Three new cryptic species of South Asian Cnemaspis Strauch, 1887 (Squamata, Gekkonidae) from Karnataka, India

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Abstract

We describe three new small-bodied, cryptic species of south Asian Cnemaspis belonging to the mysoriensis and goaensis clades from the Mysore Plateau and the Western Ghats biodiversity hotspot in Karnataka, peninsular India; and provide a key to members of each clade, besides providing the first ND2 sequence data for C. ranganaensis. Cnemaspis tigris sp. nov. from Kaiwara in Karnataka is a member of the mysoriensis clade and can be morphologically distinguished from all six described members of the clade in a number of meristic characters and subtle differences in colouration, beside ≥ 12.1–23.4 % uncorrected pairwise ND2 sequence divergence. Cnemaspis sakleshpurensis sp. nov. from Sakleshpur and C. vijayae sp. nov. from Coorg, both in the Western Ghats of Karnataka, are members of the goaensis clade and are easily diagnosed from all three described members of the clade in meristic characters beside 5.2–14.8 % divergence from described members of the clade and 14.6 % from each other in uncorrected pairwise ND2 sequence divergence. The discovery of these new species from two different clades and biogeographic regions is not surprising, given the steep rise in the number of species of Cnemaspis known from peninsular India. Comprehensive geographic sampling in conjunction with molecular and morphological data is essential to understand the true diversity and distributional ranges of species within this ancient clade of gekkonid lizards.

Keywords

Cnemaspis stellapulvis, dwarf geckos, granite boulders, Mysore plateau, systematics, taxonomy, Western Ghats

Introduction

South Asian Cnemaspis (SAC) is an exceptionally diverse radiation of geckos that originated in the Western Ghats with species distributed in India, Sri Lanka, Myanmar, Thailand, Sumatra and associated islands off its west coast (Iskandar et al. 2017; Lee et al. 2019; Agarwal et al. 2020a, 2020c, 2021a; Amarasinghe et al. 2021; Karunarathna et al. 2021; Khandekar et al. 2021a). Considered part of the paraphyletic gekkonid genus Cnemaspis Strauch, 1887 (Grismer et al. 2014), this is the oldest extant Indian squamate clade with its most recent common ancestor dating back to ~62 million years ago (Agarwal et al. 2020c; Pal et al. 2021) and is represented by more than 100 species with over 50 % of its diversity restricted to India (68 species) followed by Sri Lanka (40 species) (Am-
Materials and methods

Taxon sampling

Specimen sampling, processing and tissue collections of the new species were done following Khandekar et al. (2020a; Fig. 1). Specimens are deposited in the Museum and Research Collection Facility at National Centre for Biological Sciences, Bengaluru (NRC-AA) and Bombay Natural History Society, Mumbai (BNHS).

Morphological and meristic data

Morphological data were collected from a total of 13 specimens of the new species. Comparative morphological data of all other members of the mysoriensis clade were obtained from Khandekar et al. (2020a) and for the goaensis clade from Khandekar et al. (2019a, 2021b), and Sayyed and Sulakhe (2020). Counts and measurements were taken under a ZEISS Stemi 305 stereo dissecting microscope and on the right side of the body where possible. Colour pattern was recorded from photographs taken in life. All measurements were taken with a Mitutoyo digital vernier calliper (to the nearest 0.1 mm). We follow Agarwal et al. (2020c) for body size categories for South Asian Cnemaspis; mensural, meristic and additional morphological character states evaluation in accordance with Khandekar et al. (2019a, 2021b): snout vent length (SVL), axilla to groin length (AGL), body height (BH), body width (BW), forearm length (FL), crus length (CL), tail length (TL), tail width (TW), head length (HL), head width (HW), head depth (HD), eye diameter (ED), eye to nares distance (EN), eye to snout distance (ES), eye to ear distance (EE), ear length (EL), internarial distance (IN), interorbital distance (IO); meristic data recorded for all specimens were number of supralabials (SL), infralabials (IL), supralabials at midorbital position (SL M), infralabials at midorbital position (IL M), dorsal tubercle rows including longitudinal rows of spine-like scales on lower flank (DTR), paravertebral tubercles (PVT), ventral scales (VS), mid-body scale rows across the belly (MYSR), preocial pores (PP), femoral pores (FP), poreless scales between preoclaoc and femoral pores (SB PP&FP), poreless scales between preocloacal pores (SB PP), postcloacal tubercles (PCT), transverse subdigital lamellae on finger 1 (LamF1), finger 4 (LamF4), toe 1 (LamT1), toe 4 (LamT4), and toe 5 (LamT5).

Figure 1. Map showing our sampling for members of the goaensis (squares) and mysoriensis (triangles) clades. Squares, goaensis clade: light blue (C. amboliensis), dark blue (C. goaensis), pink (C. rangaensis), peach (C. sakleshpurenensis sp. nov.), green (C. vijayae sp. nov.). Triangles, mysoriensis clade, light blue (C. mysoriensis), dark blue (C. avasabinae), pink (C. otai), brown (C. yercaudensis), green (C. rishivalleyensis), red (C. stellapulvis), yellow (C. tigris sp. nov.).
Table 1. List of *Cnemaspis* sequences used in this study. Museum abbreviations are as follows: AA, Rohan Pethiyagoda field series; AMB, Aaron M. Bauer field series; AK, Akshay Khandekar field series; BNHS, Bombay Natural History Society; CES, Centre for Ecological Sciences, Bangalore; NRC-AA, National Centre for Biological Sciences; SB, Sayantan Biswas field series; USNM, United States National Museum; VG, Varad Giri field series.

| Species | Voucher | Locality | GeneBank Accession number |
|---------|---------|----------|---------------------------|
| C. adii | BNHS 2494 | India, Karnataka, Ballari District, Hampi | MT188142 |
| C. agarvali | AK 107 | India, Tamil Nadu, Salem District, Sankari | MK792466 |
| C. amboliensis | VG 393 | India, Maharashtra, Sindhudurg District, Amboli | MK792480 |
| C. amboliensis | VG 394 | India, Maharashtra, Sindhudurg District, Amboli | MK792481 |
| C. cf. assamensis | BNHS 2808 | India, Meghalaya, Ri Bhoi District, Saida | MW3674 |
| C. avasabinae | CES G416 | India, Andhra Pradesh, Nellore District, Penchalakona | MT773207 |
| C. bangara | BNHS 2584 (AK 292) | India, Karnataka, Kolar District, Paparajannahalli | MT188143 |
| C. flaviventralis | VG 354 | India, Maharashtra, Sindhudurg District, Amboli | MK792495 |
| C. gemunu | AMB 7495 | Sri Lanka, Nuwara Eliya District, Hakgala | KY039998 |
| C. goaensis | VG 385 | India, Karnataka, Uttara Kannada District, Gund | MK792475 |
| C. goaensis | VG 388 | India, Karnataka, Uttara Kannada District, Ganeshgudi | MK792476 |
| C. goaensis | VG 399 | India, Maharashtra, Sangli District, KWC Campus | MK792478 |
| C. goaensis | AK 360 | India, Goa, South Goa District, Canacona | MK792479 |
| C. gracilis | CES G385 | India, Kerala, Palakkad District, near Chittur River | MK792465 |
| C. grandidicola | BNHS 2589 (CES L339) | India, Andhra Pradesh, Chittoor District, Horsley hills | MT188145 |
| C. kallima | AA 82 | Sri Lanka, Matale District, Rattota, Gammaduwa | KY039970 |
| C. kolhapurensis | unvouched | India, Maharashtra, Kolhapur District, Dajipur | MK792501 |
| C. koynaensis | CES G349 | India, Maharashtra, Satara District, Humbarli | MK792490 |
| C. magnifica | unvouched | India, Karnataka, Hassan District, Sakleshpur | MK792503 |
| C. monticola | NRC-AA-1112 (AK 942) | India, Kerala, Wayanad District, MS Swaminathan Research Foundation | MWS80955 |
| C. monticola | NRC-AA-1115 (AK 943) | India, Kerala, Wayanad District, MS Swaminathan Research Foundation | MWS80956 |
| C. monticola | NRC-AA-1113 (AK 944) | India, Kerala, Wayanad District, MS Swaminathan Research Foundation | MWS80957 |
| C. monticola | BNHS 2793 (AK 945) | India, Kerala, Wayanad District, MS Swaminathan Research Foundation | MWS80958 |
| C. mysoriensis | unvouched | India, Karnataka, Bangalore Urban District, IISc Campus | MK792474 |
| C. mysoriensis | AK 570 | India, Karnataka, Bangalore Urban District, NCBS Campus | MT773208 |
| C. mysoriensis | AK 676 | India, Karnataka, Mysore District, Hunsur | MT773209 |
| C. mysoriensis | AK 851 | India, Karnataka, Kolar District, Kolar | MT773210 |
| C. mysoriensis | AK 852 | India, Karnataka, Kolar District, Kolar | MT773211 |
| C. mysoriensis | AK 979 | India, Karnataka, Bangalore Rural District, near Thathaguni | MT773212 |
| C. otai | AK668 | India, Tamil Nadu, Vellore district, Vellore Fort | MT188146 |
| C. otai | AK823 | India, Tamil Nadu, Vellore district, Jawadhu Hills | MT773213 |
| C. otai | AK935 | India, Tamil Nadu, Vellore district, Jawadhu Hills | MT773214 |
| C. punctata | AA 80 | Sri Lanka, Matale District, Rattota, Gammaduwa | KY038007 |
| C. ranganaensis | AK R 788 | India, Maharashtra, Kolhapur, Rangana Fort | OM160946 |
| C. richvalleyensis | AK 659 | India, Andhra Pradesh, Chittoor district, Rishi Valley School | MT773218 |
| C. richvalleyensis | AK 660 | India, Andhra Pradesh, Chittoor district, Rishi Valley School | MT773219 |
| C. sakleshparseens sp. nov. | AK 862 (BNHS 2814) | India, Karnataka, Hassan District, Sakleshpur | OK424588 |
| C. sakleshparseens sp. nov. | AK 864 (NRC-AA-1165) | India, Karnataka, Hassan District, Sakleshpur | OK424589 |
| C. schalleri | BNHS 2795 (AK 871) | India, Karnataka, Hassan District, Mookanana resort | MWS80959 |
| C. schalleri | NRC-AA-1116 (AK 872) | India, Karnataka, Hassan District, Mookanana resort | MWS80960 |
| C. cf. schalleri | SB 048 | India, Karnataka, Kodagu District, Kumarakallahi | KY037995 |
| C. cf. schalleri | AK R 829 | India, Karnataka, Kodagu District, Honey Valley Estate | OM160937 |
| C. cf. schalleri | AK R 830 | India, Karnataka, Kodagu District, Honey Valley Estate | OM160938 |
| C. cf. schalleri | AK R 831 | India, Karnataka, Kodagu District, Honey Valley Estate | OM160939 |
| C. cf. schalleri | AK R 832 | India, Karnataka, Kodagu District, Honey Valley Estate | OM160940 |
| C. cf. schalleri | AK R 833 | India, Karnataka, Kodagu District, Honey Valley Estate | OM160941 |
| C. cf. schalleri | AK R 834 | India, Karnataka, Kodagu District, Honey Valley Estate | OM160942 |
| C. cf. schalleri | AK R 835 | India, Karnataka, Kodagu District, Honey Valley Estate | OM160943 |
| C. stellapulvis | AK 846 | India, Karnataka, Mandya District, Yaddyur | MT773215 |
Table 2. Pairwise uncorrected ND2 sequence divergence within the *mysoriensis* clade and the *goaensis* clade, numbers in bold along diagonal represent intraspecific genetic diversity (= indicates only a single sequence available).

| Species               | Voucher  | Locality                                                                 | GeneBank Accession number |
|-----------------------|----------|---------------------------------------------------------------------------|---------------------------|
| *C. stellapulvis*     | AK 847   | India, Karnataka, Mandya District, Yadiyur                               | MT773216                  |
| *C. thayawthadangyi*  | USNM 595052 | Myanmar, Tanintharyi Region, Myeik Archipelago, southeast side of Linn Lune Kyun | MN104950                  |
| *C. tigris sp. nov.*  | AK 884 (NRC-AA-1160) | India, Karnataka, Chickballapur, Kairwara                                | OK424590                  |
| *C. tigris sp. nov.*  | AK 885 (NRC-AA-1159) | India, Karnataka, Chickballapur, Kairwara                                | OK424591                  |
| *C. vijayae sp. nov.* | AK 599 (BNHS 2815) | India, Karnataka, Kodagu District, Honey Valley Estate                   | OK424592                  |
| *C. vijayae sp. nov.* | AK R 836 (NRC-AA-1185) | India, Karnataka, Kodagu District, Honey Valley Estate                   | OM160944                  |
| *C. vijayae sp. nov.* | AK R 839 (NRC-AA-1188) | India, Karnataka, Kodagu District, Honey Valley Estate                   | OM160945                  |
| *C. yercaudensis*     | CES G133 | India, Tamil Nadu, Namakkal District, Kollimalai massif                   | MK792473                  |
| *C. yercaudensis*     | AK 767   | India, Tamil Nadu, Salem District, Yercaud massif                         | MT773217                  |
| *C. sp.*              | SB 151   | India, Kerala, Thrissur District, Athirappilly Falls                     | KY038013                  |

**Molecular data**

Total genomic DNA was extracted from tail or liver samples stored in 100% ethanol using the Qiagen DNeasy Blood & Tissue kit. PCR and sequencing were outsourced to Medauxin (Bangalore, India) and used the Macey et al. (1997) primers L4437 (AAGCTTTCGGGCCCATA CC) and H5934 (AGRGGTCGAATGTCTTTGTGR TT) to PCR amplify the entire ND2 gene + flanking tRNAs with L4437 used to sequence partial fragment of the ND2 gene (up to 1035 nucleotides). Besides the new species described herein, we additionally generated ND2 sequence data for *Cnemaspis ranganaensis* Sayyed and Sulakhe, 2020 as well as some sympatric congeners (Table 1). These sequences were added to an alignment containing published sequences for the *goaensis* and *mysoriensis* clades and representatives of other major SAC clades (after Agarwal et al. 2020c, 2021a) with *C. kolhapurenensis* Giri, Bauer and Gaikwad, 2009 and *C. magnifica* Khandekar, Thackeral, Pal and Agarwal, 2020 used as outgroups (Table 1). Sequence alignment used default settings in ClustalW (Thompson et al. 1994) and % pairwise uncorrected sequence divergence was calculated using the pairwise deletion option in MEGA 5.2 (Tamura et al. 2011). Partitionfinder2 (Lanfear et al. 2012) was used to select the best partitioning scheme and corresponding models of sequence evolution with the greedy algorithm and Bayesian Information Criteria. A Maximum Likelihood (ML) phylogeny was reconstructed using RAxML 8.2.12 (Stamatakis 2006) with 10 independent runs on distinct starting trees, 1000 thorough bootstraps, and the GTR + G model applied on the data partitioned by codon position as implemented on the CIPRES web server (RAxML-HPC2 Workflow on XSEDE; Miller et al. 2010).

**Results**

**Phylogenetic relationships**

ND2 sequences of the new species varied from 472–1047 aligned nucleotides, with a nine base pair insertion in position 455. We recovered the same broad clades for SAC as Agarwal et al. (2020c, 2021a). Within the *mysoriensis* clade, a basal split separates *C. ranganaensis* (Jerdon, 1853) and a sub-clade grouping the remaining species of the clade (Fig. 2). Within this sub-clade are two well-supported sub-clades, the first grouping *C. tigris sp. nov., C. stellapulvis* Khandekar, Thackeral and Agarwal, 2020 and *C. yercaudensis* Das and Bauer,
2000 (pairwise divergence between the three species 12.1–14.5 %) (Table 1); and the second *C. avasabinae* Agarwal, Bauer and Khandekar, 2020 *C. otai* Das and Bauer, 2000 and *C. rishivalleyensis* Agarwal, Thackeray and Khandekar, 2020. Uncorrected pairwise sequence divergence between the new species and other members of the *mysoriensis* clade varies from 12.1–23.4 %. Within the *goaensis* clade, *C. vijayae* sp. nov. is the sister taxon to the rest of the species (pairwise divergence between the new species and the rest of the clade 13.6–14.8 %) while *C. sakleshpurensis* sp. nov. is sister to *C. goaensis* Sharma, 1976 (5.2 % pairwise sequence divergence) and *C. ranganaensis* is the sister taxon to the former two species collectively. We describe the three new species using morphology below.

**Systematics**

*Cnemaspis tigris* sp. nov.

http://zoobank.org/F9CDF6C9-BC5F-40AD-A43F-0DB9EFC881

Figs 3–7A, 16A; Tables 3–5

**Holotype.** NRC-AA-1159 (AK 885), adult male, from near Kaiwara (13.3469°N, 77.9811°E; elevation ca. 910 m), Chickballapur district, Karnataka state, India, collected by Akshay Khandekar, Swapnil Pawar and Vaibhav Patil, on 7th June 2019.

Figure 2. Maximum likelihood phylogeny of South Asian *Cnemaspis* based on the mitochondrial ND2 gene. Bootstrap support >70 shown at nodes and the *goaensis* and *mysoriensis* clades are marked.
Paratypes. NRC-AA-1160 (AK 884), BNHS 2809 (AK 886), and BNHS 2810 (AK 887), adult males, BNHS 2811 (AK 888), adult female, same collection data as holotype.

Etymology. The specific epithet is the Latin *tigris* (tiger), treated here as a noun in apposition, referencing the tiger-like colour pattern in males of the new species with a strongly banded dorsum suffused with yellow.

Suggested Common Name. Tiger dwarf gecko or Kaiwara dwarf gecko.

**Diagnosis.** A small-sized *Cnemaspis*, snout to vent length less than 32 mm (*n*=5). Dorsal pholidosis heterogeneous; weakly keeled, granular scales in the vertebral and paravertebral region with a few scattered enlarged keeled tubercles, intermixed with about three irregularly arranged rows of large, weakly keeled tubercles on each side of flank, tubercles in lowest row largest, spine-like; six rows of dorsal tubercles; ventral scales smooth, imbricate, 23–25 scales across belly, 91–107 longitudinal scales from mental to cloaca; subdigital scanners smooth, entire, unnotched; nine or 10 lamellae under digit I of manus and 9–11 lamellae under digit I of pes, 15–17 lamellae under...
digit IV of manus and 17–21 lamellae under digit IV of
pes; males \(n=4/5\) with two femoral pores on each thigh
separated on either side by 6–9 poreless scales from a
continuous series of two (rarely three, \(n=1/4\)) precoa-
cal pores; tail with enlarged, strongly keeled, distinctly
pointed, conical tubercles forming whorls; a median row
of sub-caudals smooth, slightly enlarged. Dorsal colour-
ation grey-brown; continuous light brown mid-dorsal
streak runs from occiput to tail base, a single medial dark
ocellus on mid-dorsal streak just anterior to forelimb in-

Figure 4. Cnemaspis tigris sp. nov. (holotype, NRC-AA-1159): A dorsal view of head, B ventral view of head, C right side lateral
view of head, D view of cloacal region showing femoral and precoacal pores, E ventral view of left manus, and F ventral view of
left pes. Scale bars 5 mm; photos by Akshay Khandekar and Satpal Gangalmale.
sertions; five or six yellow-orange elongate blotches on dorsum, original tail with indistinct bands.

**Comparison with members of C. myorsiensis clade.** *Cnemaspis tigris* sp. nov. can be distinguished from all other six members of the *myorsiensis* clade on the basis of the following differing or non-overlapping characters: males with two femoral pores on each thigh, separated on either side by 6–9 poreless scales from two (rarely three) continuous precloacal pores (*versus* femoral pores absent, continuous series of 2–5 precloacal pores in *C. avasabinae*; three femoral pores on each thigh, separated by nine or ten poreless scales from continuous series of four precloacal pores in *C. otai*; a single femoral pore on each thigh, separated by ten poreless scales from continuous series of three precloacal pores in *C. rishivalleyensis*; three femoral pores on each thigh, separated by five or six poreless scales from two continuous precloacal pores in *C. yercaudensis*); six rows of dorsal tubercles at mid-body (*versus* dorsal tubercles irregularly arranged at mid-body in *C. avasabinae*; 7–10 rows of dorsal tubercles at mid-body in *C. stellapulvis*); 23–25 ventral scales across belly at mid-body (*versus* 17–20 ventral scales across belly at mid-body in *C. avasabinae*; 18 ventral scales across belly at mid-body in *C. stellapulvis*; 18–20 ventral scales across belly at mid-body in *C. yercaudensis*); spine-like tubercles present on flank (*versus* spine-like tubercles absent on flank in *C. avasabinae*); a single distinct black dorsal ocellus on mid-dorsal streak just anterior to forelimb insertions (*versus* distinct black dorsal ocellus absent just anterior to forelimb insertions in *C. myorsiensis* and *C. yercaudensis*); a continuous light mid-dorsal streak runs from occiput onto tail base (*versus* a light mid-dorsal streak formed by seven fused, elongate chain-links that runs from occiput to tail base in *C. otai* and *C. rishivalleyensis*).

**Table 3.** Mensural (mm) data for the type series of the new species. Abbreviations are listed in Materials and Methods; * = tail incomplete.

| Clade          | mysoriensis                      | goaensis                      |
|----------------|----------------------------------|-------------------------------|
| Species        |                                  |                               |
|                |                                  |                               |
|                | *C. tigris* sp. nov.             | *C. sakleshpurenisis* sp. nov.|
| Type           | Holotype                         | Paratypes                     |
|                | NRC-AA-1159                      | NRC-AA-1160                   |
|                | BNHS 2809                        | BNHS 2810                     |
|                | BNHS 2811                        | BNHS 2814                     |
|                | NRC-AA-1164                      | NRC-AA-1165                   |
| Sex            | Male                             | Male                          |
|                | Male                             | Female                        |
|                | Male                             | Female                        |
|                | Male                             | Female                        |
| Specimen number| NRC-AA-1159                      | NRC-AA-1160                   |
|                | BNHS 2809                        | BNHS 2810                     |
|                | BNHS 2811                        | BNHS 2814                     |
|                | NRC-AA-1164                      | NRC-AA-1165                   |
| SVL            | 30.9                             | 31.0                          |
|                | 28.5                             | 27                            |
|                | 27                               | 24.7                          |
|                | 31.8                             | 23.7                          |
| TW             | 2.5                              | 3.1                           |
|                | 2.5                              | 3.8                           |
|                | 3.8                              | 4.2                           |
|                | 4.2                              | 5.7                           |
| LAL            | 4.0                              | 4.4                           |
|                | 4.2                              | 4.5                           |
|                | 4.5                              | 4.2                           |
|                | 5.7                              | 3.6                           |
| CL             | 5.2                              | 5.6                           |
|                | 5.5                              | 4.5                           |
|                | 4.5                              | 4.2                           |
|                | 5.7                              | 3.6                           |
| AGL            | 12.6                             | 13.8                          |
|                | 11.9                             | 10                            |
|                | 10                               | 10.5                          |
|                | 12.5                             | 9.7                           |
| BH             | 3.3                              | 3.4                           |
|                | 2.5                              | 2.9                           |
|                | 2.9                              | 2.5                           |
|                | 2.5                              | 2.1                           |
| BW             | 5.8                              | 6.6                           |
|                | 4.4                              | 4.5                           |
|                | 4.5                              | 5.5                           |
|                | 5.5                              | 4.3                           |
| HL             | 7.5                              | 8.0                           |
|                | 7.3                              | 7.1                           |
|                | 7.1                              | 6.3                           |
|                | 7.6                              | 5.8                           |
| HW             | 5.5                              | 5.5                           |
|                | 5.4                              | 4.9                           |
|                | 4.9                              | 4.4                           |
|                | 4.4                              | 3.8                           |
| HD             | 2.9                              | 2.8                           |
|                | 2.6                              | 2.6                           |
|                | 2.6                              | 2.5                           |
|                | 2.5                              | 2.1                           |
| ED             | 1.6                              | 1.7                           |
|                | 1.5                              | 1.5                           |
|                | 1.5                              | 1.4                           |
|                | 1.4                              | 1.1                           |
| EE             | 2.7                              | 2.8                           |
|                | 2.5                              | 2.3                           |
|                | 2.3                              | 2.2                           |
|                | 2.2                              | 1.8                           |
| ES             | 3.8                              | 3.9                           |
|                | 3.5                              | 3.3                           |
|                | 3.3                              | 2.3                           |
|                | 2.3                              | 2.8                           |
| EN             | 3.0                              | 3.0                           |
|                | 2.7                              | 2.5                           |
|                | 2.5                              | 2.2                           |
|                | 2.2                              | 2.3                           |
| IN             | 0.8                              | 0.7                           |
|                | 0.8                              | 0.8                           |
|                | 0.8                              | 0.6                           |
|                | 0.6                              | 0.9                           |
| IO             | 1.3                              | 1.4                           |
|                | 1.3                              | 1.2                           |
|                | 1.2                              | 0.9                           |
|                | 0.9                              | 0.9                           |
| EL             | 0.4                              | 0.4                           |
|                | 0.4                              | 0.3                           |
|                | 0.3                              | 0.4                           |
|                | 0.4                              | 0.7                           |
|                | 0.7                              | 0.4                           |
|                | 0.4                              | 0.4                           |

**Figure 5.** *Cnemaspis tigris* sp. nov. (holotype, NRC-AA-1159): A dorsal view of mid-body and B ventral view of mid-body. Scale bars 5 mm; photos by Akshay Khandekar and Satpal Galmale.
Description of the holotype. Adult male in good state of preservation except head slightly bent towards right, a small portion of the regenerated tail taken for DNA extraction, and digit IV and V of manus of the right side are incomplete (Fig. 3A, B). SVL 30.9 mm, head short (HL/SVL 0.24), wide (HW/HL 0.73), not strongly depressed (HD/HL 0.38), distinct from neck. Loreal region slightly inflated, canthus rostralis not prominent. Snout half the head length (ES/HL 0.50), 2.5 times eye diameter (ED/ES 0.42); scales on snout and canthus rostralis large, weakly keeled, weakly conical; much larger than those on forehead and interorbital region; occipital and temporal region with much smaller, weakly keeled, conical tubercles (Fig. 4A). Eye small (ED/HL 0.21); with round pupil; left orbit without extra-brillar fringe.
Table 4. Meristic data for the type series of the new species. Abbreviations are listed in Materials and Methods except for: L&R = Left & Right; irr.arr. = irregularly arranged; * = lamellae missing or incomplete; abs. = absent.

| Clade       | Specimen number | Species                  | Type       | Holotype                | Paratypes | C. tigris sp. nov. | C. sakleshpurensis sp. nov. | Paratypes |
|-------------|-----------------|--------------------------|------------|-------------------------|-----------|-------------------|-----------------------------|-----------|
|             |                 | C. mysoriensis           |            | NRC-AA-1159             | NRC-AA-1160 | BNHS 2809         | BNHS 2810                    | BNHS 2811 |
| Sex         | Male            | Male                     | Male       | Male                    | Female    | 8&8               | 9&8                         | 9&9       |
|             | 8&8             | 10&10                    | 9&9        | 9&9                     | 7&7       | 8&8               | 8&8                         | 7&8&8     |
|             | 8&8             | 8&8                      | 8&7        | 8&8                     | 6&7       | 7&7               | 6&6                         | 8&8       |
|             | 6&6             | 8&7                      | 6&7        | 6&6                     | 6&7       | 7&7               | 6&6                         | 8&8       |
|             | 5&6             | 6&6                      | 5&6        | 5&5                     | 5&6       | 5&6               | 5&6                         | 6&6       |
|             | 26              | 26                       | 26         | 26                      | 26        | 26                | 26                          | 26        |
|             | 101             | 107                      | 92         | 91                      | 96        | 118               | 124                         | 127       |
|             | 6               | 6                        | 6          | 6                       | 9         | 9                 | 8                           |           |
|             | 24              | 25                       | 23         | 25                      | 24        | 24                | 26                          | 23        |
|             | 10&9            | 9&10                     | 9&9        | 9&9                     | 11&11     | 11&11             | 10&9                         |           |
|             | 16&10*          | 15&16                    | 17&17      | 15&15                   | 16&16     | 16&16             | 16&16                        | 16&14     |
|             | 9&10            | 9&10                     | 9&11       | 9&9                     | 11&11     | 11&11             | 11&11                        |           |
|             | 19&19           | 21&20                    | 19&19      | 17&18                   | 20&20     | 19&16             | 20&17                        |           |
|             | 17&17           | 18&17                    | 16&16      | 15&16                   | 17&18     | 17&18             | 16&17                        |           |
|             | 2               | 2                        | 2          | 2                       | 2         | abs.               | abs.                         | abs.      |
|             | 3               | 3&2                      | 2&2        | 2&2                     | 3&4       | abs.               | abs.                         | abs.      |
|             | 8&7             | 7&8                      | 9&8        | 6&6                     | 11&10     | abs.               | abs.                         |           |
| PCT L&R     | 1&1             | 1&1                      | 1&1        | 1&1                     | 1&1       | 1&1               | 1&1                          |           |

scales (missing/damaged), right orbit with nine or 10 extra-brillar fringe scales, largest scales on anterior side; supraoculars not elongate; interorbital scale rows across narrowest point of frontal seven or eight; 27 or 28 scale rows between left and right supraoculars at mid-orbit (Fig. 4A). Ear-opening deep, oval, small (EL/HL 0.05); eye to ear distance greater than diameter of eye (EE/ED 1.68) (Fig. 4C). Rostral twice wider (1.2 mm) than long (0.6 mm), deformed on the right side; a single enlarged supranasal on each side, roughly same the size as post-nasals, separated from each other by a single enlarged internasal and a smaller scale on the snout; rostral in contact with nostril, supraocular I, supranasal and internasal; nostrils oval, each surrounded by postnasals, supranasal, rostral and supraocular I; two rows of scales separate the orbit from the supralabials (Fig. 4C). Mental enlarged, subtriangular, marginally wider (1.5 mm) than long (1.3 mm); two pairs of postmentals, inner pair marginally larger than outer pair, roughly rectangular, separated from each other below mental by a single enlarged chin shield; inner pair bordered by mental, infralabial I, outer postmental and two enlarged chin shields on right side, and by mental, infralabial I and II, outer postmental and two enlarged chin shields on right side; outer postmentals roughly rectangular, bordered by inner postmentals, infralabial I and II, and four enlarged chin shields on left and by inner postmentals, infralabial II, and five enlarged chin shields on right; three enlarged gular scales prevent contact of left and right outer postmentals; chin shields bordering postmentals flat, smooth, smaller than outermost postmentals, rest flattened, small, smooth (Fig. 4B). Infralabials bordered below by a row or two of slightly enlarged scales, decreasing in size posteriorly. Eight supralabials up to angle of jaw and six at midorbital position on each side; supralabial I largest, decreasing in size posteriorly; eight infralabials up to angle of jaw, five at midorbital position on left and six on right side; infralabial I largest, infralabials decreasing in size posteriorly (Fig. 4C).

Body relatively slender (BW/AGL 0.46), trunk less than half of SVL (AGL/SVL 0.40) without ventralateral folds; spine-like scales present on flank on each side. Dorsal pholidosis heterogeneous; keeled, granular scales on the vertebral and paravertebral region with a few scattered enlarged keeled tubercles, intermixed with about three irregularly arranged rows of large, weakly keeled, tubercles on each side of flank (Fig. 5A). Scales on occiput and nape slightly smaller and weakly keeled than those on paravertebral rows; scales on flank slightly larger than those on dorsum, weakly keeled, conical or spine-like. Ventral scales much larger than granular scales on dorsum, those on belly smooth, subimbricate, equal from chest to vent except for those on precloacal region which slightly larger; mid-body scale rows across belly 24; 101 scales from mental to anterior border of cloaca (Fig. 5B). Scales on throat slightly smaller than those on belly and imbricate; gular region with much smaller, flattened scales with those on chin bordering postmentals, enlarged, juxtaposed and flattened (Fig. 4B). Two femoral pores on each thigh, separated by eight poreless scales.
on left and seven on right side from continuous series of two precloacal pores (Fig. 4D).

Scales on dorsal aspect of manus heterogenous, upper arm with scales much larger than dorsal granules, weakly keeled, imbricate; those near forelimb insertion much smaller than scales on upper arm; dorsal aspect of lower arm and elbow with scales much smaller than those on upper arm, weakly keeled, flat, roughly rounded; dorsal aspect of hand predominantly bearing large, flattened, weakly keeled, imbricate scales. Ventral aspect of upper arm with smooth, roughly rounded, subimbricate scales; scales on lower arm and wrist large, smooth, imbricate; scales on palm and sole smooth, flat and roughly circular. Scales on dorsal aspect of thigh, subimbricate, weakly keeled; dorsal aspect of foot predominantly bearing small, flattened, strongly keeled, imbricate scales; scales on ventral aspect of thigh and shank larger than those on mid-body ventrals, smooth, subimbricate on thigh and imbricate on shank (Fig. 3B).

Fore-limbs and hind-limbs slightly long, slender (LAL/SVL 0.12); (CL/SVL 0.16); digits long, with a strong, recurved claw, distinctly inflected, distal portions laterally compressed conspicuously. Series of unpaired lamellae on basal portion of digits, separated from unpaired, narrower distal lamellae by a single large scale at the inflection; proximal lamellae series: 1-3-4-4-4 (right manus), 2-4-5-7-5 (right pes), 1-3-4-4-4 (left manus; Fig. 4E), 1-4-6-7-5 (left pes; Fig. 4F); distal lamellae series: 8-10-12-6-*8* (right manus; * = incomplete), 8-10-12-12-12 (right pes), 8-10-12-12-10 (left manus; Fig. 4E), 8-10-12-12-12 (left pes; Fig. 4F). Relative length of digits (measurements in mm in parentheses): IV (2.6) > III (2.4)

Table 5. Additional morphological character states evaluation for the type series of the new species *Cnemaspis tigris* sp. nov. abs. = absent; / = data unavailable.

| Clade | C. mysoensis | Species | Clade | C. goaensis |
|-------|--------------|---------|-------|-------------|
| Type  | Holotype     | Paratypes | Type  | Holotype     | Paratypes |
| Specimen number | NRC-AA-1159 | NRC-AA-1160 | BNHS 2809 | BNHS 2810 | BNHS 2811 | BNHS 2814 | NRC-AA-1164 | NRC-AA-1165 |
| Sex   | Male | Male | Male | Female | Male | Female | Female |
| Occipital ocellus/ocellus just behind occiput present (1) or not (0) | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Dorsal ocellus between forelimb insertions present (1) or not (0) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Anterior extra-brillar fringe scales enlarged (1) or not (0) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ventral scales keeled (1) or smooth (0) | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Gular scales keeled (1) or smooth (0) | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Pectoral scales keeled (1) or smooth (0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Precloacal pores continuous (1) or separated (0) | 1 | 1 | 1 | 1 | abs. | 1 | abs. | abs. |
| Precloacal pores elongate (1) or round (0) | 1 | 1 | 1 | 1 | abs. | 0 | abs. | abs. |
| femoral pores elongate (1) or round (0) | 1 | 1 | 1 | 1 | abs. | 0 | abs. | abs. |
| Dorsal pholidosis homogeneous (1) or heterogeneous (0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dorsal tubercles keeled (1) or not keeled (0) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Tubercles linearly arranged (1) or more random (0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spine-like tubercles on flank present (1) or absent (0) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Lateral caudal furrows present (1) or absent (0) | / | 1 | / | 1 | 1 | / | / |
| Sub-caudals keeled (1) or smooth (0) | / | 0 | / | 0 | 0 | abs. | abs. | abs. |
| Single median row of sub-caudals keeled (1) or smooth (0) | / | 0 | / | 0 | 0 | 1 | / | / |
| Caudal tubercles encircle tail (1) or not (0) | / | 1 | / | 1 | 1 | 1 | / | 1 |
| Slightly enlarged median sub-caudal scale row (1) or not (0) | / | 1 | / | 1 | 1 | 1 | / | 1 |
| Enlarged femoral scales present (1) or absent (0) | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| Subtibial scales keeled (1) or smooth (0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
Variation and additional information from type series. Mensural, meristic and additional character states evaluation data for the type series is given in Tables 3–5 respectively. There are three male and a single female specimen ranging in size from 24.7–31.2 mm. All paratypes resemble the holotype except as follows: inner postmentals bordered by mental, infralabial I outer postmental and two enlarged chin scales on each side in all four paratypes; outer postmentals bordered by inner postmental, infralabial I & II and four enlarged chin scales on each side in BNHS 2810. Two paratypes—BNHS 2810 and BNHS 2811 with original and complete tail, slightly longer than body (TL/SVL 1.13 and 1.16 respectively) (All paratypes agree with the holotype in overall colouration except for female paratype (BNHS 2811) which is overall duller, lacking yellowish colouration on the body (Fig. 6B). Original tail (in BNHS 2810 and BNHS 2811) with enlarged, strongly keeled, distinctly pointed, conical tubercles forming whirls; median row of sub-caudal smooth, slightly enlarged. Regenerated portion of tail (in NRC-AA-1160) is light brown, and without enlarged tubercles (Fig. 7A).

Distribution and Natural history. Like most of the other South Asian *Cnemaspis*, *C. tigris* sp. nov. is currently known from its type locality (near Kaivara village in Chickballapur district, Karnataka), at an elevation of ca. 910 m asl (Fig. 1). The species was encountered during a single day of fieldwork at the base of a rocky granite hillock with large boulders, predominantly covered by thorny scrub forest (Fig. 16A). Numerous individuals (*n* = 30) of the new species were observed to be active in day-time on granite boulders < 2 m of height from the ground. All the individuals were only seen in the shaded and relatively cooler areas among the rocks. Sym pathetic lizards recorded by us at the type locality include *Hemidactylus frenatus* Duméril and Bibron, 1836; *Hemidactylus rishivaleynsis* Agarwal, Thackeray and Khandekar, 2020; *Eutropis carinata* (Schneider, 1801) and *Psammophilus dorsalis* (Gray, 1831).
Cnemaspis sakleshpurensis sp. nov.

http://zoobank.org/390EDF17-4D01-43AE-88C6-192BCA012671

Figs 7B–11A, 16B; Tables 3–5

Holotype. BNHS 2814 (AK 862), adult male, from the vicinity of Mookanana Resort, Hongadahalla village, Sakleshpur (12.7811°N, 75.7079°E; elevation ca. 850 m), Hassan District, Karnataka, India, collected by Akshay Khandekar, Swapnil Pawar and Tejas Thackeray on 5th June 2019.

Paratypes. NRC-AA-1165 (AK 864), adult female, NRC-AA-1164 (AK 863), sub-adult female, same collection data as holotype.

Etymology. The specific epithet is a toponym for Sakleshpur in Hassan district of Karnataka, the place where the species is currently known from.

Suggested Common Name. Sakleshpur dwarf gecko.

Diagnosis. A small-sized Cnemaspis, snout to vent length less than 32 mm (n=3). Dorsal pholidosis heterogeneous; weakly keeled, granular scales on the vertebral and paravertebral region with a few scattered enlarged keeled tubercles, intermixed with irregularly arranged rows of large, keeled, tubercles on flank; upper most row strongly keeled and weakly conical, rest much enlarged, weakly keeled and spine-like; eight or nine rows of dorsal tubercles at mid-body; ventral scales smooth, imbricate, 23–26 scales across belly, 118–127 longitudinal scales from mental to cloaca; subdigital scanners smooth, entire, unnotched; 9–11 lamellae under digit I of manus and 11 lamellae under digit I of pes, 14–16 lamellae under digit IV of manus and 16–20 lamellae under digit IV of pes; male (n=1/3) with three or four femoral pores, separated by 10 or 11 poreless scales from continuous series of two precloacal pores; each pore bearing scale flanked posteriorly with enlarged spine-like scale; tail with enlarged, strongly keeled, distinctly pointed, conical tubercles forming whorls; a median row of sub-caudal scales slightly enlarged, smooth only at anterior half of the tail, rest strongly keeled. Dorsal colouration grey-brown with a discontinuous, poorly defined light brown mid-dorsal streak extending from occiput to tail base, with yellow diffuse blotches and a few small black spots forming eight indistinct bars on dorsum; dark medial ocellus on occiput and another slightly smaller just anterior to forelimb insertions; original tail banded.

Comparison with members of C. goaensis clade. Cnemaspis sakleshpurensis sp. nov. can be morphologically distinguished from all other described members of the goaensis clade on the basis of the following differing or non-overlapping characters: male with three or four femoral pores on each thigh, separated by 10 or 11 poreless scales from continuous series of two precloacal pores (versus three or four femoral pores on each thigh, separated by seven or eight poreless scales from continuous series of three or four precloacal pores in C. amboliensis Sayyed, Pyron and Dileepkumar, 2018; two or three femoral pores, separated by eight or nine poreless scales from continuous series of three or four precloacal pores in C. ranganaensis); 23–26 scales across belly at mid-body (versus 19–22 ventral scales across belly at mid-body in C. amboliensis; 27–32 ventral scales across belly at mid-body in C. goaensis; 30 or 31 ventral scales across belly at mid-body in C. ranganaensis); 118–127 longitudinal ventral scales from mental to cloaca (versus 93–101 longitudinal ventral scales from mental to cloaca in C. ranganaensis); scales on upper arm and thigh uncininate (versus scales on upper arm and thigh tricarinate in C. amboliensis); internasal scales absent, supranasals in strong contact with each other on snout (versus one or two internasal scales present, supranasals separated from...
each other by one or two internasal scales on snout in *C. goaensis*.

*C. sakleshpurensis* sp. nov. is morphologically similar to its sympatric species *C. schalleri* Khandekar, Thackeray and Agarwal, 2021 of *monticola* clade in body size, having spine-like scales on flanks and presence of both femoral and precloacal pores in males. However, the new species can be easily distinguished from *C. schalleri* by having eight or nine irregularly arranged rows of dorsal tubercles at mid-body (*versus* 14–16 regularly arranged rows of dorsal tubercles at mid-body), and having only a few scattered tubercles in paravertebral region on body between forelimb and hindlimb insertion (*versus* a regular series of 17–20 tubercles in paravertebral rows on the body between forelimb and hindlimb insertions). Comparison against *C. vijayae* sp. nov. is provided after its description.

**Description of the holotype.** Adult male in good state of preservation except body slightly bent towards left and tail tip towards left, and a 3.7 mm long incision in the sternal region for liver tissue collection (Fig. 8A, B). SVL 31.8 mm, head short (HL/SVL 0.23), wide (HW/HL 0.64), not strongly depressed (HD/HL 0.39), and distinct from neck. Loral region marginally inflated, canthus rostralis indistinct. Snout half of the head length (ES/HL 0.50), more than twice of the eye diameter (ES/ED 2.53); scales on snout and canthus rostralis large, weakly keeled, and weakly conical; twice the size than those on forehead and interorbital region; occipital and temporal region with much smaller, weakly keeled granules sparsely intermixed with slightly larger, weakly keeled, conical tubercles (Fig. 9A). Eye small (ED/HL 0.19); with round pupil; orbit with nine or 10 extra-brillar fringe scales, largest scales on anterior side; supraciliaries not elongate; six interorbital scale rows across narrowest point of frontal; 27 scale rows between left and right supraciliaries at mid-orbit (Fig. 9A). Ear-opening deep, oval, small (EL/HL 0.09); eye to ear distance greater than diameter of eye (EE/ED 1.46) (Fig. 9C). Rostral two times wider (1.3 mm) than long (0.6 mm), incompletely divided dorsally by a strongly developed rostral groove for more than half of its height; a single enlarged supranasal on each side, slightly larger than upper postnasal and almost twice the size than lower postnasal, supranasals in contact with each other on snout; rostral in contact with nostril, supranasal, supralabial I and marginally with upper postnasals on each side; nostrils oval, each surrounded by rostral, supranasal, upper and lower postnasals, and supralabial I on each side; one or two rows of scales separate the orbit from the supralabials (Fig. 9C). Mental enlarged, sub-triangular, slightly wider (1.6 mm) than long (1.1 mm); two pairs of postmentals, inner pair larger than outer pair, rectangular, an enlarged chin scale prevent the contact between them below mental; inner pair bordered by mental, infralabial I, outer postmentual and two enlarged chin shields on each side; outer postmentals roughly square, bordered by inner postmentals, infralabial I, and three enlarged chin shields on left and by inner postmentals, infralabial I, and four enlarged chin shields on right side; three enlarged gular scales prevent contact between left and right outer postmentals; chin shields bordering postmentals and one or two rows bordering infralabials flat, smooth, slightly smaller than outermost postmentals, decreasing in size posteriorly (Fig. 9B). Eight supralabials up to angle of jaw on each side, six supralabials on left and seven or right side at midorbital position; supralabial I largest, decreasing in size posteriorly; seven infralabials up to angle of jaw on each side; six infralabials on left and five on right side at midorbital position; infralabial I largest, decreasing in size posteriorly (Fig. 9B).

Body slender (BW/AGL 0.42), trunk less than half of SVL (AGL/SVL 0.39) without ventrolateral folds; spine-like scales present on flank on each side. Dorsal pholidosis heterogeneous; weakly keeled, granular scales on the vertebral and paravertebral region with a few scattered enlarged keeled tubercles, intermixed with irregularly arranged rows of large, keeled, tubercles on each flank; upper most row strongly keeled and weakly conical, rest much enlarged, weakly keeled and spine-like; nine dorsal tubercles rows at mid-body including spine-like scales (Fig. 10A). Ventral scales more than thrice the size than granular scales on dorsum, those on belly smooth, imbricate, subequal from chest to vent; mid-body scale rows across belly between lowest rows of enlarged tubercles on flank 24; 118 scales from mental to anterior border of cloaca (Fig. 10B). Scales on throat slightly smaller than those on belly; gular region with much smaller, flattened scales with those on chin bordering postmentals, enlarged, juxtaposed and flattened (Fig. 9B). Three femoral pores on left thigh and four on right, separated by 11 poreless scales on left and 10 on right side from continuous series of two precloacal pores; each pore baring scale flanked posteriorly with enlarged spine-like scale (Fig. 9D).

Scales on dorsal aspect of manus heterogenous, upper arm with scales much larger than dorsal granules, strongly keeled, imbricate; those near forelimb insertion small and granular; dorsal aspect of lower arm and elbow with scales slightly smaller than those on upper arm, strongly keeled, flat, subimbricate; dorsal aspect of hand predominantly bearing large, flattened, weakly keeled, imbricate scales. Ventral aspect of upper arm with smooth, roughly subcircular, subimbricate scales; scales on lower arm and wrist large, smooth, subimbricate; scales on palm and sole smooth, flat and subcircular, subimbricate. Scales on dorsal and antero-lateral aspect of thigh much larger than those on dorsal granules, strongly keeled, subimbricate except those near hindlimb insertion which are granular, much smaller than dorsal granules and somewhat conical; scales on posterior-lateral aspect of thigh with scales similar in shape to granular scales on mid-body dorsum, marginally larger, becoming smaller, circular and smooth posteriorly. Scales on dorsal aspect of knee slightly smaller than those on dorsal aspect of thigh, weakly keeled; scales on shank still smaller, strongly keeled, subimbricate; dorsal aspect of foot predominantly bearing large flattened, weakly keeled, imbricate scales. Scales on ventral aspect of thigh and shank more or less similar in size to those on mid-body ventrals, smooth, imbricate (Fig. 8A, B).
Fore-limbs and hind-limbs slightly long, slender (LAL/SVL 0.15); (CL/SVL 0.17); digits long, with a strong, recurved claw, distinctly inflected, distal portions laterally compressed conspicuously. Series of unpaired lamellae on basal portion of digits, separated from unpaired, narrower distal lamellae by a single large scale at the inflection; proximal lamellae series: 2-4-5-4-4 (right manus), 2-4-5-7-5 (right pes), 2-4-5-4-4 (left manus; Fig.
Figure 9. *Cnemaspis sakleshpurensis* sp. nov. (holotype, BNHS 2814): A dorsal view of head, B ventral view of head, C right side lateral view of head, D view of cloacal region showing femoral and precloacal pores, E ventral view of left manus, F ventral view of left pes. Scale bars 5 mm; photos by Akshay Khandekar and Satpal Gangalmale.
Dorsal ground colour (holotype, NRC-AA-1165). Variation and additional information from type series. Relative length of digits (measurements in mm in parentheses): IV (3.0) > III (2.7) > V (2.6) = II (2.6) > I (1.9) (left manus); IV (4.2) > III (3.6) > V (3.3) > II (3.0) > I (2.0) (left pes).

Tail original, entire, subcylindrical, slender, longer than snout-vent length (TL/SVL 1.32; Fig. 8C, D). Dorsal scales on tail base weakly keeled, granular, similar in size and shape to granular scales on mid-body dorsal, gradually becoming larger, flattened, imbricate posteriorly, intermixed with enlarged, strongly keeled, distinctly pointed, conical tubercles; enlarged tubercles on the tail forming whorls; six tubercles each on first 10 whorls, four in 11–15th whorls, rest of the tail with only paravertebral tubercles (Fig. 8C). Scales on ventral aspect of tail much larger than those on dorsal aspect, sub-bimbricate, smooth only at anterior half of the tail, rest strongly keeled; median series slightly larger than rest, roughly pentagonal; scales on tail base slightly smaller than those on mid-body ventrals, smooth, imbricate; a single enlarged, conical, and smooth postcloacal spur on each side (Fig. 8D).

Colouration in life (Fig. 11A). Dorsal ground colouration of head, body, limbs and tail grey-brown; head mottled with smaller dark speckles. An indistinct fine darker vertical streak runs between the orbits; indistinct slightly darker preorbital streak runs from orbit to supranasal, two darker postorbital streaks extending onto neck; labials light yellow with indistinct darker bars; supraciliaries dirty yellow. A dark medial ocellus on occiput and another slightly smaller just anterior to forelimb insertions. A discontinuous, poorly defined light brown mid-dorsal streak extends from occiput to tail base, with yellow diffuse blotches and a few small black spots forming eight indistinct bars on dorsum. Lower flank much lighter with straw coloured enlarged spine-like tubercles on each side; tail colouration light brown with 13 alternating darker bands, post cloacal tubercles and pointed tubercles on lateral rows in alternating whorls dull-white. Dorsum of limbs with few indistinct light and dark bands, digits with distinct alternating dark and light bands, a strong dark streak on the posterior of femur. Ventral surfaces dull-white, underside of head and neck throat dirty white with light yellow on lateral sides, fine black spots under forelimbs, belly, hindlimbs and tail white with fine black speckles. Pupil black, outlined by brown iris.

Variation and additional information from type series. Mensural and meristic data and additional character states evaluation data both female paratypes are given in Tables 3–5. The two female paratypes (NRC-AA-1164, sub-adult and NRC-AA-1165, adult) having 23.7 and 32 mm SVL respectively. Both paratypes resemble holotype in overall morphology and colouration except as follows: outer postmentum bordered by inner pair, infralabial I and II and three enlarged gular scales on either side in both the paratypes. Both the paratypes with incomplete tails and both with head and neck slightly bent towards right as an artefact of the preservation (Fig. 7B).

Distribution and Natural history. Cnemaspis sakleshpurensis sp. nov. is currently known only from its type locality (in and around Mookanana Resort, Hongadahalla village, Sakleshpur, Hassan District, Karnataka), at an elevation of ca. 850 m. The type locality is part of Central Western Ghats and dominated by semi-evergreen forest. Approximately 10 individuals of the new species were encountered during two days of fieldwork. Individuals were seen active during the day time (0800–1700 hrs) on rocky faces in shaded areas alongside streams, on tree trunks and occasionally on building walls at a height of 2–5 m above ground (Fig. 16B). The holotype (BNHS 2814) was collected from a rock crevice in a forested patch just after moderate rain showers, a sub-adult female (NRC-AA-1164) was found active on a mossy tree trunk in the afternoon hours, and an adult female (NRC-AA-1165) was collected early morning (0700 hrs) from a building wall. Sympatric lizards sighted by us at the type locality include Cnemaspis magnifica, C. schalleri, Hemidactylus frenatus and Monilesaurus rouxii (Duméril and Bibron, 1837).

Cnemaspis vijayae sp. nov.

http://zoobank.org/FCE13D91-13C5-4FA0-AB40-F4740-C60F865

Figs 11B–15, 16C; Tables 6–8

Holotype. NRC-AA-1188 (AK-R 839), adult male, from Honey Valley Estate (12.2146°N, 75.6586°E; elevation ca. 1250 m) near Byllikere peak, Kodagu district, Kar-
nataka state, India, collected by Ishan Agarwal on 2nd December 2018.

Paratypes. NRC-AA-1186 (AK-R 837), BNHS 2815 (AK 599), adult males, NRC-AA-1185 (AK-R 836), NRC-AA-1187 (AK-R 838), adult females, same locality data as holotype except collected by Akshay Khandekar, Ishan Agarwal and Swapnil Pawar on 2nd December 2021.

Etymology. The specific epithet is a Latinized eponym in honour of India’s first women herpetologist, Late Jagan-nathan Vijaya (1959–1987) for her inspiring contribution towards ecology of rare Indian turtles.

Suggested Common Name. Vijaya’s Coorg dwarf gecko.

Diagnosis. A small-sized Cnemaspis, snout to vent length less than 36 mm ($n=5$). Dorsal pholidosis heterogeneous; weakly keeled, granular scales, intermixed with irregularly arranged rows of large, keeled, tubercles on the body; two or three rows of enlarged tubercles on each flank weakly keeled and spine-like; 9–11 rows of dorsal tubercles at

Figure 11. Colouration in life of male holotypes: A Cnemaspis sakleshpurensis sp. nov., (BNHS 2814), and B Cnemaspis vijayae sp. nov. (NRC-AA-1188). Photos by Tejas Thackeray (A), and Akshay Khandekar (B).
mid-body, irregularly arranged rows of paravertebral tubercles between forelimb and hindlimb insertions; ventral scales smooth (rarely keeled n=1), subimbricate, 26–30 scales across belly at mid-body, 118–127 longitudinal scales from mental to cloaca; subdigital scanners smooth, entire, unnotched; 10 or 11 lamellae under digit I of manus and pes, 15 or 16 lamellae under digit IV of manus and 17–19 lamellae under digit IV of pes; males (n=3/5) with three or four femoral pores on thigh, separated by seven or eight poreless scales on either side from three discontinuous precloacal pores, a single precloacal pore on left and two on right side, separated by one or two poreless scale (n=2/3); precloacal pores sometime continuous (n=1/3); each femoral pore bearing scale flank posteriorly with enlarged spine-like scale; tail with enlarged, strongly keeled, distinctly pointed, conical tubercles forming whorls; median row of sub-caudal scales slightly enlarged, smooth only at anterior half of the tail, rest weakly keeled. Dorsal ground colour dirty brown with a bright straw-coloured mid-dorsal stripe that extends from occiput to tail in some specimens; dark blotch on nape forming indistinct collar and smaller ocellus just anterior to forelimb insertions; dark markings and light grey blotches on dorsum; original tail with thick mid-dorsal stripe.

Comparison with members of C. goaensis clade. Cnemaspis vijayae sp. nov. can be morphologically distinguished from all other described members of the goaensis clade on the basis of the following differing or non-overlapping characters: 9–11 dorsal tubercle rows at mid-body (versus 6–8 dorsal tubercle rows at mid-body in C. amboliensis and C. goaensis; eight or nine dorsal tubercles rows at mid-body in C. sakleshpurenensis sp. nov.); paravertebral tubercles on the body between forelimb and hindlimb irregularly arranged (versus 7–12 paravertebral tubercles on the body between forelimb and hindlimb insertions in C. amboliensis); 26–30 scales across belly at mid-body (versus 19–22 ventral scales across belly at mid-body in C. amboliensis and 23–26 scales across belly at mid-body in C. sakleshpurenensis sp. nov.); scales on upper arm and those towards knee on thigh tricarinate (versus scales on upper arm and thigh unicarinate in C. goaensis; C. ranganaensis and C. sakleshpurenensis sp. nov.); males with three or four femoral pores on thigh, separated by seven or eight poreless scales on either side from three discontinuous precloacal pores, a single precloacal pore on left and two on right side, separated by one or two poreless scale (n=2/3), precloacal pores sometime continuous (n=1/3); each femoral pore bearing scale flank posteriorly with enlarged spine-like scale; tail with enlarged, strongly keeled, distinctly pointed, conical tubercles forming whorls; median row of sub-caudal scales slightly enlarged, smooth only at anterior half of the tail, rest weakly keeled. Dorsal ground colour dirty brown with a bright straw-coloured mid-dorsal stripe that extends from occiput to tail in some specimens; dark blotch on nape forming indistinct collar and smaller ocellus just anterior to forelimb insertions; dark markings and light grey blotches on dorsum; original tail with thick mid-dorsal stripe.

Table 6. Mensural (mm) data for the type series of Cnemaspis vijayae sp. nov. of the goaensis clade. Abbreviations are listed in Materials and Methods; * = tail incomplete.

| Type          | Holotype       | Paratypes          |
|---------------|----------------|--------------------|
| Specimen number | NRC-AA-1188    | NRC-AA-1185        |
| Sex           | Male           | Female             |
| SVL           | 35.6           | 32.1               |
| TL            | 46.8           | 21.0*              |
| TW            | 4.2            | 3.1                |
| LAL           | 5.1            | 4.1                |
| CL            | 6.1            | 5.1                |
| AGL           | 14.7           | 13.2               |
| BH            | 3.8            | 3.3                |
| BW            | 6.6            | 5.8                |
| HL            | 8.6            | 7.7                |
| HW            | 6.4            | 5.5                |
| HD            | 3.8            | 3.6                |
| ED            | 1.6            | 1.3                |
| EE            | 2.6            | 2.7                |
| ES            | 4.2            | 3.7                |
| EN            | 3.4            | 2.7                |
| IN            | 1.0            | 0.9                |
| IO            | 2.6            | 2.3                |
| EL            | 0.5            | 0.4                |
|               |                | Male               |
| SVL           | 32.4           | 34.1               |
| TL            | 42.2           | 39                 |
| TW            | 3.6            | 3.4                |
| LAL           | 4.56           | 4.4                |
| CL            | 5.5            | 5.4                |
| AGL           | 14            | 14.8               |
| BH            | 3.2            | 4.6                |
| BW            | 6.6            | 7.5                |
| HL            | 8.3            | 8.2                |
| HW            | 5.7            | 5.8                |
| HD            | 3.6            | 3.5                |
| ED            | 1.7            | 1.6                |
| EE            | 2.8            | 2.9                |
| ES            | 3.8            | 4.1                |
| EN            | 3.0            | 3.4                |
| IN            | 1.0            | 1.0                |
| IO            | 2.4            | 2.5                |
| EL            | 0.5            | 0.5                |
|               |                | Female             |
| SVL           | 33.0           |                    |
| TL            | 2.6*           |                    |
| TW            | 3.3            |                    |
| LAL           | 4.6            |                    |
| CL            | 5.5            |                    |
| AGL           | 13.4           |                    |
| BH            | 2.8            |                    |
| BW            | 6.5            |                    |
| HL            | 8.2            |                    |
| HW            | 5.2            |                    |
| HD            | 3.3            |                    |
| ED            | 1.5            |                    |
| EE            | 2.7            |                    |
| ES            | 4.3            |                    |
| EN            | 3.6            |                    |
| IN            | 1.1            |                    |
| IO            | 1.4            |                    |
| EL            | 0.6            |                    |
arranged rows of paravertebral tubercles on body between forelimb and hindlimb insertion (versus a regular series of 17–20 tubercles in paravertebral rows on the body between forelimb and hindlimb); and by presence of small dorsal ocellus just anterior to forelimb insertions (versus dorsal ocellus just anterior to forelimb insertions absent).

**Description of the holotype.** Adult male in a fairly good state of preservation except a 3.2 mm long incision in the sternal region for liver tissue collection, tail tip slightly bent towards left, and digit III of left manus incomplete (Fig. 12A–D). SVL 35.6 mm, head short (HL/SVL 0.24), wide (HW/HL 0.74), not strongly depressed (HD/HL 0.44), and distinct from neck. Loreal region marginally inflated, canthus rostralis indistinct. Snout almost half of the head length (ES/HL 0.48), slightly more than 2.5 times of the eye diameter (ES/ED 2.62); scales on snout and canthus rostralis large, weakly keeled, and weakly keeled.
Figure 13. *Cnemaspis vijayae* sp. nov. (holotype, NRC-AA-1188): A dorsal view of head, B ventral view of head, C right side lateral view of head, D view of cloacal region showing femoral and precloacal pores, E ventral view of right manus, and F ventral view of right pes. Scale bars 5 mm; photos by Akshay Khandekar and Satpal Gangalmale.
conical; twice the size than those on forehead and interorbital region; occipital and temporal region with much smaller, weakly keeled granules sparsely intermixed with slightly larger, weakly keeled, weakly conical tubercles (Fig. 13A). Eye small (ED/HL 0.18); with round pupil; orbit with nine or 10 extra-brillar fringe scales, largest scales on anterior side; supraciliaries not elongate; eight interorbital scale rows across narrowest point of frontal; 35 or 36 scale rows between left and right supraciliaries at mid-orbit (Fig. 13A). Ear-opening deep, oval, small

Table 7. Meristic data for the type series of *Cnemaspis vijayae* sp. nov. of the *goaensis* clade. Abbreviations are listed in Materials and Methods except for: L&R = Left & Right; irr.arr. = irregularly arranged; * = lamellae missing or incomplete; abs. = absent.

| Type                  | Holotype   | Paratypes |
|-----------------------|------------|-----------|
| Specimen number       | NRC-AA-1188| NRC-AA-1185| NRC-AA-1186| NRC-AA-1187| BNHS 2815 |
| Sex                   | Male       | Female    | Male       | Female    | Male       |
| SL L&R                | 8&8        | 8&8       | 8&8        | 9&8       | 9&10       |
| IL L&R                | 7&7        | 8&7       | 8&8        | 7&7       | 7&7        |
| SL M L&R              | 5&6        | 6&6       | 5&6        | 7&6       | 7&7        |
| IL M L&R              | 4&5        | 5&5       | 5&5        | 5&5       | 5&6        |
| PVT                   | irr.arr.   | irr.arr.  | irr.arr.   | irr.arr.  | irr.arr.   |
| DTR                   | 11         | 9         | 9          | 11        | 11         |
| MVSRI                 | 26         | 26        | 27         | 27        | 30         |
| VS                    | 127        | 119       | 118        | 122       | 124        |
| LamFI L&R             | 11&11      | 10&10     | 8*&10      | 10&11     | 10&10      |
| LamF4 L&R             | 16&16      | 15&15     | 13*&16     | 15&16     | 15&16      |
| LamT1 L&R             | 11&11      | 10&10     | 10&10      | 11&11     | 10&11      |
| LamT4 L&R             | 17&17      | 12*&17    | 17&17      | 18&18     | 18&19      |
| LamT5 L&R             | 17&17      | 16&16     | 16&15      | 16&17     | 17&17      |
| PP L&R                | 1&2        | abs.      | 3          | abs.      | 1&2        |
| SBPP                  | 2          | abs.      | abs.       | abs.      | 1          |
| FP L&R                | 4&4        | abs.      | 3&3        | abs.      | 4&3        |
| SB PP and FP L&R      | 7&8        | abs.      | 7&8        | abs.      | 8&8        |
| PCT L&R               | 1&1        | 1&1       | 1&1        | 1&1       | 1&1        |

Table 8. Additional morphological character states evaluation for the type series of *Cnemaspis vijayae* sp. nov. of the *goaensis* clade. abs. = absent; / = data unavailable.

| Type                  | Holotype   | Paratypes |
|-----------------------|------------|-----------|
| Specimen number       | NRC-AA-1188| NRC-AA-1185| NRC-AA-1186| NRC-AA-1187| BNHS 2815 |
| Sex                   | Male       | Female    | Male       | Female    | Male       |
| Occipital ocellus/ ocellus just behind occiput present (1) or not (0) | 0 | 0 | 0 | 0 | 0 |
| Dorsal ocellus between forelimb insertions present (1) or not (0) | 1 | 1 | 1 | 1 | 1 |
| Anterior extra-brillar fringe scales enlarged (1) or not (0) | 1 | 1 | 1 | 1 | 1 |
| Ventral scales keeled (1) or smooth (0) | 0 | 1 | 0 | 0 | 0 |
| Gular scales keeled (1) or smooth (0) | 1 | 1 | 1 | 1 | 1 |
| Pectoral scales keeled (1) or smooth (0) | 0 | 1 | 0 | 0 | 0 |
| Precloacal pores continuous (1) or separated (0) | 0 | abs. | 1 | abs. | 0 |
| Precloacal pores elongate (1) or round (0) | 0 | abs. | 0 | abs. | 0 |
| femoral pores elongate (1) or round (0) | 1 | abs. | 1 | abs. | 0 |
| Dorsal pholidosis homogeneous (1) or heterogeneous (0) | 0 | 0 | 0 | 0 | 0 |
| Dorsal tubercles keeled (1) or not keeled (0) | 1 | 1 | 1 | 1 | 1 |
| Tubercles linearly arranged (1) or more random (0) | 0 | 0 | 0 | 0 | 0 |
| Spine-like tubercles on flank present (1) or absent (0) | 1 | 1 | 1 | 1 | 1 |
| Lateral caudal furrows present (1) or absent (0) | 1 | 1 | / | 1 | 1 |
| Sub-caudals keeled only on posterior tail (1) or smooth entirely (0) | 1 | 1 | / | 1 | 1 |
| Single median row of sub-caudals keeled (1) or smooth (0) | 1 | 1 | / | 1 | 1 |
| Caudal tubercles encircle (1) or not (0) | 1 | 1 | / | 1 | 1 |
| Slightly enlarged median sub-caudal scale row (1) or not (0) | 1 | 1 | / | 1 | 1 |
| Enlarged femoral scales present (1) or absent (0) | 1 | 0 | 1 | 0 | 1 |
| Subtibial scales keeled (1) or smooth (0) | 0 | 1 | 1 | 1 | 0 |
(EL/HL 0.05); eye to ear distance slightly more than 1.5
times of eye diameter (EE/ED 1.62) (Fig. 13C). Rostral
two times wider (1.6 mm) than long (0.7 mm), incom-
pletely divided dorsally by a strongly developed rostral
groove for more than half of its height; a single enlarged
supranasal on each side, slightly larger than postnasals,
separated from each other by a single elongated interna-
sal; rostral in contact with nostril, internasal, supranasal,
lower postnasal and supralabial I on either side; nostrils
circular, each surrounded by rostral, supranasal, and up-
per and lower postnasals on each side; two rows of scales
separate the orbit from the supralabials (Fig. 13C). Mental
enlarged, subtriangular, slightly wider (1.9 mm) than long
(1.5 mm); two pairs of postmentals, inner pair larger than
outer pair, rectangular, an enlarged chin scales prevent the
contact between them below mental; inner pair bordered
by mental, infralabial I, outer postmentinal and three en-
larged chin shields on right and three on left side; outer
postmentinals roughly rectangular, bordered by inner post-
mentinals, infralabial I and II, and four enlarged chin shields
on either side; four enlarged gular scales prevent contact
between left and right outer postmentinals; chin shields bor-
dering postmentinals and one or two rows bordering infral-
abials somewhat flattened, smooth, slightly smaller than
outermost postmentinals, rest still smaller, weakly conical,
weakly keeled and subimbricate (Fig. 13B). Eight supral-
abials up to angle of jaw on either side, five supralabials at
midorbital position on left and six on right side; supralabi-
al I largest, decreasing in size posteriorly; seven infralabi-
als up to angle of jaw on each side; four infralabials on left
and five on right side at midorbital position; infralabial I
largest, decreasing in size posteriorly (Fig. 13C).

Body slender (BW/AGL 0.44), trunk less than half of
SVL (AGL/SVL 0.41) without ventrolateral folds; three
of spine-like scales present on flank on each side. Dorsal
pholidosis heterogeneous; weakly keeled, granular scales,
intermixed with irregularly arranged rows of large, keeled,
tubercles on each flank; three rows of enlarged tubercles
on flank on either side much enlarged, weakly keeled and
spine-like; 11 dorsal tubercles rows at mid-body includ-
ing spine-like scales; paravertebral tubercles on the body
between forelimb and hindlimb insertions irregular (Fig.
14A). Ventral scales more than thrice the size than gran-
ular scales on dorsum, those on belly smooth, subimbric-
ate, subequal from chest to vent; mid-body scale rows
across belly between lowest rows of enlarged scales on
flank 26; 127 scales from mental to anterior border of clo-
aca (Fig. 14B). Scales on throat slightly smaller than those
on belly; gular region with much smaller, weakly conical,
weakly keeled subimbricating scales with those on chin
bordering postmentinals, enlarged, smooth, juxtaposed and
flattened (Fig. 13B). Four femoral pores on each thigh,
separated by seven poreless scales on each side from three
discontinuous precoacral pores, a single precoacral pore
on left and two on right side, separated by two poreless
scale; femoral pore baring scales flanked posteriorly with
enlarged slightly spine-like scale (Fig. 13D).

Scales on dorsal aspect of manus much larger than
dorsal granular scales, tricarinate, and imbricate; those
near forelimb insertion small and granular; dorsal as-
pect of hand predominantly bearing large, flattened, 1–3
carinate, and imbricate scales. Ventral aspect of manus
with smooth, roughly subcircular, subimbricate scales;
scales on palm and sole smooth, flat and subcircular, sub-
imbricate. Scales on dorsal and anterio-lateral aspect of
thigh much larger than those on dorsal granules, strongly
keeled, imbricate except those near hindlimb insertion
which are granular, much smaller than dorsal granules,
weakly keeled and somewhat conical; scales on poste-
iero-lateral aspect of thigh similar in shape to granular
scales on mid-body dorsum, marginally larger, becoming
smaller, and smooth posteriorly. Scales on dorsal aspect
of knee slightly smaller than those on thigh dorsal, weak-
ly keeled, those around knee large, tricarinate, imbricate;
scales on shank still smaller, strongly keeled, subimbric-
cate; dorsal aspect of foot predominantly bearing large
flattened, tricarinate, imbricate scales. Scales on ventral
aspect of thigh slightly larger than mid-body ventrals,
smooth and imbricate; scales on shank more or less simi-
lar in size to those on mid-body ventrals, smooth, imbric-
ate (Fig. 12A, B).

Fore-limbs and hind-limbs slightly long, slender (LAL/
SVL 0.14); (CL/SVL 0.17); digits long, with a strong, re-
curved claw, distinctly inflected, distal portions laterally
compressed conspicuously. Series of unpaired lamellae
on basal portion of digits, separated from unpaired, nar-
rower distal lamellae by a single large scale at the inflec-
tion; proximal lamellae series: 2-3-3-4-4 (right manus;
Fig. 13E), 2-3-4-6-5 (right pes; Fig. 13F), 2-3-3-4-3 (left
manus), 2-3-4-6-5 (left pes); distal lamellae series: 9-10-
11-12-10 (right manus; Fig. 13E), 9-9-11-11-12 (right
pes; Fig. 13F), 9-9-*11-10 (left manus), 9-10-12-11-12
(left pes). Relative length of digits (measurements in mm
in parentheses): IV (3.2) > III (3.00) > II (2.8) > V (2.6)
= I (2.06) (right manus); IV (4.2) > III (3.8) > V (3.5) > II
(3.2) > I (2.0) (right pes).
Tail entire, original, subcylindrical and slender (Fig. 12C, D). Dorsal scales on tail base weakly keeled, granular, similar in size and shape to granular scales on mid-body dorsum, gradually becoming larger, flattened, imbricate posteriorly, intermixed with enlarged, strongly keeled, distinctly pointed, conical tubercles; enlarged tubercles on the tail forming whorls six tubercles each on first 10 whorls, four in 11–14th whorls, rest of the tail with only paravertebral tubercles (Fig. 12C). Scales on ventral aspect of tail much larger than those on dorsal aspect, subimbricate, smooth only at anterior half of the tail, rest weakly keeled; median series slightly larger than rest, roughly subtriangular (Fig. 12D). Scales on tail base slightly smaller than those on mid-body ventrals, smooth, imbricate; a single enlarged, conical, and weakly keeled postcloacal spur on each side (Fig. 13D).

Colouration in life (Fig. 11B). Dorsal ground colour of head, body, limbs and tail brown; head speckled with black, fine dark vertical streak between left and right orbit; fine dark pre-orbital streak from nostril to orbit, two fine dark postorbital streaks just extending onto neck; labials yellow with lighter and darker bars. A discontinuous straw-coloured mid-dorsal stripe runs from occiput to tail; a small, dark ocellus is present just anterior to forelimb insertions; enlarged, spine-like tubercles on flank yellow. Tail lighter than body; dorsum of forelimbs mottled, hindlimbs with light and dark markings, digits with alternating indistinct dark and light bands. Ventral surfaces dull-white, underside of head and neck throat dirty yellow with fine back spots fading out between hindlimb insertions, fine black spots under forelimbs and sides of the belly; underside of the tail off white, without any dark markings. Pupil black, iris bronze, outlined by fine silver ring.

Variation and additional information from type series. Mensural, meristic and additional character states evaluation data for the type series is given in Tables 6–8 respectively. There are two male and two female specimens ranging in size from 32.1–34.1 mm. All paratypes resemble the holotype except as follows: inner postmentals bordered by mental, infralabial I outer postmental and two enlarged chin scales either side in NRC-AA-1185, NRC-AA-1187, and in BNHS 2815. Outer postmentals bordered by inner postmental, infralabial I & II, five enlarged chin scales on left and three on right side in NRC-AA-1186; outer postmentals bordered by inner postmental, infralabial I & II, four enlarged chin scales on left and five on right side in NRC-AA-1187; outer postmentals bordered by inner postmental, infralabial I & II and five enlarged chin scales on left and three on right side in NRC-AA-1186, outer postmentals bordered by inner postmental, infralabial I & II and three enlarged chin scales on left and four on right side in BNHS 2815; outer postmental separated from each other by three enlarged gular scales in NRC-AA-1186 and NRC-AA-1187. NRC-AA-1187 with original and complete tail, slightly longer than body (TL/SVL 1.31); NRC-AA-1186 with entire but partially regenerated tail, slightly longer than body (TL/SVL 1.30); NRC-AA-1185 with original but incomplete tail (TL= 21 mm); and BNHS 2815 with tail entirely missing. All paratypes agree with the holotype in overall
colouration except for BNHS 2815 which has more or less continuous middorsal stripe running from occiput to tail tip (Fig. 15).

**Distribution and Natural history.** The new species is currently known only from its montane type locality (1250 m elevation) in the Central Western Ghats, within a large property surrounded by coffee plantations with large trees and evergreen forest (Fig. 16C). The area is contiguous with Brahmagiri Wildlife Sanctuary, where the new species may occur. A few individuals were observed during sunny weather between ~0800–1400 hrs at a height of 2–4 m on the walls of a few buildings. The new species is sympatric with two congeners, *C. cf. schalleri* and *C. cf. wynadensis*. During the second trip to the type locality in late November, we observed new species in good numbers, predominantly on the building walls above 2–4 m height and sympatric with *C. cf. schalleri*. 

**Figure 16.** Habitats of the new species at their type localities: A *Cnemaspis tigris* sp. nov.; B *C. sakleshpurensis* sp. nov.; C *C. vijayae* sp. nov.. Photos by Akshay Khandekar.
Key to the Cnemaspis goaensis clade

1  Scales on upper arm and thigh tricarinate .................................................. 2
   – Scales on upper arm and thigh uniaricinate ........................................... 3
2  6–8 DTR, <22 MVSR, 7–12 PVT ................................................................. Cnemaspis amboliensis
   – 9–11 DTR, 26–30 MVSR, PVT irregularly arranged ................................ Cnemaspis vijayae sp. nov.
3  93–101 ventral scales ................................................................................ Cnemaspis rangaensis
   – >110 ventral scales .............................................................................. 4
4  Internasal scales absent, supranasals in strong contact with each other on snout; 23–26 MVSR .................. Cnemaspis sakleshpurensis sp. nov.
   – One or two internasal scales separating supranasals on snout; 27–32 MVSR............. Cnemaspis goaensis

Discussion

South Asian Cnemaspis continue to be discovered and named at an unprecedented rate in India and Sri Lanka – over 75% of the ~100 known species within the group have been described in the last two decades (Uetz et al. 2021). A combination of renewed survey effort, how little was previously known, and the use of molecular data has facilitated this taxonomic explosion. This includes the discovery of novel, deeply divergent lineages, as in the case of Cnemaspis tigris sp. nov. and C. vijayae sp. nov. (>12% sequence divergence from any known species), as well as new species allied to known species as in the case of C. sakleshpurensis sp. nov. (5.2% divergent from its sister species C. goaensis).

SAC are perhaps the oldest extant Indian squamate taxon with initial divergence in the Paleocene-Eocene in the Western Ghats, and are ancestrally cool adapted (Agarwal et al. 2020c; Pal et al. 2021). The three new species described in this paper are all from montane habitats (>800 m elevation), and while Cnemaspis tigris sp. nov. is from arid, rocky habitats on the Mysore Plateau, the other two species of the goaensis clade are from rainforest habitats in the Central Western Ghats. The mechanisms governing diversification within the mysiorniensis and goaensis clades are likely to be very different given the inherently patchy nature of cool habitats outside the Western Ghats.

The discovery of Cnemaspis tigris sp. nov., the seventh species of the mysiorniensis clade, and the 16th species from peninsular India outside the Western Ghats, is not surprising given the inherently patchy nature of the granite habitats they inhabit. Agarwal et al. (2020c) showed that granite boulder habitats on and just off the Mysore Plateau act as a climate refugia for at least these relatively small, ancestrally cool adapted geckos. The patchily distributed granite boulders and high elevation hills on and just off the plateau are isolated from each other by lower and warmer scrub habitats. Interestingly, almost each of the isolated montane (>800 m elevation) habitats we have surveyed have at least one or two deeply divergent, point endemic Cnemaspis (either a member each of the bangara and mysiorniensis clades or two divergent members of the mysiorniensis clade). Considering the vast suitable unexplored area on the plateau, it is likely that many species still remain to be discovered (Agarwal et al. 2020b, 2020c; Khandekar et al. 2020a).

The discoveries of Cnemaspis sakleshpurensis sp. nov. and C. vijayae sp. nov. from the central Western Ghats takes the number of species known from the goaensis clade to five and the number of Cnemaspis described from the Western Ghats to 49 (Pal et al. 2021). Sakleshpur now has a third Cnemaspis species described from its vicinity in addition to C. magnifica and C. schalleri (Khandekar et al. 2020b, 2021a). Cnemaspis species tend to have narrow distributions and most recently described species are known only from their type-localities. Many localities in the central and southern Western Ghats are known to host at least three species from divergent clades at a single locality (Khandekar et al. 2021a; Pal et al. 2021; Khandekar and Agarwal unpubl. data./ pers. obs.), each with specific microhabitat preference and/or different activity pattern. The two new species from the Western Ghats are each sympatric with a species from the C. schalleri clade and the C. wynadensis clade. While the latter clade includes mainly nocturnal and large bodied (SVL >50 mm) species, the former includes diurnal species which are similar in size to the new species (27–32 mm), and though they sometimes use the same microhabitats, members of the C. schalleri clade were observed by us at lower perch heights than Cnemaspis sakleshpurensis sp. nov. and C. vijayae sp. nov. Much more work is needed to understand microhabitat partitioning between different Cnemaspis species. Dedicated thorough sampling efforts throughout the Western Ghats in conjunction with molecular data and a consistent comparative morphological dataset are likely to more than double the current species diversity of the genus in the Western Ghats (e.g. Pal et al. 2021).

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