



A REVIEW OF THE DISTRIBUTION AND CONSERVATION STATUS OF *Chamaeleo zeylanicus* LAURENTI, 1768 (REPTILIA: CHAMAELEONIDAE) IN NORTH-WESTERN SRI LANKA

Sectional Editor: Aaron Bauer

Submitted: 15 June 2009, Accepted: 05 July 2009

D. M. S. Suranjan Karunarathna^{1,3}, M. A. J. Saman Nawaratne¹ and A. A. Thasun Amarasinghe^{2,4}

¹IUCN – Sri Lanka Country office, No: 53, Horton place, Colombo 07, Sri Lanka

²Taprobanica Nature Conservation Society, 146, Kendalanda, Homagama, Sri Lanka

Corresponding author: ³ dmsameera@gmail.com and ⁴ aathasun@gmail.com

Abstract

In this paper we discuss the current status of *Chamaeleo zeylanicus* including some observations related to the ecology, behaviour, current distribution pattern and conservation issues, based on the north-western population of the species in Sri Lanka. The area from Puttalam to Wanatha-Villuwa has the highest abundance of this species in Sri Lanka. They are deliberately killed by people in this area due to mythical beliefs and folk stories related to this species. Unplanned agricultural practices also destroy their habitats. The Sri Lankan *C. zeylanicus* population may be different from Indian populations and their taxonomic status has not been investigated.

Keywords: Chamaeleon, Behaviour, conservation status, distribution, Sri Lanka

Introduction

The family Chamaeleonidae consists of over 180 species belonging to six genera (Gray, 1865; Pough *et al.*, 2004; Reptile Database, 2009), of which more than 56 species belong to the genus *Chamaeleo* (Halliday & Adler, 2002; Pough *et al.*, 2004; Tilbury & Tolley, 2009). The genus *Chamaeleo* is restricted to the Old World and most of them are distributed in Madagascar and Africa,

up to 4200 m above sea level (Halliday & Adler, 2002). *Chamaeleo zeylanicus* is found in Sri Lanka, India and Pakistan in South Asia (Boulenger, 1890; Das, 1994; Das & de Silva, 2005; Deraniyagala, 1953; Smith, 1935). *Chamaeleo zeylanicus* is not uncommon in India, particularly in Tamil Nadu, but it is rare in Sri Lanka (Daniel, 2002; Pethiyagoda, 1997). This species is also listed as near threatened

(NT) (IUCNSL & MENR, 2007). The chameleon is locally known as “*Bodiliya*” or “*Bodilima*” in Sinhala and as “*Kombi*” or “*Onthi*” in Tamil (Das & de Silva, 2005; Deraniyagala, 1931, 1953; Karunaratna *et al.*, 2005).

This species captures its prey by springing out its long, sticky tongue (Karunaratna *et al.*, 2005). The prey becomes attached to the sticky surface of the tongue and it is drawn back into the mouth (fig. 1A&B) with the help of the spoon-like anterior tip of the tongue (Das & de Silva, 2005; Trench, 1912; Wainwright *et al.*, 1991).

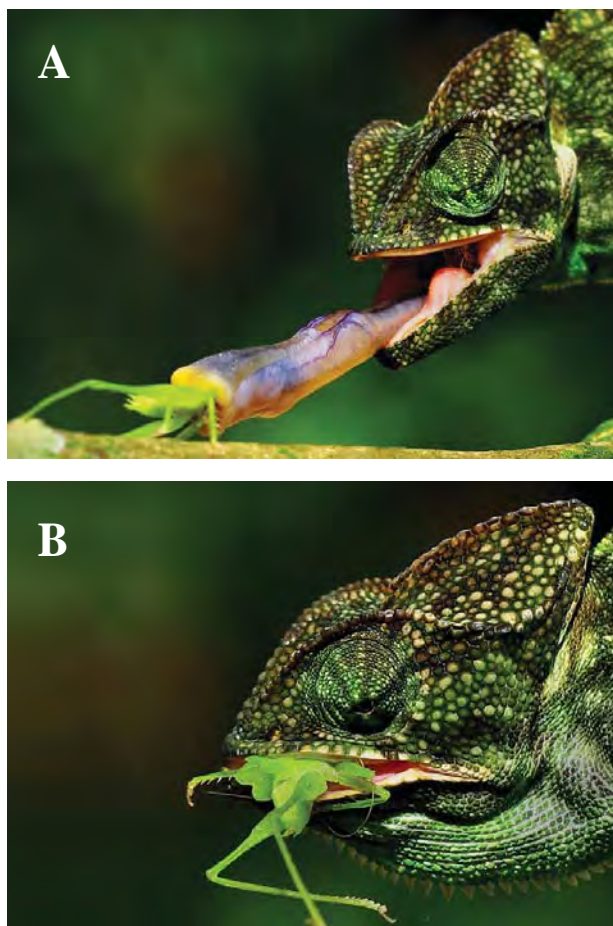


Fig. 01A,B: Tongue projection of *C. zeylanicus*

This arboreal lizard has remarkable abilities of camouflage and is also able to exhibit extreme colour changes (Durve & Sharma, 1975). The primary purpose of colour change is for communication with other chameleons and for controlling body temperature by changing to dark colours to absorb heat (Barry, 1936; Boulenger, 1885; Walton & Bennett, 1993). Strangely, they do not choose the background colour and may not even be able to perceive colour differences. They are usually pale green (fig. 2A), dark green (fig. 2B) or yellowish brown (fig. 2C) in colour with dark bands.



Fig. 02A,B&C: Body colour differences of *C. zeylanicus*

C. zeylanicus clings to the branches of trees and bushes with the help of its prehensile tail (fig. 3) and opposable claws (fig. 4) (Acharya, 1933; Gaur, 2004).

Chameleons are mainly insectivorous but they also prey on small vertebrates such as small amphibians, skinks and geckos (Singh, 1984). Chameleons are generally slow moving and sluggish (Deraniyagala,

1953; Pethiyagoda, 1997 ; Smith, 1935). The chameleon has large eyes covered by thick granular lids, except for the small transverse slit of the pupil. It can move its eyes independently and they have a greater range of movement than the eyes of other lizards (Deraniyagala, 1953; Wisumperuma, 2001). In Sri Lanka, a fully-grown chameleon may be >375 mm in total length. Generally an adult female chameleon lays about 10 – 31 eggs (Halliday & Adler, 2002; Singh *et al.*, 1984). The eggs are elliptical and soft shelled. They are white in colour, about 15 – 22 mm in total length and 9 – 12 mm in breadth (Deraniyagala, 1953; Whitaker, 1978). In this paper we discuss some observations related to their ecology, behavior, current distribution patterns and conservation, based on the north-western population of Sri Lanka



Fig. 03: The prehensile tail of *C. zeylanicus*



Fig. 04: Opposable claws of *C. zeylanicus*

Locations and Habitats

Wanata-Villuwa (8° 08' 44.65" N and 79° 50' 40.76" E) is located between Eluwankulama and Puttalama, in Puttalam District. Wanata-Villuwa lies in the dry zone of the North-western lowland of Sri Lanka, and has a moderately hot and dry

climate. The vegetation type has been classified as tropical dry mixed evergreen forest (Gunatilleke & Gunatilleke, 1990). The mean annual temperature at Puttalam is 28 °C. The average relative humidity is 75% and highest humidity is recorded in December. The annual rainfall for the area is about 1000 – 1500 mm. The vegetation is mainly composed of tree species like *Terminalia arjuna* (kumbuk), *Diospyros ebenum* (kaluwara), *Drypetes sepiaria* (weera), *Feronia limonia* (diul), *Manilkara hexandra* (palu) and *Mischodon zeylanicus* (tammenna). Common shrubs include *Acanthospermum hispidum* (nerenchi), *Carissa spinarum* (karamba), *Cassia auriculata* (ranawara), *Ceiba pentandra* (wal kapu), *Dichroatachys cinerea* (andara), *Zizyphus rugosa* (eraminiya), *Lantana camara* (baloliya), and *Eupatorium odoratum* (podisingchomaran).

Methodology

All the scale counts were taken using a 10 x Tricle brand® hand lens and external measurements were taken to the nearest 0.1 mm using Tricle brand® manual vernier calipers. Photographs were taken with Cannon EOS-40D and DSC H9 Sony digital cameras. Altitudes are given in meters above mean sea level (alt.); geographic co-ordinates are derived from the inch-to-the-mile topographical map series of Sri Lanka Survey Department. The chameleons were kept in captivity in a glass tank (100cm x 50cm x 60cm) and observed for 10 days before being released in their original habitat.

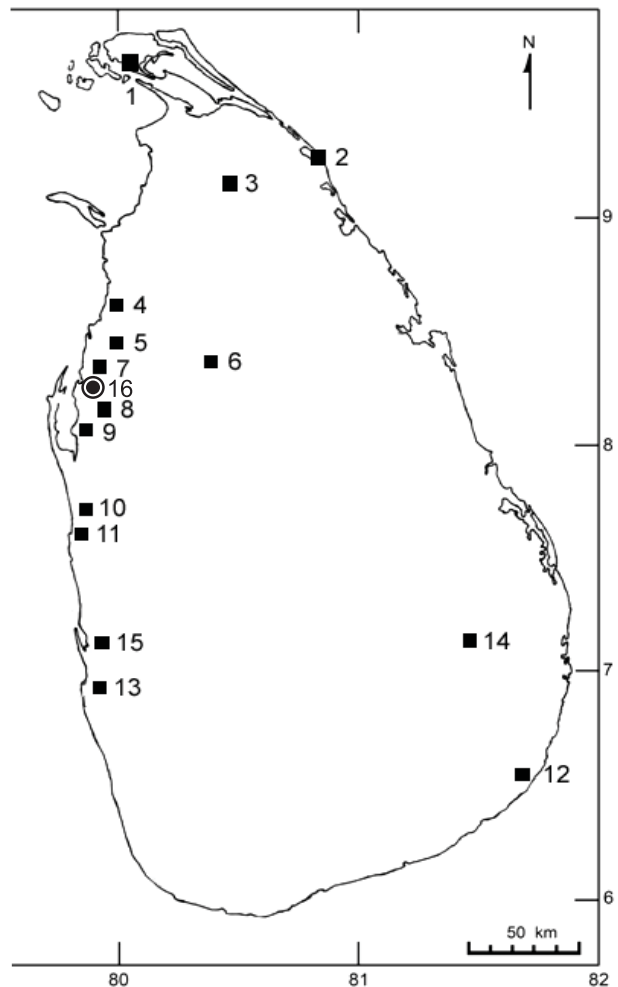
External measurements: **SVL**, snout-vent length (distance between tip of snout and anterior margin of cloaca); **TAL**, tail length (distance between posterior margin of cloaca and tip of tail); **HL**, head length (distance between posterior edge of mandible and tip of snout); **HW**, head width (maximum width of the head at the angle of gape); **HD**, head depth (maximum height of the head at the mid-orbital position); **AG**, axilla-groin (distance between axilla and groin); **BW**, body width (maximum width of the body at the inter rib region); **BD**, body depth (maximum height of the body between vertebral and mid ventral); **SN**, snout length (distance between tip of snout and anterior margin of nostril); **SO**, snout to orbit (distance between tip of snout and anterior margin of orbit); **SFC**, snout to crest (distance between tip of snout and anterior margin of crest); **SEC**, snout to end of crest (distance between tip of snout and posterior margin of crest); **ND**, nostril diameter (maximum diameter of nostril); **ED**, eye diameter (maximum diameter of eye); **OD**, orbit diameter (maximum

diameter of orbit); **PAL**, palm length (taken from posterior most margin of palm and tip of longest finger); **FOL**, foot length (distance between heel and tip of longest toe, with both foot and tibia flexed); **UAL**, upper arm length (distance between axilla and angle of elbow); **LAL**, lower arm length (distance between elbow to wrist, with both upper arm and palms flexed); **FEL**, femur length (distance between groin and knee); **TBL**, tibia length (distance between knee and heel with both tibia and tarsus flexed); **IOW**, inter orbital width (least distance between the upper margins of orbits); **IN**, inter nasal width (least distance between the upper margins of nostrils) and **TBW**, width of tail base (most diameter of the tail base).

Scale counts: **SUP**, supralabials (from the first scale anterior to that at angle of gape); **INF**, infralabials (from first scale posterior to mental, to angle of gape); **OS**, orbit scales (around the orbital); **IOS**, inter orbital scales (between inter orbital); **SNS**, snout to nasal scales (from first scale posterior to rostral, to front of the nasal); **SCS**, snout to crest scales (from first scale posterior to rostral, to front of the crest); **INS**, inter nasal scale (between internasal); **VS**, ventral scale (from first scale posterior to mental to last scale anterior to vent); **TS**, tail scales (from first scale posterior to vent to end of the tail); **MS**, mid body scales (centre of mid-dorsal row forwards and downwards across ventrals); **CR**, canthus rostralis (from rostral scale along scale row passing over nostril to posterior end of supraciliary ridge); **EN**, eye to nasal scale (from first scale posterior to nasal to last scale anterior to eye); **CS**, crest scales (first scale to last of mid-dorsal row of the crest); **GS**, gular scales (from first scale posterior to mental, to end line of the mandible bone).

Observations

Observations were made in “Thirikka-pallama” village (alt: 5 m a.s.l.; 8° 08' 44.65" N and 79° 50' 40.76" E) 30 km north of Puttalam town and 3 km west of the Puttalam – Eluwankulama road, in August 2008. This area falls under the “Wanata Villuwa” Divisional Secretarial area. The average ambient temperature and the relative humidity during the study period was 32 °C and 56% respectively. The floristic community canopy in this area is less than 8 m height. During this period we could only locate a few adult male specimens from forested areas.



Current Distribution Pattern of *C. zeylanicus* [(1) Jaffna, (2) Mullative, (3) Mankulam, (4) Marichchukatte, (5) Villpattu, (6) Anuradapura, (7) Eluwankulama, (8) Tabbowa, (9) Puttalam, (10) Anavilundawa, (11) Chilaw, (12) Yala, (13) Colombo, (14) Nilgala (15) Minuwangoda, (16) Wanata-Villuwa]

One adult female specimen of *Chameleo zeylanicus* was detected while it was crossing a 3 m wide gravel road (fig. 5).



Fig. 05: *C. zeylanicus* crosses the gravel road

The observation was made around 13:40 hr. When we approached it, the lizard opened its mouth and hissed, probably in defense. It continuously showed this defensive behaviour while actively turning its head for about 2 minutes and then it tried to escape. At that time we captured the specimen and the animal suddenly changed its body colour to dark blackish green from light green. It gripped our hands firmly while releasing and moving its tail. During this time it did not try to bite our hands but continued to hiss. We then placed it in a glass enclosure with some plants collected from the same location where it was kept in captivity for ten days, before releasing back to the same habitat. During this time the lizard fed on about 300 grasshoppers, 20 damselflies (*Ceragrion coromandelianum*) and 10 dragonflies (*Neurothemis tullia*).

However it refused a 10 cm long stick insect and a small stick insect (2.5 cm) that was offered. We arranged the glass container half with dry brown leaves and sticks and the other half with fresh green leaves and sticks. During the entire captive period it preferred to inhabit the fresh green area and selected the highest point of the branch to sleep. At night while sleeping it placed its head on its forelimbs and it slept from 17:00 hr to 06:00 hr. This animal was active between 10:00 hr to 12:00 hr and it was very inactive during other times. We obtained relevant measurements and scale counts in captivity (Table 1 & 2).

Table 01: Measurements in mm of *C. zeylanicus* in life (specimens not preserved).

	Measurements			
	Female		Male	
SVL	203.1	154.2	190.3	172.8
TAL	171.3	185.4	201.7	215.4
HL	31.7	31.7	37.2	36.7
HW	22.7	20.1	27.4	26.8
HD	32.1	32.8	38.8	38.1
AG	98.3	81.3	104.8	101.1
BW	41.1	36.3	38.8	38.2
BD	53.3	48.4	59.2	57.6
SN	6.2	5.7	9.1	8.9
SE	12.4	11.8	16.2	15.7
SFC	24.3	22.5	27.2	26.6
SEC	54.4	47.1	52.1	50.9
ND	2.4	2.2	2.4	2.4
ED	2.4	2.6	2.6	2.7
OD	12.2	12.4	14.6	14.1
PAL	17.1	16.2	18.9	18.6
FOL	17.2	16.9	21.3	20.4
UAL	32.3	32.2	38.1	37.5
LAL	34.1	33.5	39.3	38.6
FEL	32.1	31.3	38.4	37.7

TBL	29.4	28.6	34.2	33.7
IOW	21.7	21.1	22.7	22.2
IN	8.9	8.6	10.7	10.1
TBW	17.1	16.7	17.3	16.9

Table 02: Scale counts of *C. zeylanicus* in life (specimens not preserved).

	Scale counts		Numbers	
	Female		Male	
SUP	26	27	27	27
INF	25	25	24	25
OS	49	49	48	49
IOS	16	16	17	17
SNS	7	6	7	7
SCS	18	17	18	18
INS	6	6	7	7
VS	141	133	138	135
TS	190	188	192	194
MS	149	153	154	157
CR	9	9	9	9
EN	7	6	6	6
CS	20	18	21	19
GS	37	34	41	35

Current distribution

The species is restricted to the dry and arid zones in Sri Lanka. Up to now this species has been recorded from sixteen locations in the island. According to the published literature (Tennent, 1861; Deraniyagala, 1953; Karunaratna *et al.*, 2005; Pethiyagoda, 1997, Somaweera & Somaweera, 2009; Wisumperuma, 2001), this species have been recorded in Wilpattu, Anuradhapura (Anuradhapura District), Puttalam, Anavilundawa, Eluwankulam, Chilaw, Tabbowa (Puttalam District), Mankulam (Kilinochchi District), Marichchukatte (Mannar District), Mullative (Mullative District), Yala (Hambantota District) Jaffna (Jaffna District), Nilgala (Monaragala District), Minuwangoda (Gampaha District) and Colombo (Colombo District). However, according to Karunaratna *et al.* (2005) and Wisumperuma (2001) the record from Colombo is doubtful. Given that Minuwangoda location is also near Colombo (30 km east), further verification is needed for the Colombo locations.

Conservation

The large scale clearance of forests for various development activities and man-made forest fires devastate the habitat of *C. zeylanicus* (fig. 6).



Fig. 06: The original habitats of *C. zeylanicus* are destroyed by man made fire.

Their habitats are also subjected to deforestation by illegal timber logging. In several areas human settlements have invaded and encroached on the forest. Therefore, domestic predators such as dogs and cats also hunt the edges of the forest. This may increase the predatory pressure on these slow moving lizards. Unplanned agricultural practices also destroy their habitats e.g. chena cultivation leads to the decimation of large forest areas. Among other threats, these slow moving lizards are also subjected to roads kills. In addition, they are also deliberately killed by people in the area due to mythical beliefs related to this species. Their cries are believed to indicate the death of a villager and they are considered as the ‘ghosts’ of pregnant women who died during pregnancy. They are believed to fear women and but for men they are taboo and are creatures to avoid (Somaweera & Somaweera, 2009).

Large land areas have been cleared for plantation of coconut palm (*Cocos nucifera*) and cashew (*Anacardium occidentale*) cultivations (fig. 7A,B).



Fig. 07: The large private lands clearing in (A) Wanata-Villuwa forest area for the coconut cultivation and (B) in Thirikka-pallama area.

Therefore, the forest cover has decreased at an alarming rate. In addition, large extents of mangrove forest areas and adjacent scrub areas have been cleared for prawn farms. According to published records (Das & de Silva, 2005; Deraniyagala, 1953; Karunarathna *et al.*, 2005; Wisumperuma, 2001), the area from Puttalam to Wanatha-Villuwa has the highest abundance of this species. However if these unplanned development projects continue, its habitat will be further reduced. In addition there are many myths surrounding this species among the villagers. According to a survey interviewing the villagers in these areas carried out by the authors, 90% of the villagers who accepted mythical beliefs have not even seen this species. In addition no proper studies on their ecology or distribution have been done before. At present no awareness programs are being conducted in these areas.

Recommendations

Lack of reliable scientific data on the habitat preferences, ecological relationships and interactions with co-occurring species is a major hindrance to the conservation of this species. Therefore, systematic research on this species has to be carried out to determine the distribution, population structure and density of this species in Sri Lanka. This would facilitate in the preparation and implementation of a proper conservation action plan. According to our observations immediate action has to be taken to address human induced fires and forest clearing. Many environmental education programs have to be carried out among local people regarding not only *C. zeylanicus*, but also on conservation in general. Several awareness programs should be organized

among school children and local villagers to protect this species and counter the myths that prevail in this area. According to our measurements and scale counts the Sri Lankan *C. zeylanicus* population may differ from the Indian population. Therefore, the taxonomic status of the Indian species should be clarified, to verify its position. We believe our present study may motivate Indian taxonomists to pursue this issue.

Acknowledgements

The authors would like to thank Channa Bambaradeniya and John Rudge for reviewing the earlier draft of this paper. The first author wishes to thank Vimukthi Weeratunga (IUCN) for providing photographs of chameleons in captivity. Our sincere appreciation goes to Niranjana Karunarathna, Panduka Silva, Toshana Peiris, Chamila Soysa, Asanka Udayakumara, Tiran Abeywardena and Ramyanath Sirimanna (YZA) for participating in several field visits. Finally we also thank Anushka Kumarasinghe, Jayasundara, Wathsala, Dayaratne and Ashoka (Holcim Lanka pvt. Ltd.) for their valuable help during the field visits.

Literature Cited

Acharya, H. N. G., 1933. The Occurrence of the Common Chameleon (*Chamaeleo calcarata*) in Gujarat. *Journal of Bombay Natural History Society*, 36: 513-514.

Barry, A. T., 1936. The Common Chamaeleon (*Chamaeleon zeylanicus*). *Journal of Bombay Natural History Society*, 38: 201-202.

Boulenger, G. A., 1885. *Catalogue of the lizards in the British Museum (Natural History)*. Vol. II, Second edition. London: 497.

Boulenger, G. A., 1890. *Fauna of British India, including Ceylon and Burma. Reptilia and Batrachia*. Taylor and Francis, London: 541.

Daniel, J. C., 2002. *The Book of Indian Reptiles and Amphibians*. Bombay Natural History Society and Oxford University Press, Oxford: 252.

Das, I., 1994. The Reptiles of South Asia: Checklist and Distribution Summary, *Hamadryad*, 19 (1): 15-40.

Das, I. and de Silva, A., 2005. *Snakes and other Reptiles of Sri Lanka*, New Holland Publishers: 144.

Deraniyagala, P. E. P., 1931. Some Ceylon Lizards, *Spolia Zelanica*, 16 (2), 155-156.

Deraniyagala, P. E. P., 1953. *A Colored Atlas of some vertebrates from Ceylon, Tetrapod Reptilia*, Vol. 02. National Museums of Sri Lanka, Colombo: 101.

Durve, V. S and Sharma, H. S., 1975. Some observations on color changes of the Indian chameleon. *Journal of Bombay Natural History Society*, 72: 107-112.

Gaur, S., 2004. Discovery of the Indian Chameleon (*Chamaeleo zeylanicus* Laurenti) in the Aravalli Foothills of Rajasthan (India), *Tigerpaper*, 31(3), 1-3.

Gray, J. E., 1865. Revision of the genera and species of Chamaeleonidae, with the description of some new species, *Proceeding Zoological Society London*, 1864: 465-479.

Gunatilleke, I. A. U. N. and Gunatilleke, C. V. S., 1990. Distribution of Floristic Richness and its Conservation in Sri Lanka, *Conservation Biology*, 4(1): 21-31.

Halliday, T. and Adler, K., 2002. *The new encyclopedia of Reptiles and Amphibians*. Oxford University Press, Oxford: 641.

IUCNSL and MENR, 2007. *The 2007 Red List of Threatened Fauna and Flora of Sri Lanka*. Colombo, Sri Lanka: 148.

Karunarathna, D. M. S. S., Abeywardena, U. T. I., Asela, M. D. C., Karunarathna, D. M. G. N., Sirimanna, D. G. R. and Amarasinghe, A. A. T., 2005. First record of the *Chamaeleo zeylanicus* Laurenti, 1768 (Reptilia: Chamaeleonidae) from the Nilgala forest in Sri Lanka. *Loris*, 24 (1&2): 18-20.

Pethiyagoda, R., 1997. The Elusive Chameleon. *Sri Lanka Nature*, 1 (1): 63.

Pough, F. H., R. M. Andrews, J. E. Cadle, M. L. Crump, A. H. Savitzky and K. D. Wells, 2004. *Herpetology*, Third Edition. Pearson Prentice Hall, USA: 726.

Reptile Database, 2009. http://www.jcvi.org/reptiles/search.php?taxon=Chamaeleonidae&genus=&species=&subspecies=&author&year=&common_name=&location=&holotype=&reference=&submit=Search

Singh, L. A. K., 1984. The Indian Chameleon, *Chamaeleon zeylanicus* (Laurenti) in satkoshia gorge Sanctuary, Orissa: Notes on availability, growth and Biometrics. *Journal of Bombay Natural History Society*, 81: 111-119.

Singh, L. A. K., L. N. Achariyo and H. R. Bustard, 1984. Observation of the Reproductive Biology of the Indian *Chameleon Chamaeleo zeylanicus* (Laurenti). *Journal of Bombay Natural History Society*, 81 (1): 86–92.

Smith, M. A., 1935. *The Fauna of British India including Ceylon and Burma: Reptilia and Amphibia*, Vol. II – Sauria. Taylor and Francis, London: 440.

Somaweera, R. and N. Somaweera, 2009. Lizards of Sri Lanka: A colour guide with field keys. 304.

Tennent, J. E., 1861. *Sketches of the Natural History of Ceylon, with Narratives and Anecdotes*. Longman and Roberts, London: 500.

Tilbury, C. R. and Tolley, K. A., 2009. A re-appraisal of the systematics of the African genus *Chamaeleo* (Reptilia: Chamaeleonidae). *Zootaxa*, 2079: 57–68.

Trench, J., 1912. Notes on the Indian Chameleon (*Chamaeleon calcaratlls*). *Journal of Bombay Natural History Society*, 21: 687-689.

Wainwright, P. C., Kraklau, D. M. and Bennett, A. F., 1991. Kinematics of tohgue preojecion in *Chamaeleo ousaleti*. *Journal of Experiment Biology*, 159: 109-133.

Walton, B. M. and Bennett, A. F., 1993. Temperature-dependent Color Change in Kenyan Chameleons. *Physiological Zoology*, 66 (2): 270-287.

Whitaker, R., 1978. Breeding record of the Indian Chameleon (*Chamaeleo zeylanicus*). *Journal of Bombay Natural Histoiry Society*, 75: 232.

Wisumperuma, D., 2001. The Indian Chameleon (*Chamaeleo zeylanicus*) Laurenti. *Loris*, 22 (5): 49-50.