DESIGNATION OF A NEOTYPE FOR *Cnemaspis mysoriensis* (JERDON 1853) (SAURIA: GEKKONIDAE), WITH A REDESCRIPTION AND NOTES ON ITS DISTRIBUTION AND HABITAT

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The diurnal/crepuscular gecko *Cnemaspis mysoriensis* was described from Bangalore, Karnataka, India by Jerdon in 1853. The type specimens of this taxon are lost and there are no subsequent confirmed records of this species. We have rediscovered this distinctive gecko near its heavily urbanized type locality and, owing to instability in the taxonomy of Indian *Cnemaspis* in general and confusion regarding the identity of *C. mysoriensis* in particular, we designate a neotype for the taxon and provide a redescription. It is distinguished from all Indian congeners by its spine-like flank tubercles, homogenous dorsal scalation, low number of femoral pores (2 – 3) in males, and smooth ventral scales. All new records are from the Bangalore area, where this species is commensal with man. Its tolerance of disturbance and occurrence in an area not noted for endemism suggest that *C. mysoriensis* is more widespread than currently recognized.

Keywords: *Cnemaspis mysoriensis*, neotype, redescription, Karnataka, India.

INTRODUCTION

The genus *Cnemaspis* Strauch 1887 with at least 43 recognized species in South Asia and many others in southeast Asia (Grismer and Kin Onn, 2008) and Africa (Perret, 1986) is one of the most specious Indian gekkonid genera (Manamendra-Arachchi et al., 2007). The most recent, comprehensive review of this genus from peninsular India and Sri Lanka is by Manamendra-Arachchi et al. (2007). According to these authors, all but two of the species of *Cnemaspis* from Peninsular India and Sri Lanka is by Manamendra-Arachchi et al. (2007). According to these authors, all but two of the species of *Cnemaspis* from Peninsular India and Sri Lanka, *C. mysoriensis* (Jerdon 1853) and *C. littoralis* (Jerdon 1853), now possess recently-described name-bearing types.

*Cnemaspis mysoriensis* was originally described as *Gymnodactylus mysoriensis* by Jerdon (1853) based on an unspecified number of specimens from Bangalore, Karnataka. Subsequent 19th century reviewers of the Indian lizard fauna either explicitly mentioned that they had not seen material of this species ( Günther, 1864), or otherwise suggested this ( mere repetition of Jerdon’s description and no mention of any specimens examined; Theobald, 1876). Boulenger (1885), however, noted that he had examined several specimens collected by Beddome from the Shevaroys and Malabar, although he subsequently listed the distribution of the species as Mysore and Shevaroy Hills (Boulenger, 1890). Smith (1933) figured the pectoral girdle and hyoid apparatus of a species he identified as *C. mysorensis* [sic] and later (Smith, 1935), without specific localities, mentioned the range of this species as “Hills of Southern India as far north as lat. 13°; up to 3,000 feet.” Smith’s account was essentially repeated by Murthy (1985, 1990). According to Tikader and Sharma (1992) and Sharma (2002), *C. mysoriensis* is reported from Karnataka (Bangalore), Kerala (Malabar Hills), and Tamil Nadu (Anaimalai Hills), although the map provided by Sharma (2002:124) shows the range as restricted to the southern Western Ghats. There appear to be only three recent published records of this species, none of them taxonomic in nature: a note on the breeding behavior from around the type locality in Bangalore, Karnataka (Biswas, 2005), and records
from the Anaimalai Hills in Tamil Nadu State (Ishwar et al., 2001; Kumar et al., 2002). A report of *C. mysoriensis* from Thailand (Taylor, 1963) was subsequently referred to *C. kandiana* (Kelaart, 1852) by Dring (1979), although this re-identification is in error as well (Das and Leong, 2004; Bauer et al., 2007). The additional localities reported after Jerdon (1853) are at a considerable distance from and different in habitat to the type locality and it is unclear if the species involved was indeed *C. mysoriensis* or another congener. Most recently Manamendra-Arachchi et al. (2007) have claimed that no specimens of *C. mysoriensis* have been recorded since the original description. Clearly this is not the case, but unfortunately, it is not possible to identify with certainty any of the specimens recorded by Boulenger (1885) or Smith (1933) as *C. mysoriensis*. Further, it has been established that Jerdon’s type material of this species is not present in the Natural History Museum, London, or the Zoological Society of India, the two collections most likely to possess type material supplied by Jerdon (Smith, 1935; Das et al., 1998; Manamendra-Arachchi et al., 2007). Thus the status and validity of *Cnemaspis mysoriensis* remain in doubt.

The only unambiguously authentic natural history information on the species is from the original description in which Jerdon (1853) stated that he found “this small and very distinctly characterized species of Gecko at Bangalore, frequenting rocks and also entering outhouses.” Sharma (2002) appears to contain information identical to Tikader and Sharma (1992), and only mentions that “this is a mountain dwelling species recorded at Bangalore, frequenting rocks and also entering out-houses.” It is unclear whether they consider the species vulnerable at the type locality in Bangalore, or in the areas shown on their accompanying map.

In their recent review Manamendra-Arachchi et al. (2007), described three new species of Indian *Cnemaspis*, *C. monticola*, *C. australis*, and *C. nilagirica*, based on preserved specimens in the Natural History Museum, London which were among the syntypes of *C. tropidogaster* (Boulenger, 1885). The description of *C. nilagirica* is based on a single female specimen (BMNH 74.4.29.729) from the Nilgiri District, Tamil Nadu State, southwestern India, which was purchased from Colonel Beddome. According to Manamendra-Arachchi et al. (2007), this species is closely related to *C. mysoriensis*, with certain ambiguities related to the unavailability of comparative material.

Recently collected specimens of *Cnemaspis* from near the type locality, Bangalore, Karnataka, match the original description (Jerdon, 1853) well and provide an opportunity to designate a neotype for *C. mysoriensis* and redescribe this species. We argue that a neotype designation is justified as recent descriptions and taxonomic revisions of South Asian *Cnemaspis* (Mukherjee et al., 2005; Wikramasinghe, 2006; Bauer et al., 2007; Wikramasinghe and Munindradasa, 2007; Manamendra-Arachchi et al., 2007) have been in partial conflict with one another and a lack of material unambiguously referable to *C. mysoriensis* has resulted in a continued instability in the allocation of names to Indian members of the genus.

**MATERIAL AND METHODS**

Specimens collected were photographed in life, euthanized, fixed in formalin, and subsequently transferred to 70% ethanol. The following measurements were taken with Bruder Mannesmann Werkzeuge digital calipers (to the nearest 0.1 mm): snout-vent length (SVL; from tip of snout to vent), trunk length (TrunkL; distance from axilla to groin measured from posterior edge of forelimb insertion to anterior edge of hindlimb insertion), trunk width (TrunkW; maximum width of body), crus length (CrusL; from base of heel to knee); forearm length (ForeaL; from base of palm to elbow), tail length (TailL; from vent to tip of tail), head length (HeadL; distance between retroarticular process of jaw and snout-tip), head width (HeadW; maximum width of head), head height (HeadH; maximum depth of head, from occiput to underside of jaws), orbital diameter (OrbD; greatest diameter of orbit), nares to eye distance (NarEye; distance between anterior most point of eye and nostril), snout to eye distance (SnEye; distance between anterior most point of eye and tip of snout), eye to ear distance (EyeEar; distance from posterior corner of eye to anterior edge of ear opening), interaural distance (IntNar; distance between nares), interorbital distance (IntOrb; shortest distance between left and right superciliary scale rows).

Meristic data recorded were number of supralabial scales (SupraL), infralabial scales (InfraL), preocular pores (PrecP), femoral pores (FemP), and lamellae under digit I (LamI) and digit IV (LamIV) of the right manus and right pes. Scale counts and external observations of morphology were made using a Wild M5 dissecting microscope.

**Cnemaspis mysoriensis** (Jerdon 1853) (Figs. 1–12)

**Neotype** (here designated). Bombay Natural History Society (BNHS) 1830, an adult male, collected...
from Agara Village, approximately 15 km northeast of Bangalore [= Bengaluru] Karnataka State, India (12°56' N 79°09' E), on November 16, 2007, by Ishan Agarwal. We selected this well preserved, intact specimen because it clearly exhibits the typical characters of the taxon as mentioned by Jerdon (1853).

Other material. BNHS 1701 – 1705; from same locality as neotype, on October 25, 2003, by Ishan Agarwal; BNHS 1831 – 1835, collection data identical with those of neotype.

Description of neotype. The neotype (Fig. 1) is generally in good condition with an entire, unregenerated tail. SVL 28.2 mm. Head short (HL/SVL = 0.29), wide (HW/SVL = 0.70), not strongly depressed (HD/HL = 0.42), distinct from neck. Loreal region slightly inflated, canthus rostralis not prominent. Snout short (SE/HL = 0.44); longer than eye diameter (OD/SE = 0.44); scales on snout and canthus rostralis large, keeled, juxtaposed; slightly larger than those on forehead and interorbital region; occipital and temporal region with much smaller, granular scales intermixed with larger tubercles (Fig. 2). Eye small (OD/HL = 0.20); orbits with extra-brillar fringes (sensu Underwood, 1954); pupil approximately round in life; superciliaries not elongated. Ear opening deep, almost circular, small (EL/HL = 0.05); eye to ear distance slightly greater than diameter of eyes (EE/OD = 1.56) (Fig. 3). Rostral wider than long, completely divided by rostral groove; two unequal supranasals separated by a single internasal; two postnasals, slightly smaller than supranasals and approximately same size as scales on snout; rostral in contact with nostril, supralabial I, first supranasal, and internasal; nostril circular, surrounded by two supranasals, two postnasals, rostral; supralabial I in narrow contact with nasal; two rows of scales separate orbit

Fig. 1. Dorsal view of neotype of Cnemaspis mysoriensis (BNHS 1830).

Fig. 2. Dorsal view of head of neotype of Cnemaspis mysoriensis.

Fig. 3. Lateral view of head of neotype of Cnemaspis mysoriensis.
from supralabials. Mental enlarged, triangular, slightly wider than rostral; two pairs of postmentals, inner pair larger, subrectangular, separated by a single chin shield; outer postmentals small, about half the length of the inner; inner postmental bordered by mental, infralabial I, outer postmental and two enlarged chin shields; outer postmental bordered by infralabials I and II, inner postmental, three enlarged chin shields; undifferentiated scales separate infralabials from chin shields (Fig. 4). Supralabials to midorbital position 6, supralabials to angle of jaws 7; infralabials to angle of jaws 7; interorbital scale rows between left and right superciliaries in front of the eye 14, at midorbit 22.

Body relatively slender, not elongate (TRL/SVL = 0.43) without ventrolateral folds. Dorsal scales homogeneous, granular, keeled; with 2 – 3 rows of spine-like, keeled tubercles along lateral portion of the body beginning from temporal region and extending onto tail, approximately twice the size of adjacent granules; scales in the most medial parasagittal rows slightly smaller than those on more lateral portions of dorsum (Fig. 5). Ventral scales larger than dorsal, smooth, imbricate, slightly larger on abdomen than on chest (Fig. 6); mid-body scale rows across belly to lowest row of tubercles 21; gular region with still smaller, juxtaposed, smooth scales, anterior gular scales hexagonal, twice as large as the rest. Two precloacal pores and two femoral pores on either side; no preanal groove (Fig. 7).

Scales on palm and sole smooth, slightly elongate; scales on forelimb and dorsal aspect of hindlimb 3 – 4 times larger than dorsal granules, keeled, imbricate; those on inner surface of hindlimb slightly, smaller, keeled. Fore- and hindlimbs relatively short, slender; forearm and tibia short (FL/SVL = 0.15; CL/SVL = 0.17); digits elongate, clawed; subdigital scanners smooth, entire, except for two to three fragmented ones at base, unnotched; an enlarged scanner near proximal interphalangeal joint is more than twice the width of more distal lamellae; interdigital webbing absent. Lamellae 10 – 10 – 13 – 14 – 11 (right manus), 8 – 13 – 16 – 17 – 18 (right pes); relative length of digits (measurements in mm): IV (2.6) > III (2.5) > V (2.2) > II (2.1) > I (1.4) (right manus); IV (3.4) > V (3.2) > III (3.1) > II (2.3) > I (2.0) (right pes) (Fig. 8).

Tail cylindrical, flattened beneath, tail longer than snout-vent length (TL/SVL = 1.43); tail base distinctly swollen when viewed ventrally; tail covered above with large (much larger than those on the dorsum), posteriorly-pointed, subimbricate to imbricate, strongly keeled
scales and a series of 3 enlarged (about 2 – 3 times the size of adjacent scales), sharply pointed, conical, keeled tubercles along each side of an indistinct median furrow (Fig. 9); ventral scales larger, imbricate, smooth, with a series of three enlarged subcaudal scales of which the median series is larger, pentagonal (Fig. 10).

**Coloration (in preservative).** Dorsal background coloration mottled brown and white, with generally alternating, transversely-aligned, irregular, white and dark brown series of spots or broken cross-bars. Usually two pair of narrow white markings alternating with a single pair of enlarged, dark brown, paravertebral spots. Same pattern on flanks, but phase-shifted so that each paravertebral dark brown marking aligns with the white markings on the flank skin ventral to it. Eight pairs of dark paravertebral markings from posterior margin of parietal table to sacrum. A broad, cream to beige vertebral stripe extending from the parietal table to the tail base. Spine-like tubercles on flanks white.

Dorsum of head similar to body, with roughly transverse alternating brown and white markings. A single middorsal dark brown spot on parietal region anterior to vertebral stripe. Narrow brown bar extending across from supraciliary scales across midorbital region. Anterior rim of circumorbital scales white to pale yellow, continuous with whitish fronto-nasal cross-marking and irregular whitish canthal and loreal stripes. Temporal and rictal tubercules white. Two thin, irregular dark brown lines paralleling one another from posterior margin of orbit to ear opening. Labial scales cream; more posterior ones with increasingly large central patches of scattered brown speckling.

Limbs mottled like body, with roughly alternating brown and white markings on upper arms and thighs, becoming more distinctly banded on forearms and shanks; digits distinctly banded. Enlarged tubercles on limbs whitish.

Tail dorsum medium brown with alternating large white spots and smaller pairs of dark brown spots. Enlarged spine-like tubercles of tail white.

Body venter grayish-buff, semi-translucent, without dark speckling. Chin and throat cream to very pale yellow; pericloacal region opalescent. Ventral surfaces of limbs grayish-buff with dorsal markings fading towards ventral midline; distal portions of digits with scattered dark gray to brown pigmentation. Subcaudal scales pale grayish, with tiny brown speckles outlining the periphery of individual scales, most noticeably laterally.

**Coloration (in life).** Background color straw-brown (Fig. 11). Pale areas of head, neck, chin, and anterior forelimb insertion straw to mustard yellow, particularly bright on anterior circumorbital scales. Vertebral stripe and pale spots on tail beige to straw. Dorsal and lateral limb surfaces pale grayish-beige suffused with straw. Pale paravertebral and flank markings, and pale bands on manus and pes grayish-white. Flank and tail tubercles bright white. Ventral surfaces of chest, abdomen, and tail white.

**Variation.** See Table 1 for mensural features of the neotype and additional specimens. Most specimens have 7 supralabials (bilateral) to angle of jaws 7, except BNHS 1702 with 7 (left) – 8 (right), BNHS 1705 with 8 (left) – 7 (right), and BNHS 1703 and 1833 8 (bilateral). Most specimens have 7 infralabials (bilateral), except BNHS 1701 with 5 (left) – 6 (right), BNHS 1702 and 1703 with 7 (left) – 8 (right), and BNHS 1831 with 6 (left) – 7 (right). All males with two precloacal pores and two femoral pores on each side; females without pores.
TABLE 1. Mensural and Meristic Features of the Neotype and Additional Specimens of *Cnemaspis mysoriensis*

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Fig. 11. Lateral view of neotype of *Cnemaspis mysoriensis* in life. Note the circular pupil and yellowish head and throat markings.

Yellowish coloration on head, neck, chin, and forelimb insertion variable; absent in some individuals. Juvenile specimens have the vertebral stripe very prominent, a condition noted in all juveniles observed.

**Distribution.** As per our observations, there are confirmed reports of *Cnemaspis mysoriensis* only in and around Bangalore city (Agara Village, Indira Nagar, Kanakapura Village, Sarjapura) (Fig. 12). There are also
non-voucher visual reports of _Cnemaspis cf. mysoriensis_ from Mysore (Rohit Naniwadekar and Aaron Lobo, personal communication).

**Natural history.** The neotype (BNHS 1830) and other specimens (BNHS 1831 – 1834) were collected at 19:15 – 19:45, November 16, 2007, from among prop roots of a large _Ficus bengalensis_, from a rock wall (Fig. 13), and in dry cement gutters. BNHS 1701 – 1705 were collected on 25 October 2003 from similar habitats. Consistent with Jerdon’s (1853) observations, _C. mysoriensis_ is found as a commensal of man, living in houses and gardens in the heart of Bangalore city, as well as in less disturbed areas on the outskirts. This species shows high local abundance at certain microsites, for example among prop roots and trunks of fig trees (_Ficus_ ssp.), as well as in and around dilapidated houses or walls (Fig. 12).

Biswas (2005) recorded oviposition in _Cnemaspis mysoriensis_ around Bangalore city, with 20 – 30 eggs recorded from communal sites about 3.7 m above ground on the inner side of a moist bridge. One of us (IA) observed four communal oviposition sites, one in a crevice in a prop root of a large _Ficus bengalensis_ at a height of about 4 m, two others between 1.5 and 2 m beneath the bark of a _Ficus religiosa_, and the fourth less than a meter above the ground on a stone wall. All but the last clutch, which had only four eggs, had more than 20 eggs each. Two eggs collected from the _Ficus religiosa_ clutch were hatched, confirming the identity of the clutch.

The species has been observed throughout the day, with more sightings at dusk. At night, they are usually seen resting in crevices or among _Ficus_ roots, occasionally in exposed positions. Juveniles have been observed in mid October, while adults are seen year round. This species is sympatric with _Hemidactylus frenatus_ Schlegel 1836 and _H. triedrus_ (Daudin 1802). Other lizard species recorded from this area include _Geckoella collegalensis_ (Beddome 1870), _Hemidactylus brookii_ Gray 1845, _H. flaviviridis_ Rüppell 1835, _Eutropis carinata_ (Schneider 1801), _Calotes versicolor_ (Daudin 1802), _Psammophilus dorsalis_ (Gray 1831), and _Sitana ponticeriana_ Cuvier 1829.

**DISCUSSION**

Our specimens are fully consistent with the original description of Jerdon (1853; reprinted in Manamendra-Arachchi et al., 2007) in morphology and color (we do not interpret Jerdon’s absence of a mention of precloacal pores and his description as evidence of a lack of such pores in his specimen(s)). The features of _Cnemaspis mysoriensis_ permit its clear diagnosis from all other peninsular Indian congeners. The presence of spine-like tubercles on the flanks distinguishes it from _C. anaikattensis_ Mukherjee et al. 2005 (considered a junior synonym of _C. sisparensis_ by Manamendra-Arachchi et al., 2007) _C. australis_ Manamendra-Arachchi et al. 2007, _C. beddomei_ (Theobald 1876), _C. boiei_ (Gray 1842), _C. indica_ (Gray 1846), _C. nairi_ Inger et al. 1984, _C. ornata_ (Beddome 1870), _C. otai_ Das and Bauer 2000, _C. sisparensis_ (Theobald 1876), _C. wynadensis_ (Bed-
Homogeneous dorsal scalation differentiates it from
*C. goaensis* Sharma 1976, *C. gracilis* (Beddome 1870),
*C. heteropolis* Bauer 2002, *C. indraneilidasii* Bauer
2002, and *C. monticola* Manamendra-Arachchi et al.
2007, and a reduced number of femoral pores (2 – 3) in
males distinguishes it from *C. littoralis* (Jerdon 1853),
and *C. jerdonii* (Theobald 1868), both of which have 8
or more such pores. It may be distinguished from the
recently described *C. nilagarica* Manamendra-Arachchi et al.
2007, the most similar species and its supposed clos-
est relative (Manamendra-Aracchi et al., 2007) by its
smooth (vs. weakly carinate) ventral scales. Compari-
sions with other South Asian taxa (Sri Lanka, Andaman
and Nicobar Islands, Assam) may be made by reference
to Das and Sengupta (2000) and Manamendra-Arachchi
et al. (2007).

The distribution of *C. mysoriensis* remains poorly
documented. While it is likely that the record of Biswas
(2005) from Bangalore is genuine, records from the She-
varoys, Anaimalais, and other highland areas in South
India require verification. Material from these regions
should be reexamined in light of the revision of Mana-
mendra-Arachchi et al. (2007). Further, molecular meth-
ods need to be employed to clearly establish the genetic
discreteness of all of the currently recognized South
Asian *Cnemaspis*. This is especially crucial as prelimi-
nary findings based on mitochondrial and nuclear DNA
suggest that some of the recently described species in
the genus may not reflect evolutionary entities (Bauer
et al., unpublished data).

It appears unlikely that *Cnemaspis mysoriensis* is re-
stricted to the immediate area of Bangalore. This would
reflect an extreme degree of microendemism in a region
not typically regarded as biologically unique from its
immediately adjacent surroundings. Second, it would
imply both an extremely low vagility for the species and
a great tolerance for habitat disturbance and urbanization.
The combination of these two features is highly un-
likely as species that are insensitive to habitat modifica-
tion and degradation are nearly always good colonizers
and habitat generalists. Rather, it seems probable that
*C. mysoriensis* is more widely distributed in southern
Peninsular India than has been documented. Indeed,
despite their relative conspicuousness and diurnal activity
patterns, *Cnemaspis* ssp. remain among the most poorly
understood geckos in India and the group is in dire need
of a thorough revision including a comprehensive range-
wide collecting effort.

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