

VOLUME 10 ISSUE 2 2024

ISSN 2454 – 3055



**INTERNATIONAL
JOURNAL OF
ZOOLOGICAL
INVESTIGATIONS**

***Forum for Biological and
Environmental Sciences***

Published by Saran Publications, India



International Journal of Zoological Investigations

Contents available at Journals Home Page: www.ijzi.net

Editor-in-Chief: Prof. Ajai Kumar Srivastav

Published by: Saran Publications, Gorakhpur, India



ISSN: 2454-3055

Morphometric Analysis of the Indian Golden Gecko *Calodactylodes aureus* (Beddome 1870)

Chakrapani I.S.^{1*}, Jayappa K.², Srinivas N.³, Rajasekhar M.⁴ and Nagendra Prasad S.V.⁵

¹Department of Zoology, P.R.R. and VS Govt. College, Vidavalur, SPSR Nellore, Andhra Pradesh, India

²Department of Zoology, Govt. Degree College, Penugonda, Anantapur, Andhra Pradesh, India

³Department of Zoology, Govt. Degree College, Ramachandrapuram, EG, Andhra Pradesh, India

⁴Department of Zoology, S. V. University, Tirupati, Andhra Pradesh, India

⁵Department of Zoology, Govt. Degree College, Udayagiri, SPSR Nellore, Andhra Pradesh, India

*Corresponding Author

Received: 30th December, 2023; Accepted: 22nd March, 2024; Published online: 5th July, 2024

<https://doi.org/10.33745/ijzi.2024.v10i02.004>

Abstract: The Indian Golden Gecko, *Calodactylodes aureus* is a Schedule - 1 reptile, being found in interior pockets of the Eastern Ghat hill ranges. It is considered as a Gondwanan relic. Very less is known about its biology and ecology, despite a number of reports about its distribution. In the present study, morphometric analysis of *Calodactylodes aureus* is presented, from specimens found in Chittor and Nellore district of Andhra Pradesh, India. Further research is needed to know its complete biology.

Keywords: Calodactylodes, Golden gecko, Eastern ghats, Morphometric analysis

Citation: Chakrapani I.S., Jayappa K., Srinivas N., Rajasekhar M. and Nagendra Prasad S.V.: Morphometric analysis of the Indian golden gecko *Calodactylodes aureus* (Beddome 1870). Intern. J. Zool. Invest. 10(2): 36-42, 2024.

<https://doi.org/10.33745/ijzi.2024.v10i02.004>



This is an Open Access Article licensed under a Creative Commons License: Attribution 4.0 International (CC-BY). It allows unrestricted use of articles in any medium, reproduction and distribution by providing adequate credit to the author (s) and the source of publication.

Introduction

Indian golden gecko, *Caulodactylodes aureus* belongs to the family Gekkonidae of the order Squamata (Kluge, 1993). After its discovery by Beddome in 1869 (Beddome, 1870), there was a silence among Wild Life Biologists about the Indian Golden gecko till its rediscovery by Daniel and Bharat Bhushan in Tirumala hills during 1985 and 1986 (Daniel *et al.*, 1986). Its presence from Seshachalam biosphere Reserve was reported by

Nandakumar *et al.* (2000). Then onwards, there have been reports of its existence only from different areas of South India (Dutta *et al.*, 2005; Rajasekhar and Nandakumar, 2007; Javed *et al.*, 2007, 2017; Chettri and Buhpathy, 2010; Sreekar *et al.*, 2010; Rajasekhar and Rajarami Reddy, 2010; Dilip Venugopal, 2010; Rajasekhar and Chakrapani, 2012; Amarnath Reddy *et al.*, 2013; Chakrapani *et al.*, 2014, 2023; Bharati *et al.*,

2017) and nothing is known about its biology.

The earliest descriptions of this animal were of Boulenger (1885) and Smith (1935). Though it is least concerned as per the IUCN red list (2023), the Indian Golden gecko is considered as an endangered animal, and hence was included in Schedule – I of the Indian Wild Life Act (1972). Research about its biology, ecology, reproductive behavior, life cycle etc., was very limited. Amidst reports that lizard density has been falling across the globe (Sinervo *et al.*, 2010), we tried to focus on its existence and habitat in Chittoor and SPSR Nellore districts, Andhra Pradesh, India. Here we give a brief description of the animals we observed in the locations surveyed, followed by morphometric analysis.

Materials and Methods

Study area included Chittoor and SPSR Nellore districts of Andhra Pradesh, India. The survey covered rocky terrain and exposed barren rock present in thick forests, wherein the Indian Golden Gecko is found. Such a rupicolous habitat is ideal for the propagation of its progeny in predator free environment. The study area also included Seshachalam Biosphere Reserve and Sri Venkateswara National Park, and Velikonda range of Hills which form the geographic area of prime focus in this survey.

Chittoor district is located between 12°37' to 14°8' N latitudes and 78°3' to 79°55' E longitudes at a mean elevation of 333.75m from sea level. The region is mostly arid throughout the year. Summer temperature raises to as high as 44 °C in the eastern parts of the district and 36°C - 38°C in the western parts. Winter temperatures range between 16°C - 18°C in the eastern parts and 12°C -14°C in the western. Annual rainfall is about 918.1 mm.

Nellore District is the Southern most Coastal District of Andhra Pradesh. It lies between 13°30' and 15°6' of the Northern latitude and 70°5' and 80°15' of the Eastern Longitude. It is bound on the north by Prakasam District, on the east by Bay of Bengal, on the south by Chittoor District and

Chengalpattu District of Tamilnadu and on the west by Velikonda Hills which separate it from Kadapa District. The eastern half of the District adjoining coastal belt is fairly fertile and the western half of the district has low elevation towards west with large track of low shrub jungles diversified with rocky and stony plains. Maximum temperature ranges between 40-45°C during May, which is the hottest month in summer. Minimum temperature ranges from 17-30°C during December.

Seshachalam Biosphere Reserve and Sri Venkateswara National Park are located at high altitude when compared to down hill areas of above mentioned two districts. All the hills were elevated from 400 to 1300 m from sea level. The forest cover spreads over 4,500 square Kilometres and houses many endemic and scheduled animals. The temperature is usually less by 6-8 °C when compared to down hills and also rain fall is high. Humidity is also high at majority of the uphill location in both the districts. Therefore it became a lively residence for native flora and fauna.

Conventional distance sampling method was adopted for this survey. The expanded terminal phalanges with large trapezoidal penultimate and distal expansions were considered as the key character to identify Golden Gecko (Smith, 1935). Colour is the basis for sexual dimorphism as noticed. When we go close to the animal, round snout which is longer than the distance between the eye and ear-opening, strong Supraorbital and canthal ridges, single frontal, vertical pupil, oblique split ear opening, number of upper and lower labials, rostral characteristics were clearly visible and thoroughly observed for identification.

At each site, one Golden gecko was caught non-invasively by noosing. Morphometric measurements were taken using a standard vernier calipers. During this process every care was taken, so that the animal would not be harmed. Measurements like SVL, FL, TL etc., were taken, and then the animal is released safely into its native habitat. The observations were statistically analyzed.

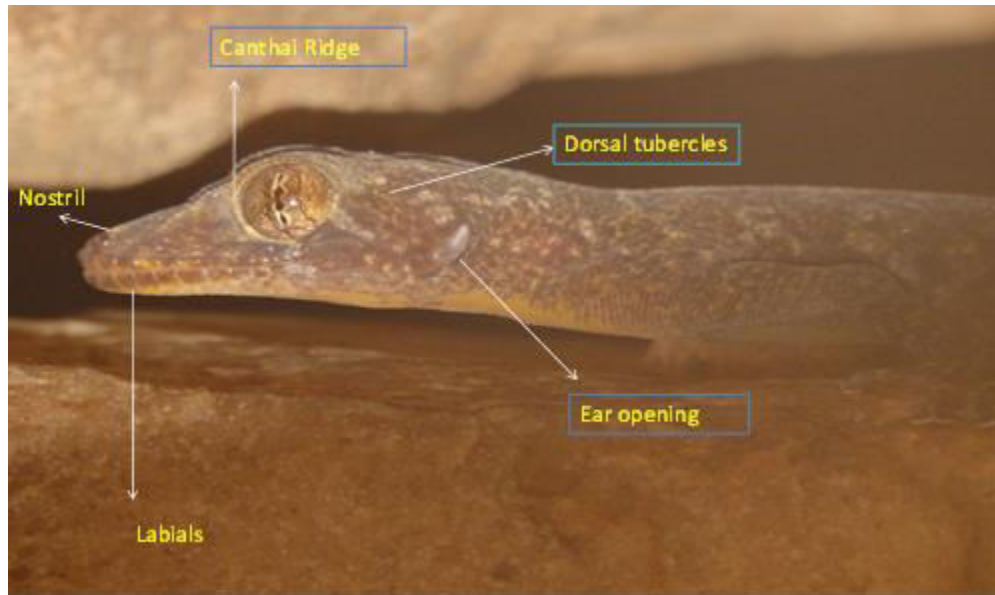


Fig. 1: The Golden Gecko *Caulodactylodes aureus* and its identification features.



Fig. 2: Expanded terminal phallanges with retractile claws.

Results and Discussion

Like other geckos, Golden gecko has a flattened body with large head, and distinct oviform neck. Dorsal surface of the body is covered with very small granules interspersed by large, smooth, round tubercles (Fig. 1). Ventral surface of the body is covered with squarish scales juxtaposed against each other. Tail is long and slender, covered with large squarish scales (Smith, 1935).

We noticed a strong rounded supraorbital and prominent canthal ridge. Pupil and the ear opening is vertical (Fig. 1). Snout is longer than the distance between ear opening and eye. Head is

covered with small granules. These granules are reported to be the largest on the canthal ridge (Smith, 1935, Javed *et al.*, 2007), but such differentiation could not be found in specimens observed by us. Golden Gecko has a four-sided rostral. We could observe a concavity at its posterior border. Nostril is pierced between the rostral, three nasals and the first labial as described by Smith (1935). 12 supra and infralabials are present. Mental is equal in size to the adjacent labials. We could not observe regular chin shields, but small granules are present on the gular region.



Fig. 3: Golden Gecko camouflaging with the surroundings.

Limbs are long, slender and pentadactyle. Each toe/digit appears like a hoof. Digits have large penultimate and distal expansions which are trapezoid. Each of these expansions has two large plates beneath, separated by a longitudinal groove. A retractile claw is observed in all the digits (Fig. 2).

Colour of the body is reportedly golden yellow in colour (Fig. 1), but we find that the golden geckos camouflage (Fig. 3) with the surroundings. We observed brown, black and white shades. Dorsolateral sides of the specimens exhibit golden yellow colour (De Silva, 1994, 1995). Adult females have mixed colours with dark brown and yellow.

Morphometric Analysis:

One Golden gecko at each site was caught non-invasively by noosing, and morphometric measurements were taken using a standard vernier callipers. During this process every care was taken, so that the animal would not be harmed. Measurements like SVL, FL, TL etc., were taken, and then the animal is released safely into its native habitat. The morphometric details are presented in Tables 1 and 2. The mean SVL was 56 mm, mean Tail length was 52 mm. The other key morphometrics include distance between eyes (6 mm), between eye and ear (3.5 mm), between nostril and eye (4.5 mm) and distance between

nostrils (2 mm). Ten locations were chosen for morphometric analysis.

Unlike *Hemidactylus* species, Golden gecko has a lengthy tail. This helps in swift running on rupicolous habitat, competing with rock or garden lizards for prey insects. A long tail would certainly have a survival value in such a habitat, because it also helps steer the movements. Tail movement displays may help in communication about prey and predators. They may also help communication between mates.

We observed that animals in Chittoor district are larger (mean total body length 109 mm) in size than those of SPSR Nellore district (mean total body length 107.4 mm) as represented in Table 1. We did not attempt to study clinal variation in morphometrics of Golden gecko, as it is out of scope of the present work. Variation in the shape of different structures can be explored to throw light on latitudinal variations in the anatomical and morphological correlates of Golden gecko, which will certainly help understand the kinematics of this animal and in turn the conservation efforts. Individuals in different parts may also exhibit ecomorphological specialization, which needs further study. The morphometric analysis would help future researchers as an index for identification and also to study the impact of environment on morphometrics at different habitats.

Table 1: Morphometric analysis of the Indian golden gecko *Calodactylodes aureus*

S. No	Body Division	Location of the Animal										Average (in mm)	S.D
		Kylasakona	Ardhagiri	Talakona	Boya konda	Utlavanipalem	Mallem konda	Penchalakona	Konamalle swaram	Vempallitoka	Udayagiri		
1	Head - Width	8.6	8.5	8.7	8.6	8.2	8.3	8.3	8.6	8.6	8.4	8.5	0.168655
2	Eye diameter	2	2.9	2.6	3.2	2.9	3.2	3.3	2.6	3.3	2.8	3	0.407704
3	Ear opening (W)	1.1	1.4	1.3	1.6	1.5	1.4	1.2	1.1	0.9	1.5	1.3	0.221108
4	Ear opening (L)	1.1	2.2	1.8	2.1	1.6	1.9	2.2	2.3	1.3	1.7	1.8	0.402216
5	Distance b/w eyes	6.1	6.2	5.7	6.3	5.8	6.2	5.8	5.8	5.9	6.4	6	0.248551
6	Distance b/w eye & ear	3.6	3.5	3.6	3.2	3.6	3.4	3.6	3.7	3.3	3.3	3.5	0.168655
7	Distance b/w nostril & eye	4.3	4.6	4.7	4.2	4	4.8	4.9	4.8	4.4	4.4	4.5	0.296086
8	Distance b/w nostrils	2.1	2	1.8	2	1.8	2.1	2.2	2.1	2.1	2	2	0.131656
9	No. of labials (Upper & Lower)	12	12	12	12	12	12	12	12	12	12	12	-
10	Neck (W)	3.9	3.7	3.6	3.8	3.8	3.8	3.8	4	3.8	3.9	3.8	0.11005
11	Abdomen	9.9	9.6	10.1	10.2	10.4	10	9.7	10.3	9.5	10.4	10	0.328126
12	Forelimb (Humerus)	6.8	6.8	7	6.8	7.2	7	7	6.7	7.3	7.2	7	0.204396
13	Forelimb (Radio-Ulna)	7	7	6.6	6.8	7.1	6.9	7.2	6.9	7.2	7.1	7	0.18738
14	Hind limb (Femur)	8.8	9	8.7	9.1	8.9	9.2	9.1	8.8	8.9	9.2	9	0.176698
15	Hind limb (Tibia)	9	8.9	9.2	9.3	9	8.6	8.8	8.7	9.1	9.3	9	0.242441
16	Fore limb digit 1	2.2	2	2	1.9	1.7	2.2	2	2	1.9	2.1	2	0.149071
17	Fore limb digit 2	3.1	3.2	3	3	2.8	3	3.2	2.9	3	2.8	3	0.141421
18	Fore limb digit 3	3.6	4	3.8	4.3	4.2	3.8	4.1	3.9	4.3	4	4	0.23094
19	Fore limb digit 4	5.4	5.4	4.7	4.9	5	5	5.1	5.1	4.8	4.6	5	0.266667
20	Fore limb digit 5	3.8	4.2	3.7	4.2	3.8	4	4	4.1	4.2	4.4	4	0.222111
21	Hind limb digit 1	1.9	1.7	2.3	1.9	2	2	2	2.2	1.9	2.1	2	0.169967
22	Hind limb digit 2	2.8	2.8	3	2.8	3.1	3.2	3.2	2.8	3	3	3	0.163639
23	Hind limb digit 3	5	5.4	5	4.9	4.7	5.1	5.2	4.9	4.4	5.3	5	0.292309
24	Hind limb digit 4	6.4	6.4	6.6	6.5	6.8	6.5	6.4	6.2	6.4	6.8	6.5	0.188562
25	Hind limb digit 5	5.4	5.1	4.9	5.2	5.2	5.1	5.1	5.2	4.8	4.9	5	0.179196
26	SVL	55	54	56	57	54	59	58	56	57	55	56	1.66333
27	Tail	50	51	53	56	54	52	49	50	50	55	52	2.403701
28	Total Body length	109	108	110	110	108	109	110	106	108	104	108	1.932184

Table 2: Morphometric details of the Indian Golden gecko, *Calodactylodes aureus*

S. No.	Part	Measurement (mean values in mm)
1	Head	8.5 W
2	Eye	3
3	Ear Opening	1.3W & 1.8 L
4	Distance between eyes	6
5	Distance between eye & ear	3.5
6	Distance between nostril & eye	4.5
7	Distance between nostrils	2
8	Labials	12 Upper & 12 lower
9	Neck	3.8 W
10	Abdomen	10W
11	Fore limb length	7 HL & 7 RUL
12	Hind limb length	9 FL & 9 TL
13	Fore limb digits	2,3,4,5,4
14	Hind limb digits	2,3,5,6,5,5
15	SVL	56
16	Tail	52
17	Total body length	108
W-width; L-Length; HL- Humerus Length; RUL-Radius-Ulna Length; FL- Femur Length; TL- Tibial Length; SVL-Snout Vent Length		

Acknowledgements

The authors are highly thankful to the forest department officials who helped us travel across thick forests of Seshachalam.

References

- Amarnath Reddy Y, Indira P, Pullaiah T, Sadasivaiah B, Raja Kullai Swamy K and Sandhya Rani S. (2013) Range extension of Indian golden Gecko *Calodactylodes aureus* in Andhra Pradesh, India. Reptile Rap. 15: 41-42.
- Beddome RH. (1870) Descriptions of some new lizards from the Madras Presidency. Madras Monthly J Med Sci. 1: 30-35.
- Boulenger G.A. (1885) Catalogue of the lizards in the British Museum (natural History). Vol. I. British Museum (Natural History), London XII+463, pp: 32.
- Bharati D, Hemavathi B and Sobharani A. (2017) Conservation of fauna of Seshachalam Biosphere Reserve. Int J Recent Innovative Trends Computers Communication 5(7): 361-368.
- Chakrapani IS, Rajasekhar M, Chanikyudu B and Janardana Rao R. (2014) Status survey of the Indian Golden Gecko *Calodactylodes aureus* in YSR Kadapa and SPSR Nellore districts, Andhra Pradesh, India. World J Zool 9(1): 21-27.
- Chakrapani IS, Rajasekhar M, Indira Priyadarsini A, Bhaskar LVKS, Srinivas N and Jayappa K. (2023) Does egg clutch size determine the abundance of Indian golden gecko *Calodactylodes aureus* (Beddome 1870)? An example from SPSR Nellore District, Andhra Pradesh, India. Intern J Zool Invest. 9(1): 485-493.
- Chettri B and Buhpathy S. (2010) Three little known reptiles from the Araku Valley, Eastern Ghats with notes on their distribution. J Threatened Taxa 2(8): 1109-1113.
- Daniel JC, Bhushan B and Sekar AG. (1986) Rediscovery of the golden gecko *Caulotactylus aureus* (Beddome) in the Eastern Ghats of Andhra Pradesh. J Bombay Natural History Soc. 83: 15-16.
- De Dilva A. (1994) An introduction to the herpetofauna of Srilanka. Lyriocephalus 1: 3-19.
- De Silva A. (1995) The reptiles of Srilanka, a checklist and common names, part 1: Testudines, Crocodilia and Lacertilia. Lyriocephalus 2: 25-33.
- Dilip Venugopal P. (2010) An updated and annotated list of Indian lizards (Reptilia: Sauria) based on a review of distribution records and checklists of Indian reptiles. J Threatened Taxa 2(3): 725-738.
- Dutta SK, Mohanty B and Mohapatra PP. (2005) Niyamgiri unraveled. Sanctuary Asia Magazine 56-59.
- Indian Wildlife (Protection) Act (1972) Government of India, Chapter VII, Schedule II.
- IUCN. (2013) IUCN Red List of Threatened Species.

- Javed SM, Mithun Raj and Kumar S. (2017) Predicting potential habitat suitability for an endemic gecko *Calodactylodes aureus* and its conservation implications in India. *Tropical Ecol.* 58(2): 271-282.
- Javed SM, Waran A and Tampal F. (2007) On the occurrence of golden gecko *Calodactylodes aureus* (Beddome, 1870) in Papikonda Hills, Eastern Ghats, Andhra Pradesh, India. *J Threatened Taxa* 2(1): 639-643.
- Kluge AG. (1993) Geckonid lizard taxonomy. *Int Gecko Society San Diego*, 245.
- Nandakumar NV, Vijayalakshmi KM, Rajasekhar M and Ameer Basha M. (2000) Survey of Golden Gecko habitat – Analysis and conservation in Tirumala Hills. *Ecol Environ Conserv.* 6(4): 435-439.
- Rajasekhar M and Chakrapani IS. (2012) Occurrence of *Calodactylodes aureus* in Chittoor district of Andhra Pradesh, India. *Int J Comp Anim Physiol.* 30: 116-124.
- Rajasekhar M and Nandakumar NV. (2007) A new finding on the occurrence of Golden Gecko (*Calodactylodes aureus*) in the rock boulders near Vellore town. *Bioscan* 2(1): 61-62.
- Rajasekhar M and Rajarami Reddy G. (2010) Occurrence and ecology of *Calodactylodes aureus* in Sri Venkateswara Sanctuary and Nallamalai Hills of Andhra Pradesh, India. *Emerging Trends Modern Biol Centre Biotechnol Acharya Nagrjuna University Guntur* 234-244.
- Sinervo B, Méndez-de-la-Cruz F, Miles DB, Heulin B, Bastiaans E, Villagrán-Santa Cruz M, Lara-Resendiz R, Martínez-Méndez N, Calderón-Espinosa ML, Meza-Lázaro RN, Gadsden H, Avila LJ, Morando M, De la Riva JJ, Victoriano Sepulveda P, Rocha CF, Ibargüengoytia N, Aguilar Puntriano C, Massot M, Lepetz V, Oksanen TA, Chapple DG, Bauer AM, Branch WR, Clobert J and Sites JW Jr. (2010) Erosion of lizard diversity by climate change and altered thermal niches. *Science* 328(5980): 894-899.
- Smith MA. (1935) The Fauna of British India, including Ceylon and Burma: Reptilia Amphibia Vol. II. Sauria. Taylor Francis, London, pp. 440.
- Sreekar R, Srinivasulu C, Seetharamaraju M and Aditya Srinivasulu C. (2010) Selection of egg attachment sites by the Indian golden Gecko *Calodactylodes aureus* (Beddome, 1870) (Reptilia: Geckonidae) in Andhra Pradesh, India. *J Threatened Taxa* 2(11): 1268-1272.