

## Observations on the Ovipositional Behavior of the Crest-less Lizard *Calotes liocephalus* (Reptilia: Agamidae) in the Knuckles Forest Region of Sri Lanka

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**Abstract.**—A mature female *Calotes liocephalus* lying on the ground in Pitawala in the Knuckles Forest Region of Sri Lanka. This is the first described observation of the ovipositing of *Calotes liocephalus*. The ovipositional behavior consisted of digging a hole to lay eggs, laying the eggs, scraping soil to bury the eggs, filling of the spaces between the eggs, the tight compression of the soil and camouflaging the nest.

**Keywords.**—Agamidae, *Calotes*, egg-laying behavior, Knuckles, Sri Lanka, conservation.

### Introduction

There are eighteen species of agamid lizards in Sri Lanka, fifteen of them are endemic to the island (Bahir and Surasinghe, 2005; Manamendra-Arachchi et al., 2006; Samarawickrama et al., 2006). Seven species belong to the genus *Calotes*. Five of them (*C. ceylonensis* Muller, 1887; *C. liocephalus* Gunther, 1872; *C. liolepis* Boulenger, 1885; *C. nigrilabris* Peters, 1860; *C. desilvai* Bahir and Maduwage, 2005) are endemic. The remaining two *Calotes* (*C. calotes* [Linnaeus, 1758]; *C. versicolor* (Daudin, 1802)) are probably widespread species throughout South East Asia. According to the published literature, *Calotes liocephalus* is a largely arboreal species found only in parts of the Knuckles Forest Region in Sri Lanka (Manamendra-Arachchi and Liyanage, 1994). Its conservation status is Rare and Endangered (Bahir and Surasinghe, 2005). It can be distinguished from its congeners by the presence of an oblique fold in front of the shoulder, a lower jaw that is rather short, a head without spines (or rarely a rudimentary spine above the ear), enlarged supraocular scales and poorly-developed dorsinuchal crests on the head and lower neck (Manamendra-Arachchi, 1990). Adults have a snout to vent length of 91 mm, a head length of 37 mm, a tail length of 261 mm and an axilla to groin length of 43 mm (Deraniyagala, 1953).

**Location of observation.**—Observations were made approximately 1 km from Matale-Pallegama Road in Pitawala in the Knuckles Forest Region (altitude: 783 m) in Matale District, Central Province. The habitat consisted mainly of disturbed home gardens (Ekanayake and Bambaradeniya, 2001). The ground was covered with small amounts of wet leaf litter and the soil was

soft. There was approximately 10% canopy cover and the undergrowth consisted primarily of grasses. Observations of the lizard was made by the unaided eye from 2 m away between the hours of 1420 and 1600 hrs. The animal was not disturbed during observation. All measurements were taken to the nearest 0.1 mm using dial calipers.

### Observations

A mature female *Calotes liocephalus* (snout to vent length: 54.0 mm, head length: 19.4 mm, head width: 11.9 mm, tail length: 156.0 mm, axilla to groin length: 26.5 mm) lying on the ground, approximately 50 cm from the road, was observed on 21 June 2006 at about 1420 hr. The temperature was 23.6°C and the humidity 93%. The weather was gloomy and the cloud cover was 8/8.

**Digging the nest hole.**—First, the lizard lifted the anterior part of its body using its forelimbs. It then looked around for ~10 min. During this period it repeatedly turned its head 180° five times, without moving its body (Fig. 1). The female then began digging into the ground while scraping the soil with its forelimbs, which was thrown backward under its body through its raised hind limbs. This continued for approximately 5 minutes (Fig. 2). After that it stopped digging and looked around for approximately 5 min. while repeatedly turning its head 180° three times, without moving its body (Fig. 3). Again, it continued digging and this time the female dug the hole continuously for approximately 10 min. It stopped and looked around for about 5 min. while turning its head 180° around three times, without moving its body as in Figure 3. After that, it continued to dig the

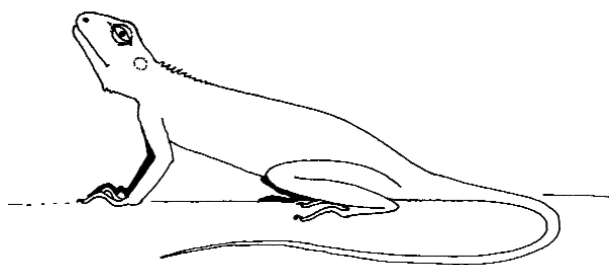


Figure 1.



Figure 2.



Figure 3.



Figure 4.



Figure 5.

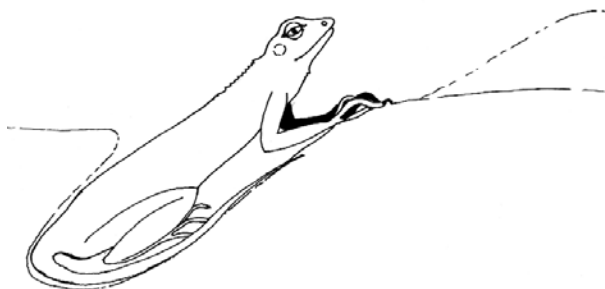


Figure 6.

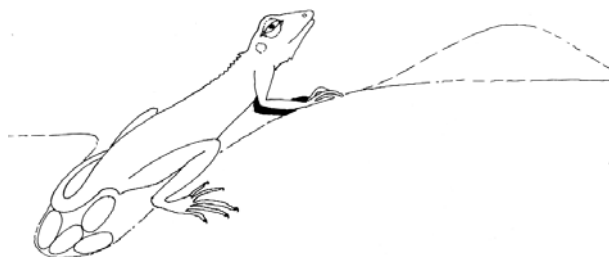


Figure 7.



Figure 8.



Figure 9a.



Figure 9b.

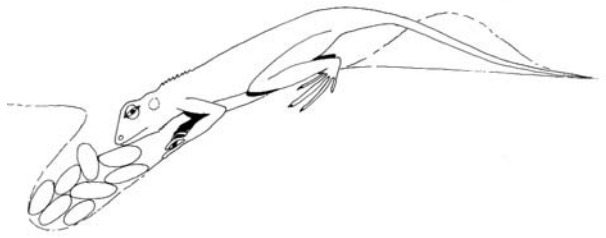


Figure 10.



Figure 11.

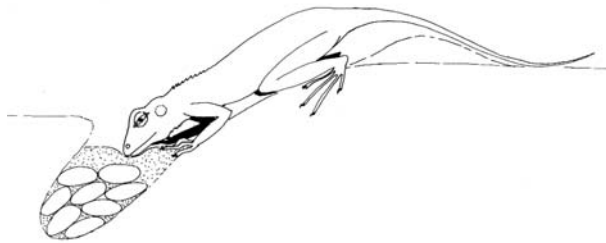


Figure 12.

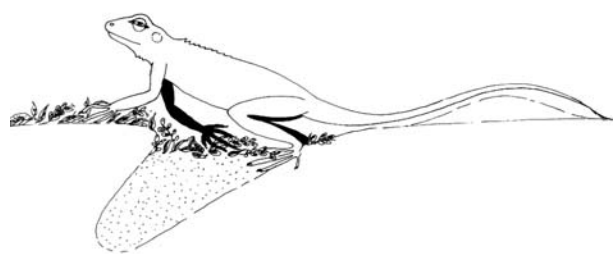


Figure 13.

hole for another half an hour, stopping three more times for 5 min. each, to rest. The hole was dug into the ground at a 45° angle. The final hole was 92.6 mm deep and 79.1 mm in diameter (Fig. 4). During the rest intervals the body was coiled inside the hole with the anterior half bent at an angle of 90° to looking around (Fig. 5). There was a drizzle for ~15 minutes, but the female continued digging.

**Laying the eggs.** - After half an hour of digging, the female turned its body 180° clockwise, placing the posterior part of its body inside the hole. It then looked around again (Fig. 6). The significance of this egg laying

behavior was that the female removed herself slowly from the hole without lifting her limbs while it was laying its eggs (Figs. 7–8). Eight eggs were laid at a rate of one per minute. The eggs were pure white and elliptical, with a mean length of 14.8 mm and a mean width 8.6 mm. After the eggs were laid, the female came out of the hole completely and started looking around (Fig. 9a, b). Then the female crept back into the hole for 15 min. to pack and place the eggs below ground level using the anterior part of its lower jaw (Fig. 10).

**Burying the eggs and camouflaging the nest.** - After coming out of the hole, the female turned 180° clock-

wise and began to drag the soil towards the hole using its forelimbs. The dragged soil was thrown backwards under its body while it lifted its hind limbs (Fig. 11). After dragging the soil for about 5 min., it turned 180° counter-clockwise and began pressing the soil with the anterior half of its lower jaw for half an hour. The hole was filled up to 18.4 mm below ground level (Fig. 12). After looking around, it dragged the surrounding *Albizia saman* (Family: Fabaceae) leaves over the nest site for camouflage (Fig. 13). It remained motionless for 2 min. and then ran towards the forest, during which time it was caught for measurement and then released.

## Discussion

The oviposition behavior of this species varies from the oviposition behavior of *Calotes versicolor*. According to Amarasinghe and Karunaratna (2007), *C. versicolor* places its cloacal aperture over the opening of the hole while laying its eggs, but *C. liocephalus* places the posterior part of the body inside the hole while laying eggs. *C. versicolor* also lifts the anterior part of the body with its forelimbs while turning its head to look around, but *C. liocephalus* coils its entire body inside the hole while bending the anterior part of its body to look around. *C. versicolor* makes a knocking noise while packing and placing the eggs in the hole using its lower jaw while the *C. liocephalus* places them softly without making any noise. After the observation the eggs were removed from the hole and the hole was subsequently examined. The bottom was conical and the soil was soft, dark and wet. Finally the eggs were buried in a home garden to hatch. After approximately two and half months we observed five small holes where the hatchlings had come out. Unfortunately we could not observe the hatchlings.

A Few diagrams, brief descriptions and notes of *Calotes liocephalus* are available in popular journals, books and magazines but almost nothing exists on the pre and post mating behavior, egg laying behavior, captive breeding and their hatchlings. In addition *Calotes liocephalus* is an endemic, rare and threatened species and therefore it may become extinct if their population does not increase. For such a situation to be achieved, captive breeding methods may be needed for ex-situ conservation of this species. In addition further observations are also needed for the conservation of *Calotes liocephalus*.

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