolaterally; limbs barred with darker shades, especially in males; adpressed hind-limb reaches between tympanum and loreal; fingers not webbed; toes 3/4 webbed; underside yellowish white anteriorly with small dark specklings; iris often dark reddish, with a black circular pupil.

Recorded from. Shevaroy, Kolli, and Sirumalai hills.

Remarks. The golden-backed frogs (*Indosylvirana*) inhabiting the Western Ghats-Sri Lanka hotspot was recently revised by Biju et al. (2014) (read with Oliver et al. 2015) and the newly described species *I. sreeni* originating from the Western Ghats, also included genetically-tested conspecifics from Shevaroy.

Dicroglossidae

***Fejervarya* sp.**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

Remarks. This taxon represents the peninsular Indian species usually mistakenly called as *Fejervarya limnocharis* (Gravenhorst, 1829) (Dutta, 1997).

***Fejervarya cf. nilagirica* (Jerdon, 1853)**

Morphology ($n = 11$). Snout-vent length: 47 – 55, head length: 15 – 22, head width: 16 – 19, head depth: 10 – 15, body width: 19 – 25, axilla-groin distance: 24 – 33, fore limb length: 26 – 34, hind limb length: 84 – 112. Skin highly pustular, with distinct tubercles and warts,

both globular and elongate; dorsum dark olive green to dirty brown, with distinct yellow marblings on the many warts; a yellowish white vertebral stripe from prefrontal to groin present or absent; limbs often barred with darker shade; adpressed hindlimb surpassing snout-tip; fingers 1/3 webbed, toes 3/4 webbed; venter and lateral regions, especially along lower lips, mid trunk, thigh and lower hindlimbs yellow; iris fawn brown, with a black rhomboid pupil.

Recorded from. All the four hill ranges.

Remarks. The nominotypical species *Fejervarya nilagirica*, is restricted to upper Nilgiris, in the Western Ghats (Biju, 2001). It is likely that Daniels and Ishwar (1994) reported this species as “*Rana keralensis*” from Jawadi and Shevaroys, and Vanak et al., (2001) mentioned it, tentatively, as *Limnonectes brevipalmata*.

***Sphaerotheca* sp.**

Morphology (n = 10). Snout-vent length: 19 – 23, head length: 7 – 9, head width: 7 – 9, head depth: 6 – 7, body width: 10 – 12, axilla-groin distance: 11 – 13, fore limb length: 9 – 11, hind limb length: 20 – 23, adpressed tibio-tarsal articulation reaches tympanum. Skin dorsally granular with distinct pustular warts on head, back and limbs, ventrally smooth; supratympanic fold evident; dorsally light to dark brown with some distinct orange spots on the warts; facial regions below eye dark gray to black with small white spots; limbs brown above, barred with darker brown; digits on fore and hind limbs white; belly white, lateral body, groin and inguinal region pink to gray with white spots; iris golden above, darker below, with black rhomboidal pupil.

Recorded from. Sirumalai hills.

Remarks. Vanak et al., (2001) reported this species from Sirumalai as *Sphaerotheca breviceps*. Although superficially resembling *S. breviceps*, these frogs are much smaller and inhabit denser forests.

***Sphaerotheca* cf. *dobsonii* (Boulenger, 1882)**

Morphology (n = 7). Snout-vent length: 48 – 60, head length: 20 – 24, head width: 21 – 25, head depth: 13 – 18, axilla-groin distance: 31 – 37, body width: 20 – 26, fore limb length: 28 – 35, hind limb length: 63 – 74, adpressed tibio-tarsal articulation reaches tympanum. Skin dorsally smooth with some minute warts on trunk and limbs, ventrally smooth except near thighs and groin that are granular; supratympanic fold evident; dorsally yellowish to dark gray with a light vertebral stripe from snout to groin; facial regions below eye dark gray to black with random white blotches; limbs of body color above, barred with dark brown; femoral region and groin



Fig. 2. Some range-restricted herpetofauna in the Southern Eastern Ghats, India: a, *Microhyla* cf. *sholigari*; b, *Indirana* sp.; c, *Pseudophilautus* cf. *wynaadensis*; d, *Raorchestes* cf. *leucolatus*; e, *Fejervarya* cf. *nilagirica*; f, *Sphaerotheca* cf. *dobsonii*; g, *Hylarana sreeni*; h, *Ophisops minor nictans*.

dark brown with yellow reticulations; belly white, lateral body, groin and inguinal region pink to gray with white spots; iris golden above, darker below, with a black rhomboidal pupil.

Recorded from. Jawadi hills.

Remarks. Dutta (1997) mentions the distribution of *S. dobsonii* as Western and Eastern Ghats. Although *S. dobsonii* was described from Western Ghats (Dutta, 1997), subsequently it was widely reported from throughout the Eastern Ghats (Dutta, 1997; Rao et al., 2005; Srinivasulu and Das, 2008). However owing to differences in the Western Ghats and Eastern Ghats populations in this taxon (personal observation) that are also geographically disjunct, we refer Jawadi population as *Sphaerotheca* cf. *dobsonii*.

Ranixalidae
***Indirana* sp.**

Morphology ($n = 5$). Snout-vent length: 19–42, head length: 8–17, head width: 6–14, head depth: 4–9, body width: 8–17 (gravid: 20–22), axilla-groin distance: 10–18, fore limb length: 10–23, hind limb length: 30–67, adpressed tibio-tarsal articulation reaches eye. Skin dorsally with many linear elongate folds, ventrally smooth, except near femur and groin that have distinct glandular patches; supratympanic fold slightly evident; dorsally light to dark brown scattered with darker spots; top of snout, till interocular midline, often yellowish; labia spotted with white; a black facial stripe from nostril to tympanum, across the eye; limbs barred with darker brown; venter yellowish in males and off-white in females, except around the groin and thighs that are pinkish in both sexes; toes 3/4 webbed; mental and gular regions with gray spots; iris golden above, darker below, with a black circular pupil.

Recorded from. Sirumalai hills.

Remarks. Barring the dubious record of an *Indirana* sp. [as “*Indirana leithii*” (sic) after Modak et al., 2014] from Nallamalai hills in Central Eastern Ghats by Srinivasulu and Das (2008), this is the first verified record of the genus *Indirana* outside the Western Ghats proper. Vana et al., (2001) did not record this species in Khandige estate, the only place they surveyed in Sirumalai and we too did not observe this species in the estate region. As this genus currently contains many species complexes (Modak et al., 2014; Nair et al., 2012), the taxonomic status of the Sirumalai population remains unclear.

Reptilia. Squamata. Gekkonidae
***Cnemaspis mysoriensis* (Jerdon, 1853)**

Morphology ($n = 10$). Snout-vent length: 24–26, tail length: 24–25, head length: 6, head width: 4, head depth: 3, body width: 4–5, axilla-groin distance: 12–13, fore limb length: 7, hind limb length: 10. Postmentals separated by one scale; dorsal scales homogenous, flanks with spiny tubercles; ventral scales smooth; preanal pores 2, femoral pores 2–3; 4th toe subdigitals 17–18. Dorsum dark olive with numerous small yellow marblings all over; venter pearly white; chin and gular region often bright yellow; a thin yellow vertebral stripe extending from neck to tail tip often present, especially in young ones; regenerated tail dark mottled brown to pale fleshy pink.

Recorded from. Jawadi hills.

Remarks. This is the first confirmed record of *Cnemaspis mysoriensis* from these hills, as earlier records are only from Bangalore (type locality) and Mysore (Giri et al., 2009). Although the Jawadi hills are closer to the type locality of *C. otai* — Vellore (Das and Bauer,

2000), we are certain that all our sightings are only of *C. mysoriensis*, as we restrained and examined several specimens particularly checking the diagnostic characters. Additionally, the higher elevation and mesic forest settings appear to be an unsuitable habitat for *C. otai* (personal observation; also see Das and Bauer, 2000).

***Cnemaspis yercaudensis* Das et Bauer, 2000**

Morphology ($n = 11$). Snout-vent length: 25–28 (subadult 20), tail length: 30–33 (subadult 18), head length: 8–11, head width: 4–6, head depth: 3–4, body width: 6–9, axilla-groin distance: 12–19 (subadult 9), fore limb length: 5–8, hind limb length: 8–11. Postmentals separated by one scale; flanks without spiny tubercles; 4th toe subdigitals 16–19; preanal pores 2; femoral pores 3 on each thigh; ventral scales smooth. Dorsum dark olive with numerous small yellow marblings all over; venter pearly white; chin and gular region often bright yellow; a thin yellow vertebral stripe extending from neck to tail tip often present, especially in young ones; regenerated tail dark mottled brown to pale fleshy pink.

Recorded from. Shevaroy (type locality) and Kolli hills.

Remarks. This is the first record of this species in Kolli hills, although the genus is known earlier from this range (Daniels and Ishwar, 1994; Daniels and Kumar, 1998; Das and Bauer, 2000; Kumar and Daniels, 1999). The species is peculiar to higher elevations of >1350 m a.s.l. in these hills. Below this elevation range, this species is replaced by another congener (see below).

***Cnemaspis* sp.**

Morphology ($n = 12$). Snout-vent length: 34–40 (juvenile 17), tail length: 49–55 (juvenile 18), head length: 10, head width: 6–7, head depth: 4, body width: 6, axilla-groin distance: 16–20, fore limb length: 9, hind limb length: 10–12. Postmentals separated by one scale; dorsal scales with scattered larger tubercles; preanal pores 3; femoral pores 3–4 on each thigh; ventral scales smooth; 4th toe subdigitals 18–20; tail with whorls of large tubercles. Dorsum greenish brownish to dark ochre with numerous small red, white and black spots on the back; venter dirty white; chin and gular region often yellowish with many thin black radiating streaks from face to neck; a broken series of yellowish white vertebral spots from neck to trunk; tail distinctly annulated with black and white particularly in males; regenerated tail pale pink.

Recorded from. Shevaroy and Kolli hills.

Remarks. This species is widespread in mid elevations (<1350 m a.s.l.) of Shevaroy and Kolli hills. Above

this elevation range, this species is replaced by another congener (*C. yercaudensis*).

***Cnemaspis cf. gracilis* (Beddome, 1870)**

Morphology ($n = 10$). Snout-vent length: 25 – 27, tail length: 34 – 37, head length: 7 – 8, head width: 4, head depth: 3, body width: 5 – 6, axilla-groin distance: 12 – 15, fore limb length: 5 – 7, hind limb length: 7 – 9. Postmentals in contact with each other; dorsal scales heterogeneous, intermixed with large tubercles; flanks with spiny tubercles; preanal pores 2; femorals pores 4 on each thigh; 4th toe subdigitals 19 – 21; tail with whorls of large tubercles. Dorsum dark olive with numerous small yellow blotches all over; venter off white; chin and gular region often bright yellow; tail distinctly banded with black and white annuli in males, sober colored and unpatterned in females.

Recorded from. Sirumalai hills.

Remarks. Vanak et al. (2001) reported this species as *Cnemaspis* sp. The nominotypical species *C. gracilis* is known only from Palghat/Anaiamlai hills in the Western Ghats (Manamendra-Arachchi et al., 2007).

***Cyrtodactylus speciosus* (Beddome, 1870)**

Morphology. Snout-vent length: 39, tail length: 31, head length: 10, head width: 7, head depth: 3, body width: 9, axilla-groin distance: 17, fore limb length: 8, hind limb length: 11. Scales on the back uniform, without any tubercles; ventral scales imbricate; 4th toe subdigitals 19; scales on tail imbricate. Tail short swollen basally, tapering abruptly. Dorsum yellowish brown with four distinct dark blackish brown bands; one on nape, two on trunk and one near tailbase; three or four such bands on tail; head with numerous symmetrical dark rounded spots on crown, labia and chin whitish with black streaks; venter pale brownish white with black spots and random patterns.

Recorded from. Jawadi, Shevaroy and Kolli hills.

Remarks. Agarwal et al., (2014) confirmed the taxonomic status of *Geckoella* to be a subgenus of *Cyrtodactylus*. Agarwal and Karanth (2014) elevated this taxon to a species rank.

***Cyrtodactylus cf. speciosus* (Beddome, 1870)**

Morphology. Snout-vent length: 38, tail length: 34, head length: 12, head width: 8, head depth: 4, body width: 10, axilla-groin distance: 16, fore limb length: 10, hind limb length: 14. Scales on the back uniform, without any tubercles; ventral scales imbricate; 4th toe subdigitals 20; scales on tail imbricate. Tail short swollen basally, tapering abruptly. Dorsum ashy brown with large dark brown elongate ovoid blotches from nape to tailbase, such blotches outlined with black; three or four ragged

bands on tail; head with numerous symmetrical dark rounded spots on crown, labia and chin whitish with black streaks; venter pale brownish white with black spots and random patterns.

Recorded from. Sirumalai hills.

Remarks. This is the first record of this genus in Sirumalai, where the previous survey did not record it (Vanak et al., 2001). Agarwal et al., (2014) confirmed the taxonomic status of *Geckoella* to be a subgenus of *Cyrtodactylus*.

***Hemidactylus frenatus* Schlegel, 1836**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Hemidactylus cf. brookii* Gray, 1845**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

Hemidactylus graniticolus

Agarwal, Giri et Bauer, 2011

Morphology ($n = 12$). Snout-vent length: 105 – 112 (juvenile 27), tail length: 128 – 135 (juvenile 28), head length: 25 – 29, head width: 20 – 22, head depth: 10 – 12, body width: 23 – 27, axilla-groin distance: 51 – 55, fore limb length: 22 – 26, hind limb length: 30 – 35. Dorsal scales heavily pustular and tuberculate, but those on tail less developed; postmentals in 2 pairs; femoral pores 24 – 27, separated medially by 2 – 3 poreless scales; 4th toe subdigitals 12 – 13, divided. Dorsum fawn brown to ashy gray with large dark brown spots on the tubercles, forming a reticulated pattern; venter yellowish white; pure white in young ones; limbs barred with darker shade; iris brown with a black slit-like pupil.

Recorded from. Jawadi, Shevaroy and Kolli hills.

Remarks. In Sirumalai, this species is apparently replaced by *H. cf. acanthopholis*.

Hemidactylus cf. acanthopholis

Mirza et Sanap, 2014

Morphology ($n = 10$). Snout-vent length: 79 – 92, tail length: 85 – 99, head length: 20 – 25, head width: 13 – 18, head depth: 9 – 13, body width: 15 – 19, axilla-groin distance: 40 – 47, fore limb length: 25 – 32, hind limb length: 33 – 39. Dorsal scales heavily pustular and tuberculate, including those on tail; postmentals in two pairs, anterior larger; femoral pores 20 on each thigh, separated medially by 10 – 12 poreless scales; 4th toe subdigitals 11 – 12, divided. Dorsum fawn brown with large dark brown spots on the tubercles, forming a reticulated pattern; venter ashy white; pure white in young ones; limbs barred with darker shade; iris brown with a black slit-like pupil.

Recorded from. Sirumalai hills.

Remarks. Nominotypical species *Hemidactylus acanthophilis* is so far known only from dry, rocky, low-elevation, eastern slopes of Agasthyamalais in the far south of the peninsula (Mirza and Sanap, 2014). It is likely that this taxon was mentioned by Vanak et al., (2001) as *Hemidactylus prashadi*.

***Hemiphyllodactylus aurantiacus* (Beddome, 1870)**

Morphology ($n = 18$). Snout-vent length: 30 – 40, tail length: 23 – 32, head length: 8 – 9, head width: 6, head depth: 3, body width: 5 – 7 (gravid 9), axilla-groin distance: 18 – 24 fore limb length: 4 – 7, hind limb length: 5 – 8. Skin smooth and brittle; tail short swollen basally, tapering abruptly; postmentals broken-up, not discernible from gular scales; femoral pores 6 – 8 on each thigh; preanal pores 10 – 12; 4th toe subdigitals 6. Dorsum pale fleshy pink, with wavy dark brown alternate longitudinal bands across; venter dirty white with minute brown speckles; tail distinctly orange, dorsally with wavy dark and light annuli, ventrally bright orange; iris fawn brown with black, vertical slit-like pupil.

Recorded from. All the four hill ranges.

Remarks. First described from Shevaroy hills, later, apart from reports in Western Ghats, this species was recorded from Kolli hills (Daniels and Kumar, 1998; Kumar and Daniels, 1999) and also Sirumalai hills (Vanak et al., 2001) and more recently from Yelagiri, a part of Jawadi hill complex (Aengals, 2013). Bauer and Das (1999) based on a study of topotypical specimens raised this taxon to specific rank.

***Calodactylodes aureus* (Bedome, 1870)**

Morphology ($n = 5$). Snout-vent length: 66 – 72, tail length: 75 – 91, head length: 17 – 21, head width: 11 – 13, head depth: 8 – 10, body width: 9 – 12, axilla-groin distance: 39 – 44, fore limb length: 27 – 32, hind limb length: 38 – 43. Postmentals broken-up, not discernible from gular scales; dorsal and ventral scales smooth; scales on back scattered with some larger scales; subcaudal scales larger than those on top of tail; digits with double (except innermost that has one) series of trapezoidal expansions on either side; 4th toe subdigitals 10 – 12. Dorsum fawn brown to ashy gray with obscure large dark brown blotches and ragged bands, forming a reticulated pattern, in breeding males dorsal body and throat turn to bright golden yellow; venter yellowish white in breeding males, dirty white in females and young ones; limbs barred with darker shade; iris brown with a black slit-like pupil.

Recorded from. Jawadi hills.

Agamidae

***Calotes calotes* (Linnaeus, 1758)**

Morphology ($n = 13$). Snout-vent length: 80 – 127 (juvenile 33), tail length: 325 – 450 (juvenile 92), head length: 22 – 32, head width: 18 – 23, head depth: 15 – 19 body width: 20 – 24, axilla-groin distance: 40 – 70 (juvenile 18), fore limb length: 28 – 44, hind limb length: 43 – 68. Scalerows 32 – 34, strongly imbricate; ventral and caudal scales larger, orienting posterodorsally distinctly keeled; crest well-developed, supratympanic spines evident, particularly in adult males; 4th toe subdigitals 25 – 29. Dorsum verdant green with 4 – 5 white transverse bars across; venter pale green; adult males in nuptial season sporting scarlet red head and blue cheeks; tail proximally green gradually turning to brown distally, with white cross bars; iris light brown with black circular pupil. Inside of mouth dark gray.

Recorded from. All the four hill ranges.

Remarks. This is the first precise record of this species in Jawadi hills, although earlier works (Daniels and Ishwar, 1998; Kalaiarasan and Kannan, 1994) recorded it from nearby areas.

***Calotes rouxii* Duméril et Bibron, 1837**

Morphology ($n = 8$). Snout-vent length: 36 – 73 (subadult 25), tail length: 82 – 180 (subadult 55), head length: 12 – 22, head width: 8 – 13, head depth: 5 – 10, body width: 9 – 12, axilla-groin distance: 21 – 42 (subadult 15), fore limb length: 12 – 23, hind limb length: 18 – 34. Scalerows 55 – 59, scales rather small, keeled, orienting posterodorsally, subcaudal scales distinctly enlarged, more so in adult males; 4th toe subdigitals 34 – 37; dorsum brownish drab gray; limbs brownish above, pale whitish below; tail pale brown with obscure ragged bands; venter of a light gray, blackish near the gular and subtympanic regions; distinct black antehumeral fold visible in all age groups and both sexes; adult males in breeding season sporting a red head and black trunk; iris fawn brown with black circular pupil.

Recorded from. Jawadi and Shevaroy hills.

Remarks. This is the first precise record of this species in Jawadi hills, although earlier works (Daniels and Ishwar, 1998) recorded it from nearby areas.

***Calotes versicolor* (Daudin, 1802)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

Remarks. This taxon is a species complex pending revision (Somaweera and Somaweera, 2009).

***Draco dussumierii* Duméril et Bibron, 1837**

Morphology ($n = 3$). Snout-vent length: 100, tail length: 150, head length: 18, head width: 12, head depth:

8, body width: 12, axilla-groin distance: 50, fore limb length: 27, hind limb length: 30, patagium length: 56, patagium width: 40, supporting ribs: 6 (palpable). Skin covered with strongly keeled scales, spiny projections on tail; upper and lower labials 10 – 11; 4th toe subdigitals 22 – 26; dorsum fawn brown with a series of rhomboid marks vertebraally; reddish or yellowish streaks laterally; venter yellow with random blackish spots and a black outer rim under patagia; gular region distinctly fluorescent yellow with numerous brown speckles; a black collar-ring below adjacent to gular appendage; tail of a duller intensity of the same color; iris yellow with a black circular pupil.

Recorded from. Kolli and Sirumalai hills.

Remarks. Although earlier mentioned in checklists of Kolli hills (Kumar and Daniels, 1999) and of Sirumalais (Vanak et al., 2001), the occurrence of this species in Eastern Ghats had remained doubtful by some (Das, 2002; Srinivasulu and Das, 2008) but not all authors (Daniel, 2002; Balachandran and Pittie, 2000). Considering its lack of sightings in Jawadi and Shevaroys in our study, we do not comment here about the identity of Tirumala range population further north (see Balachandran and Pittie, 2000; Srinivasulu and Das, 2008). But the morphology of Kolli and Sirumalai hills population agree with literature (Smith, 1935; Das, 2002).

***Psammodromus blanfordianus* (Stoliczka, 1871)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Psammodromus dorsalis* (Gray in Griffith et Pidgeon, 1831)**

Morphology. Specimens typical of the species.

Recorded from. Jawadi, Shevaroys and Kolli hills.

Remarks. Vanak et al. (2001) also did not mention this species in Sirumalai hills.

Scincidae

***Eutropis allapallensis* (Schmidt, 1925)**

Morphology (*n* = 8). Snout-vent length: 43 – 53 (juvenile 23, subadult 30), tail length: 45 – 65 (juvenile 22, subadult 37), head length: 7 – 10, head width: 6 – 7, head depth: 4 – 6, body width: 10 – 16 (21, gravid), axilla-groin distance: 27 – 32 (juvenile 14, subadult 18), fore limb length: 9 – 10, hind limb length: 10 – 12. Supranasals separated or rarely just touching each other; postnasal present or absent; frontoparietals entire; scalerows 28 – 30, multicarinate dorsally; 4th toe subdigitals 13 – 16. Brown above, laterally black with numerous yellow spots; venter metallic pale bluish white; breeding males with orange red chin and throat; iris brownish red with a black circular pupil.



Fig. 3. Some range-restricted herpetofauna in the Southern Eastern Ghats, India: a, *Calodactylodes aureus*; b, *Cyrtodactylus* cf. *speciosus*; c, *Hemidactylus* cf. *acanthopholis*; d, *Hemiphyllodactylus aurantiacus*; e, *Calotes rouxii*; f, *Calotes calotes*; g, *Draco dussumierii*; h, *Eutropis beddomii*.

Recorded from. Jawadi, Shevaroys and Kolli hills.

Remarks. This is the first record of this species from the Southern Eastern Ghats as earlier surveys did not record it (Daniels and Ishwar, 1994) or were not categorical in species identification (Kumar and Daniels, 1999).

***Eutropis beddomii* (Jerdon, 1870)**

Morphology. Snout-vent length: 52 – 60 (juveniles 24 – 33, subadult 40), tail length: 65 – 79 (juveniles 38 – 50, subadult 52), head length: 8 – 10, head width: 6 – 8, head depth: 5 – 6, body width: 10, axilla-groin distance: 32 – 37 (juvenile 20 – 28, subadult 30), fore limb length: 7 – 9, hind limb length: 9 – 11. Supranasals in contact with each other; postnasal absent; temporal smooth; frontoparietals divided; scalerows 30 – 32, mildly muticarinate dorsally; 4th toe subdigitals 12 – 16, keeled. Dorsum brownish with multiple black longitudi-

nal stripes from head to tail, prominent in young ones than adults; lateral region black with white stripes above and below; underside yellowish white; iris reddish brown with black circular pupil.

Recorded from. Jawadi, Shevaroy and Kolli hills.

Remarks. This is the first definite record of this species from Jawadi and Kolli hills, as earlier this species was just mentioned as from Salem that is near Shevaroy and all other southern Indian localities were within the Western Ghats (Smith, 1935).

***Eutropis carinata* (Schneider, 1801)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Eutropis macularia* (Blyth, 1853)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

Remarks. This species was dominant in density (personal observation) only in Sirumalai hills, where *E. allapallensis* did not occur. In the other ranges, *E. macularia* was rare in the surveyed elevations when compared to the commoner *E. allapallensis*.

***Lygosoma cf. pruthi* (Sharma, 1977)**

Morphology ($n = 13$). Snout-vent length: 30 – 54 (subadult 26), tail length: 29 – 53 (subadult 27), head length: 5 – 9, head width: 3 – 7, head depth: 2 – 4, body width: 4 – 9, axilla-groin distance: 18 – 34 (subadult 15), snout-axilla distance: 11 – 18, fore limb length: 4 – 8, hindlimb length: 5 – 11, midbody scalerows 24 – 28; supranasals in contact with each other; prefrontal single; interparietal present; frontoparietals divided; nuchals 2 – 3 pairs, elongate; 4th toe subdigitals 13 – 15. Dorsum brown, sometimes with many feeble black longitudinal stripes especially when young; pale pinkish white below; laterally with a dark brown wash; temporal, cheek and labial regions with several dark and white radiating streaks.

Recorded from. All the four hill ranges.

Remarks. This species closely resembles *L. pruthi* (Sharma, 1977) which is described from the Chitteri hills near Shevaroy. However, since *L. pruthi* is very poorly known, we provisionally refer these populations as *Lygosoma cf. pruthi*.

***Lygosoma punctatum* (Gmelin, 1789)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Kaestlea* sp.**

Morphology ($n = 4$). Snout-vent length: 40 – 45, tail length: 80 – 83, head length: 8, head width: 5, head depth: 4, body width: 4 – 5, axilla-groin distance: 25 –

27, distance from snout to fore limb contained: 15, fore limb length: 5 – 6, hind limb length: 7. Frontoparietals 2, midbody scalerows 22; 4th toe subdigitals 15 – 17; supradigital scales entire; loreal + presuboculars 5 – 6 per side; tympanum visibly larger than a lateral body scale; auricular lobules absent; preanals 2, large; vertebral, paravertebral, nuchal and subcaudal scales enlarged. Dorsum light fawn brown with a thin black vertebral stripe from neck to tail base; laterally dark blackish brown from snout tip, face, across temporal, neck, till tail; this region heavy with minute golden yellow speckles all over; venter pearly white; subcaudals and lateral part of tail blue; all scales edged with black, especially ventrally; iris brown with black circular pupil.

Recorded from. Shevaroy hills.

Remarks. The present observation is the first record of this entire genus from outside the Western Ghats (Smith, 1935; Das, 2002; Eremchenko and Das, 2004; Murthy, 1990). This population resembled *K. beddomii* in morphological features and was found only at high elevations of >1500 m a.s.l., in montane cloud forests.

Lacertidae

***Ophisops minor nictans* Arnold, 1989**

Morphology ($n = 6$). Snout-vent length: 38 – 41, tail length: 40 – 45, head length: 10 – 11, head width: 6, head depth: 4 – 5, body width: 7 – 10, axilla-groin distance: 19 – 21, forelimb length: 10 – 14, hindlimb length: 13 – 18. Labials without visible keels; occipitals absent; dorsal scales larger than lateral scales, as large as caudal scales; scalerows 25 – 28; ventral scales enlarged, in 6 – 7 rows across trunk, in 20 – 22 rows along trunk. Dorsum rusty brown to dark brown with black ragged bands; two pairs (a thick dorsolateral pair and a thinner ventrolateral pair) of yellow lateral stripes on either side of trunk from temple to groin; venter white, throat with black spots.

Recorded from. Sirumalai hills.

Remarks. Vanak et al. (2001) also recorded this species in Sirumalai. Curiously, this species was not recorded in Shevaroy that is relatively closer to its type locality, the Kollegal-Cauveryapuram region (Smith, 1935). *Ophisops minor* species complex in peninsular India and Sri Lanka (Das, 2002; Das and De’Silva, 2005) requires taxonomic revision.

Gerrhopilidae

***Gerrhopilus cf. beddomei* (Boulenger, 1890)**

Morphology ($n = 11$). Snout-vent length: 120 – 147, tail length: 5 – 9, head length: 2 – 4, head width: 2 – 3, body width: 3 – 4. Scalerows 18, ventrals 188 – 197, anal 1, subcaudals 7. Scales smooth and shiny all throughout. Overall color fleshy pinkish to dark coffee brown dorsal-

ly, ventrally of a lighter shade, white patches sometimes seen near anal scale and tail tip; black subdermal eye.

Recorded from. All the four hill ranges.

Remarks. This is the first record of the family Gerrhopilidae from the Eastern Ghats, as previous records from Vizagapatnam remained doubtful (Smith, 1943).

Uropeltidae

Uropeltis dindigalensis (Beddome, 1877)

Morphology ($n = 9$). Snout-vent length: 220 – 250 (subadult 125 – 160), tail length: 12 – 17 (subadult 6 – 9), head length: 5 – 8, head width: 4 – 6, head depth: 3 – 5, body width: 5 – 7, tail-shield length: 8 – 11, tail-shield width: 4 – 6, tail-shield depth: 4 – 5. Supralabials: 4, infralabials: 4, scalerows 18:17:15; ventrals, anal 1, subcaudals 8 – 10 pairs; tail shield bulged, oval and notably convex, covered with multicarinate scales. Body scales smooth and glossy. Dorsum dirty yellowish to dark brown with some minute black and yellow speckles, more or less arranged in transverse rows; venter lighter brown heavily spotted with yellow; head and neck with two yellow ventrolateral stripes; tail brown medially, flanked by two yellow stripes that conjoin anteriorly at anal scale; tail shield of a darker shade as that of the dorsum; black subdermal eye.

Recorded from. Sirumalai hills.

Remarks. This species was first described, and is currently definitely known, only from Sirumalai hills. This is the only species of herpetofauna that is definitely endemic to Sirumalai hills. Rajendran (1985) and Vanak et al. (2001) also recorded its presence in Sirumalai. We observed ontogenetic color variation in this species, with subadults (<120 mm total length) being predominantly brownish black with yellow spots, while larger individuals (>180 mm total length) turning golden yellow, with black spots.

Uropeltis ellioti (Gray, 1845)

Morphology ($n = 8$). Snout-vent length: 145 – 250, tail length: 10 – 14, head length: 6 – 9, head width: 5 – 8, body width: 5 – 8, tail-shield length: 6 – 11, tail-shield width: 4 – 7, tail-shield depth: 3 – 5. Supralabials: 4, infralabials: 4, scalerows 19:17:15; ventrals 137 – 153, anal 1, subcaudals 8 – 9 pairs; tail shield bulged, oval and notably convex, covered with multicarinate scales. Body scales smooth and glossy. Dorsum brown with some minute yellow speckles, venter lighter brown heavily spotted with yellow; head and neck with two yellow ventrolateral stripes; tail brown medially flanked by two yellow stripes that conjoin anteriorly at anal scale; tail shield dark brownish gray; black subdermal eye.

Recorded from. Jawadi and Shevaroy hills.



Fig. 4. Some range-restricted herpetofauna in the Southern Eastern Ghats, India: a, *Kaestlea* sp. (dorsum); b, *Kaestlea* sp. (venter); c, *Lygosoma* cf. *pruthi*; d, *Gerrhopilus* cf. *beddomei*; e, *Rhinophis goweri*; f, *Uropeltis* cf. *ceylanica*; g, *Uropeltis shorttii*; h, *Uropeltis ellioti*.

Remarks. Rajendran (1985) recorded this species from Shevaroy hills and, Smith (1943) and Whitaker and Captain (2004) mention its presence in Jawadi hills.

Uropeltis shorttii (Beddome, 1863)

Morphology ($n = 2$). Snout-vent length: 245, tail length: 18, head length: 10, head width: 6, body width: 8; tail-shield length: 11; tail-shield width: 6; tail-shield depth: 5. Supralabials: 4 – 5, infralabials: 4, scalerows 17:17:15; ventrals 150 – 152, anal 1, subcaudals 8 pairs; tail shield distinctly flat, circular, circumscribed and slightly concave, covered with multicarinate scales. Body scales smooth and glossy. Dorsum blackish brown, with alternate series of closely-packed yellow ovoid spots forming cross bands; head and neck with two yellow ventrolateral stripes; venter of a lighter brown alternately spotted with large yellow blotches, both colors equal in extent; tail brown in the middle, flanked by two



Fig. 5. Some range-restricted herpetofauna in the Southern Eastern Ghats, India: a, *Uropeltis dindigalensis*; b, *Dendrelaphis* cf. *chairecos*; c, *Coelognathus helena monticollaris*; d, *Lycodon travancoricus*; e, *Macropisthodon plumbicolor*; f, *Boiga nuchalis*; g, *Calliophis beddomei*; h, *Trimeresurus gramineus*.

yellow stripes that conjoin anteriorly at anal scale; tail shield dark brownish gray; black subdermal eye.

Recorded from. Shevaroy hills.

Remarks. This species was originally described, and is currently known, only from Shevaroy. Also, this is the only species of herpetofauna currently definitely known to be endemic to Shevaroy. As earlier stated, the lizard *Cnemaspis yercaudensis* also occurs in Kolli hills. We found this species only in high elevations (>1300 m a.s.l.), near riverine forest tracts.

Uropeltis cf. *ceylanica* Cuvier, 1829

Morphology ($n = 4$). Snout-vent length: 155 – 225 (juvenile 90), tail length: 10 – 16 (juvenile 5), head length: 7 – 9, head width: 5 – 6, head depth 4, body width: 5 – 6, tail-shield length: 6 – 8, tail-shield width: 4 – 5, tail-shield depth 4 – 5. Supralabials: 4, infralabials:

4, scalerows 17:17:15; ventrals 153 – 158, anal 1, subcaudals 8 – 10 pairs; tail shield distinctly flat, circular, circumscribed, slightly concave, covered with multicarinate scales. Scales smooth and glossy. Dorsum uniform brown, venter lighter brown with alternating yellow blotches such that both colors become equal in extent; tail brown in the middle flanked by two yellow stripes that conjoin anteriorly at the anal scale; tail shield dark brownish gray; black subdermal eye.

Recorded from. Kolli hills.

Remarks. This is the first record of genus *Uropeltis* from Kolli hills (Kumar and Daniels, 1999). Nominotypical species *Uropeltis ceylanica* is known only from the Western Ghats (Rajendran, 1985).

Uropeltis cf. *phipsonii* (Mason, 1888)

Morphology ($n = 2$). Snout-vent length: 195, tail length: 10, head length: 7, head width: 5, body width: 6; tail-shield length: 8, tail-shield width: 5, tail-shield depth: 4. Supralabials: 4, infralabials: 4, scalerows 17:17:15; ventrals 154, anal 1, subcaudals 6 – 7 pairs; tail-shield distinctly flat, circular, circumscribed and notably concave, covered with multicarinate scales. Body scales smooth and slightly glossy. Uniform brownish black above; underside lighter brown with distinct bright yellow spots that may join to form crossbars; subcaudals medially black flanked on both sides by bright yellow; anal scale yellow; tail shield black; black subdermal eye.

Recorded from. Jawadi hills.

Remarks. Apart from *U. ellioti*, ours is the first record of another uropeltid from Jawadi (Whitaker and Captain, 2004). Nominotypical species *Uropeltis phipsonii* is restricted to Northern Western Ghats and records from south India are doubtful (Whitaker and Captain, 2004).

Rhinophis goweri Aengals et Ganesh, 2013

Morphology ($n = 5$). Snout-vent length: 335 (juvenile 115), tail length: 10 (juvenile 5), head length: 12, head width: 8, body width: 10; tail-shield length: 8, tail-shield width: 8, tail-shield depth: 5. Supralabials: 4, infralabials: 4, scalerows 17:17:15; ventrals 189 – 192, anal 1, subcaudals 8 – 9 pairs, tail-shield rugose, keratinized and distinctly circumscribed. Body scales smooth and slightly glossy. Uniform brown above, with very faint, black, wavy, ragged bars evident especially in juveniles; underside bright yellow rarely spotted with minute brown speckles; subcaudals distinctly orange or red; tail shield dark brown; black subdermal eye.

Recorded from. Kolli hills.

Remarks. This work provides the first in life coloration data and illustration of this little-known species and is also the first published record from Kolli hills.

Colubridae***Coelognathus helena monticollaris* (Schulz, 1992)
type II collar mark**

Morphology ($n = 7$). Snout-vent length: 500 – 680, tail length: 140 – 200, head length: 23, head width: 14, head depth 13 – 14, body width: 17. Supralabials: 9 – 10, infralabials: 10, preocular 1, postoculars 3, loreal 1, temporal 2+3, scalerows 23:25:17; ventrals 204 – 228, anal 1, subcaudals 78 – 89 pairs. Dorsum fawn brown with alternating black and white edged ocellated bands from neck to midbody; latter half of body with dark bilateral stripes extending till tail tip. Venter white, anteriorly encircled with those ocellated rings; ventral and subcaudal scales often edged with black; iris orangish brown with a large, black circular pupil.

Recorded from. Shevaroy and Kolli hills.

Remarks. The present observation forms the rediscovery of this species complex from the Eastern Ghats after 150 years, wherein it was only recorded (as *Cynophis malabaricus*) from Denkinicottah and Shevaroy hills by Beddome (1863). This is the first record of this taxon from Kolli hills (Kumar and Daniels, 1999).

***Coelognathus helena monticollaris* (Schulz, 1992)
type III collar mark**

Morphology ($n = 1$). Snout-vent length: 390, tail length: 79 + ? (tail cut), head length: 17, head width: 10, head depth: 5, body width: 10. Supralabials: 9, infralabials: 10, preocular 1, postoculars 3, loreal 1, temporal 2 + 3, scalerows 25; ventrals 236, anal 2, subcaudals 67 + ? pairs (tail cut). Dorsum brown, a distinct large black chevron mark on forehead, converging towards snout; anterior body with 15 black and white ocellated crossbars, the bars arranged alternately, with those on either sides of the trunk just contacting each other; hindbody unbanded, brownish gray with obscure black lateral stripes ventrolaterally iris orangish brown with a large, black circular pupil.

Recorded from. Jawadi hills.

Remarks. Our observation forms the first precise locality record for this morpho-species in Southern Eastern Ghats (Schulz, 1996; Whitaker and Captain, 2004).

Ptyas mucosa

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Dendrelaphis girii* Vogel et Rooijen, 2011**

Morphology ($n = 1$). Snout-vent length: 650, tail length: 380, head length: 23, head width: 12, body width: 16. Supralabials: 9, infralabials: 9, preoculars 1, postoculars 2 – 3, loreal 2, temporal 2 + 3 + 3, scalerows 15:15:11; ventrals 166, anal 2, subcaudals 142 pairs. Dor-

sum golden brown with wide black eye-streaks, no vertebral stripe; venter pale green, each scale with a brownish border; tongue red.

Recorded from. Sirumalai hills.

Remarks. A paratype originating from Sirumalai (Vogel and Rooijen, 2011), was earlier mentioned as *D. tristis*, instead of either as *D. bifrenalis* or as *D. pictus* complexes (see Vanak et al., 2001).

***Dendrelaphis cf. chairecacos* (Boie, 1827)**

Morphology ($n = 1$, subadult). Snout-vent length: 300, tail length: 140, head length: 10, head width: 6, head depth: 4, body width: 5. Supralabials: 9, infralabials: 9, preoculars 1, postoculars 2, loreal absent, temporal 2 + 2 + 2, scalerows 15:15:9; ventrals 153, anal 2, subcaudals 123 pairs. Dorsum uniform grayish brown, anteriorly with faint traces of yellow streaks on the sides and a few black bars near neck and forebody; venter unpatterned, greenish brown to gray; iris light yellowish brown, with large black circular pupil.

Recorded from. All the four hill ranges; (escaped in Jawadi, Kolli and Sirumalai).

Remarks. Rooijen and Vogel (2009) who reassessed the taxonomic status of this species, noted its distribution mainly from the Western Ghats, but however they included specimens labeled as from “Madras” (i.e., Madras Presidency). Pending a thorough study, we provisionally identify this population as *D. cf. chairecacos*, since they resemble this species, more than *D. tristis*. A subadult examined in Shevaroy, at high elevation (1550 m a.s.l.) open montane grassland did not have loreal scale on both the sides.

***Dendrelaphis* sp.**

Morphology ($n = 2$). Dorsum brown; two white ventrolateral stripes from neck to tail tip; venter yellowish green, unpatterned; no vertebral stripe; forebody with distinct black bars near neck; black postocular streak extending up to temporal region; tongue red.

Recorded from. Jawadi hills.

Remarks. No specimen could be restrained and examined in detail, either live or dead. Superficially resembles the Western Ghats-endemic *D. ashoki*. Pending proper scalation and other morphological data, we here represent this population as *Dendrelaphis* sp.

***Chrysopelea taprobanica* Smith, 1943**

Morphology ($n = 2$). Dorsum light brownish gray, with distinct black cross bars bordered by thin white outline; head black with three to four white transverse bars on forehead, occupying the crown region; venter greenish brown. Dorsal scales slightly keeled, with apical pits, ventral scales distinctly notched.

Recorded from. Jawadi hills.

Remarks. No live individuals could be restrained for scoring complete morphological details. Precise Indian records of *C. taprobanica* are only from Tirumala hills, in the Central Eastern Ghats (Guptha et al., 2015; Somaweera et al., 2015). Thus, our find in Jawadi represents an additional, although not unlikely, record of this species in Indian peninsula.

***Lycodon travancoricus* (Beddome, 1871)**

Morphology ($n = 21$). Snout-vent length: 320 – 420 (juvenile 210 – 270), tail length: 75 – 100 (juvenile 40 – 65), head length: 12 – 15, head width: 8 – 11, head depth: 4 – 5, body width: 9 – 11. Supralabials: 9, infralabials: 8 – 9, preoculars 1, postoculars 2, loreal 1, temporal 2 + 3, scalerows 17:17:15; ventrals 185 – 192, anal 1, subcaudals 68 – 72 pairs. Dorsum black with white alternate cross bands; venter pure white; iris and pupil indistinguishably black.

Recorded from. All the four hill ranges.

Remarks. This is the first definite record of this species from several hills in the Southern Eastern Ghats (Daniels and Ishwar, 1994; Kumar and Daniels, 1999; Vanak et al., 2001) apart from a historical record in South Arcot, that is near Jawadi, one of the four studied hill ranges (Whitaker and Captain, 2004).

***Amphiesma stolatum* (Linnaeus, 1758)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Macropisthodon plumbicolor* (Cantor, 1839)**

Morphology ($n = 5$). Snout-vent length: 470 (juvenile 240), tail length: 110 (juvenile 55), head length: 27, head width: 21, body width: 25. Supralabials 8, 9, infralabials 8, preoculars 2, postoculars 3 – 4, loreal 1, temporal 2 + 3, scalerows 23 – 25:25 – 27:17 – 19; ventrals 153, anal 2, subcaudals 46 pairs. Dorsum grass green, with, in young, a yellowish orange V-shaped nuchal collar converging towards snout, followed by thin black crossbands (obscure or absent in adults); venter pearly white; iris greenish with a black circular pupil.

Recorded from. All the four hill ranges.

***Xenochrophis piscator* (Schneider, 1799)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Ahaetulla nasuta* (Bonnaterre, 1790)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

***Boiga nuchalis* (Günther, 1875)**

Morphology ($n = 7$). Snout-vent length: 475 – 610 (juvenile 240), tail length: 95 – 150 (juvenile 50), head length: 13 – 17, head width: 9 – 11, head depth: 4 – 6, body width: 8 – 9. Supralabials: 8, infralabials: 8, preoculars 1, postoculars 2, loreal 1, temporal 2 + 3 + 3, scalerows 21:21:17, ventrals 224 – 246, anal 1, subcaudals 92 – 113 pairs. Dorsum light brown with many dark maroon colored crossbars, the first one at the neck/collar; venter pale pinkish white, powdered heavily with minute brown dots; iris fawn brown with a dark black elliptical slit-like pupil.

Recorded from. Sirumalai, Kolli and Shevaroy hills.

Remarks. This is the first definite record of *B. nuchalis* from Southern Eastern Ghats. Mention of this species from Northern Eastern Ghats has been proved to be erroneous (Mohapatra et al., 2009; Das et al., 2010).

***Boiga forsteri* (Duméril, Bibron et Duméril, 1854)**

Morphology ($n = 4$, subadults). Snout-vent length: 400 – 1230, tail length: 100 – 190, head length: 20 – 60, head width: 16 – 45, head width: 12 – 39, body width: 14 – 47. Supralabials: 8, 9, infralabials: 8, preoculars 1, postoculars 2, loreal 1, temporal 3 + 3, scalerows 25:27:17; ventrals 248 – 255, anal 2, subcaudals 110 – 114 pairs. Dorsum either grayish black or fawn brown with distinct ragged bands of the same color intermixed with white rhomboid blotches; venter pale white, checkered with similar color as of dorsum; iris fawn brown with a dark black elliptical slit-like pupil.

Recorded from. All the four hill ranges.

Remarks. Following Kumar and Daniels (1999) mention in Kolli hills, the present observation is the first definite record of this species from many sites in the Southern Eastern Ghats (Whitaker and Captain, 2004), although known from more northern parts of Eastern Ghats (Rao et al., 2005; Srinivasulu and Das, 2008; Mohapatra et al., 2009).

Elapidae

***Bungarus caeruleus* (Schneider, 1801)**

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

Remarks. The band pattern of adults and young ones, including those from Sirumalai hills, matched that of Das (2002) account on Vadanemelli (east coast) populations.

***Calliophis beddomei* Smith, 1943**

Morphology ($n = 1$). Snout-vent length: 480, tail length: 50, head length: 9, head width: 6, body width: 5. Supralabials: 8, infralabials: 8, preoculars 1, postoculars 2, temporal 2 + 2, scalerows 13:13:13; ventrals 210, anal

2, subcaudals 33 pairs. Dorsum bluish black with a series of two paravertebral obscure white-edged black spots from neck to tail; neck with a chevron shaped alternate white and black markings; venter bright coral red; subcaudal of the same color, medially separated by a white interspace; iris dark black.

Recorded from. Shevaroy (type locality) and Kolli hills.

Remarks. This is the first record of this species from Kolli hills, although the genus was known from this region earlier (Kumar and Daniels, 1999).

Calliophis nigrescens pentalineatus Beddome, 1877

Morphology ($n = 1$). Snout-vent length: 500, tail length: 60, head length: 9, head width: 6, body width: 5. Supralabials: 8, infralabials: 7, preoculars 1, postoculars 2, temporal 2 + 2, scalerows 13:13:13; ventrals 244, anal 2, subcaudals 38 pairs. Dorsum light orange to brown with a series of five, two lateral, two paravertebral and one vertebral white-edged black stripe from neck to cloacal region; tail with three such stripes, one vertebral flanked on both sides by a single similar stripe till the tip; neck with a chevron shaped alternate white and black markings; venter bright coral red; subcaudal of the same color, medially separated by a white interspace; iris dark black.

Recorded from. Sirumalai hills.

Remarks. Not mentioned from Sirumalai hills by Smith (1943) and Vanak et al. (2001). But Rajendran (1985) in his accounts on *Uropeltis dindigalensis* mentioned it from Sirumalai.

Naja naja (Linnaeus, 1758)

Morphology. Specimens typical of the species.

Recorded from. All the four hill ranges.

Viperidae

Trimeresurus gramineus (Shaw, 1802)

Morphology ($n = 5$). Snout-vent length: 370 – 520, tail length: 80 – 110, head length: 20 – 27, head width: 14 – 18, head depth: 7 – 10, body width: 8 – 15. Supralabials: 12, infralabials: 12, supraoculars entire, intersupraoculars 9 – 11; scalerows 21:21:15 – 17; ventrals 163 – 168 anal 1, subcaudals 70 – 77 pairs. Dorsum pale bluish green with a series of dark brown to gray diamond-shaped pattern vertebraally; venter pale greenish or yellowish white, unpatterned medially, but with bluish-green squared spots present ventrolaterally; tail tip often bluish; iris mild greenish yellow with a black, vertical, slit-like elliptical pupil.

Recorded from. All the four hill ranges.

Remarks. This species has been reported from all the studied hill ranges (Smith, 1943; Gumprecht et al., 2004;

Vanak et al., 2001; Whitaker and Captain, 2004) except Kolli hills where it was identified only up to genus level (Kumar and Daniels, 1999). This is the only pitviper species occurring in this whole landscape, even at the highest of elevations, up to 1550 m a.s.l. in Shevaroy. Therefore we advocate excluding the dubious records of other species of pitvipers from Shevaroy and Kolli hills given by Smith (1943) and Kumar and Daniels (1999) respectively (also see Vogel, 2006).

DISCUSSIONS

To the best of our knowledge, this is the first comprehensive, long-term inventory of Southern Eastern Ghats herpetofauna. Among the previous studies, the most comprehensive area-coverage was by Daniels and Ishwar (1994) who briefly surveyed many grid-based, select localities including Mettur, Javadi, Yercaud, Kolli, Kurnagiri, Kalrayanmalai, Amirti, Walajapet, Palar/Chengelpet, Rajampalayam, Vedanthangal, Gingee, Chembarambakkam, Thiruporur, Tirukalikundram, Cheyyur, Vadane-melli for a total of 167 man-h. However, the majority of survey duration (50 h, i.e., ca. 30%) was spent in Vadane-melli (5 m a.s.l.) which is actually in the Eastern Coastal Plains and not in the Eastern Ghats at all. Thus, unfortunately, their study was apparently of limited sampling duration in habitats that starkly differ from the surrounding plains. Consequently their species records were meager and did not give a complete representation of the region's herpetofauna.

Subsequently the study in Kolli hills by Daniels and Kumar (1998) and Kumar and Daniels (1999) were much better and did focus on wet forests. As earlier stated, theirs is perhaps the first ever herpetological study in Kolli hills. Unfortunately, their study did not provide morphological data and vouchers to explicitly substantiate their records of range-restricted taxa such as *Philautus* (sic), *Hylarana*, *Hemiphyllo-dactylus*, *Cnemaspis*, *Draco*, and *Hypnale* with better evidence. Hence, due to insufficient details and evidence many of their records were not considered by other subsequent authors (e.g., Das, 2002). The study in Sirumalai by Vanak et al. (2001) involving a bioinventory of an estate is perhaps the only herpetological study from Sirumalai apart from sporadic notes on a few snakes by Rajendran (1985). Indeed, Vanak et al., 's work even had specimen-collection components which we could not carry out in the present study. However, we opine that owing to its incompleteness that is inevitable in such short-term works, it still remains an unpublished report. Nevertheless, these studies do piece together some body of data and novelties for this region.

Considering the aforementioned facts, the present work now represents the first comprehensive, long-term herpetological study in the Southern Eastern Ghats. For each hill range our study presents several first precise records that are summarized here. Jawadi hills, 12 new records: 2 species of frogs (*Microhyla* cf. *sholigari*, *Sphaerotheca* cf. *dobsonii*), 6 species of lizards (*Calotes calotes*, *C. rouxii*, *Cyrtodactylus speciosus*, *Lygosoma* cf. *pruthi*, *Eutropis allapallensis*, *E. beddomei*) and 5 species of snakes (*Gerrhopilus* cf. *beddomei*, *Uropeltis* cf. *phipsonii*, *Coelognathus helena monticollaris*, *Chrysopelea taprobanica*, *Boiga forsteni*); Shevaroy hills, 5 new records: 2 species of lizards (*Lygosoma* cf. *pruthi*, *Kaestlea* sp.), 3 species of snakes (*Gerrhopilus* cf. *beddomei*, *Lycodon travancoricus*, *Boiga nuchalis*); Kolli hills, 10 new records: 1 species of frog (*Fejervarya* cf. *nilagrica*), 3 species of lizards (*Lygosoma* sp., *Eutropis allapallensis*, *E. beddomei*) and 6 species of snakes (*Uropeltis* cf. *ceylanica*, *Rhinophis goweri*, *Coelognathus helena monticollaris*, *Lycodon travancoricus*, *Boiga nuchalis*, *Calliophis beddomei*); Sirumalai hills, 5 new records: 1 species of frog (*Indirana* sp.), 1 species of lizard (*Cyrtodactylus* cf. *speciosus*) and 3 species of snakes (*Lycodon travancoricus*, *Boiga nuchalis*, *B. forsteni*).

Thus, our survey resulted in a total of 32 (51%) new records, almost half of the total no. of species ($n = 62$) we recorded in hill-tops of these four hill ranges. Although some of our new distributional records may not be unexpected, noteworthy findings do exist, like the new reports of genera such as *Kaestlea* and *Indirana* from these hills. Additionally, this survey also paved way for our advocacy to exclude some unsubstantiated, often historical, “records” of certain species in the Southern Eastern Ghats. These include the frog *Ramanella triangularis*, the coral snake *Calliophis nigrescens* and the pitvipers *T. malabaricus*, *T. macrolepis*, and *T. strigatus* from Shevaroy (after Dutta, 1997; Smith, 1943), the pitviper *Hypnale hypnale* from Kolli (after Daniels and Kumar, 1998; Kumar and Daniels, 1999), the skink *Ristella guentheri* and the shieldtail *Uropeltis broughami* from Sirumalai (after Smith, 1935; 1943), all of which are, as currently understood, endemic to the Western Ghats (Aengals et al., 2011; Annandale, 1909; Biju, 2001; Roux, 1928; Vogel, 2006).

When the entire landscape inclusive of foot-hills and immediate plains were considered, the species richness would be higher, while the proportion of endemism getting lower. However, even though our elevational restriction imposed exclusion of widespread species from our data set, it was deliberately kept so to make it practical for us to focus on range-restricted taxa. For example, in a previous study (Daniels and Ishwar, 1994), fieldwork in places unnecessary for a survey of Southern Eastern

Ghats, like Vadanemelli, had, sadly, consumed the time, which, had it been spent more in Yercaud for example, could have revealed unreported endemics, as exemplified by our find of *Kaestlea* there. It is such cumulative additions of novel findings that have really enriched our knowledge of this regions” herpetofauna, adding on to/revising considerably the previous findings (Aengals and Murthy, 2008; Daniels and Kumar, 1998; Ishwar and Daniels, 1994; Kumar and Daniels, 1999; Vanak et al., 2001).

CAVEATS AND SUGGESTED RECOURSE

A few observations and records made in the present study on some range-restricted montane taxa require further taxonomic resolution. This is at least partly due to the want of collection permits and the consequent dependence solely on photo-documentation and field diagnostic data. However, to the best extent possible, although many taxa were mentioned here with a cf. prefix, we exercised due care to identify and characterize potential species-level taxa in line with suggestions made by recent literature (e.g., Biju and Bossuyt, 2009; Manamendra-Arachchi et al., 2007) regardless of the prevailing taxonomic rank of the associated nomina used. We believe that our judicious taxon representations will alleviate the underestimation of herpetological diversity of these hill ranges, at the same time not artificially inflating it. Additionally, as most of the unresolved genera such as *Raorchestes*, *Cnemaspis*, and *Uropeltis* still remain problematic in the Western Ghats, where they are much more diverse (Aengals et al., 2011; Das, 1996, 2002; Dutta, 1997; Biju, 2001), works on Southern Eastern Ghats congeners must either include or first await revision of Western Ghats congeners (e.g., Agarwal and Karanth, 2014; Biju et al., 2014). We recommend future studies be oriented in these directions as identified by us, to better understand the endemism and hence the conservational significance of the Southern Eastern Ghats and its herpetofauna.

Acknowledgments. We thank the Tamil Nadu Forest Department for granting permission to conduct field work in forest areas and for their local logistic support provided. We are deeply grateful to the Executive Chairman and all other officers of the Chennai Snake Park Trust for their generous support and encouragements provided. We record our thanks to the staff and lab members of the Dept. of Zoology, University of Madras for all their help and encouragements provided and the anonymous referees for their lucid comments on the manuscript.

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