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ATTEMPTED PREDATION ON A LARGE GECKO BY A TWIN-BARRED TREE SNAKE, *CHRYSOPELEA PELIAS* (REPTILIA: SQUAMATA: COLUBRIDAE)

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INTRODUCTION

The twin-barred tree snake, *Chrysopelea pelias* (Linnaeus) (Squamata: Serpentes: Colubridae) has a definitive Sundaic distribution and is known to occur in southern Thailand, Peninsular Malaysia (including Penang and Pulau Tioman), Sumatra (including Nias, Mentawai, Natuna and Riau islands), Singapore, Java, Bangka and Borneo (including Brunei, Sabah, Sarawak, Kalimantan) (Cox et al., 1998; Das, 2006; Iskandar & Colijn, 2001; Manthey & Grossmann, 1997). This attractive species of snake is largely arboreal and may be easily recognised by its reddish dorsum, uniformly patterned with black-white-black bands (Fig. 1). In Singapore, it is largely confined to the remnant forests of the Central Catchment Nature Reserve and on Pulau Ubin (Baker & Lim, 2008). The species name is occasionally misspelled as *Chrysopelea* '*peleas*' (e.g., Sworder, 1923). Just like its more common relative, the paradise tree snake (*Chrysopelea paradisi* Boie), the twin-barred tree snake is also capable of gliding from the crowns of trees, adopting a 'J'-shaped posture prior to launching itself from heights (Socha, 1999–2005, 2006). This snake is known to be diurnal in habit and is mildly venomous, mostly consuming lizard prey (Baker & Lim, 2008). Here, we present an account of an ambitious, yet determined attempt by a twin-barred tree snake to subdue and swallow an over-sized gecko prey.

Fig. 1. An adult twin-barred tree snake, *Chrysopelea pelias*, found at Bukit Kallang, Central Catchment Nature Reserve, on the morning of 27 Jan.2006. (Photograph by: Leong Tzi Ming).

OBSERVATIONS

On the night of 11 Jul.2009 (ca. 2300 hours), upon returning to the Central Nature Reserve Branch (Conservation Division, National Parks Board) office at Bukit Kallang (adjacent to mature secondary forest) from nocturnal field surveys, our attention was abruptly drawn to a commotion ca. 3 m up on the wall, just below the ceiling of the corridor. It became apparent that a robust, adult male spotted house gecko, *Gekko monarchus* (Duméril & Bibron) (Sauria: Gekkonidae) had fallen victim to the swift strike of a twin-barred tree snake (Fig. 2). The snake had immediately wrapped three coils of its body around the lizard in a firm grip, but had to endure the constant struggling fits of the lizard. After ca. 10 mins, the snake intensified its constriction around the neck and chest of the gecko, still supported merely by the tail end (Fig. 3). At 2315 hours, the snake shifted the position of its head and wrapped its jaws around the snout tip of the gecko. In the process, this might have served to suffocate the gecko further and/or signal the commencement of swallowing (Fig. 4). The snake was clearly an adult, with an estimated total length of ca. 70 cm.

Fig. 2. On the night of 11 Jul.2009 (ca. 2300 hours), an adult male spotted house gecko (*Gekko monarchus*) was ambushed by an adult twin-barred tree snake (*Chrysopelea pelias*, total length: ca. 70 cm) near the corridor ceiling of the Central Nature Reserve (National Parks Board) office at Bukit Kallang. The gecko had been attacked and bitten on the right side of its head, and its body was constricted by at least three coils of the snake. (Photograph by: Leong Tzi Ming).

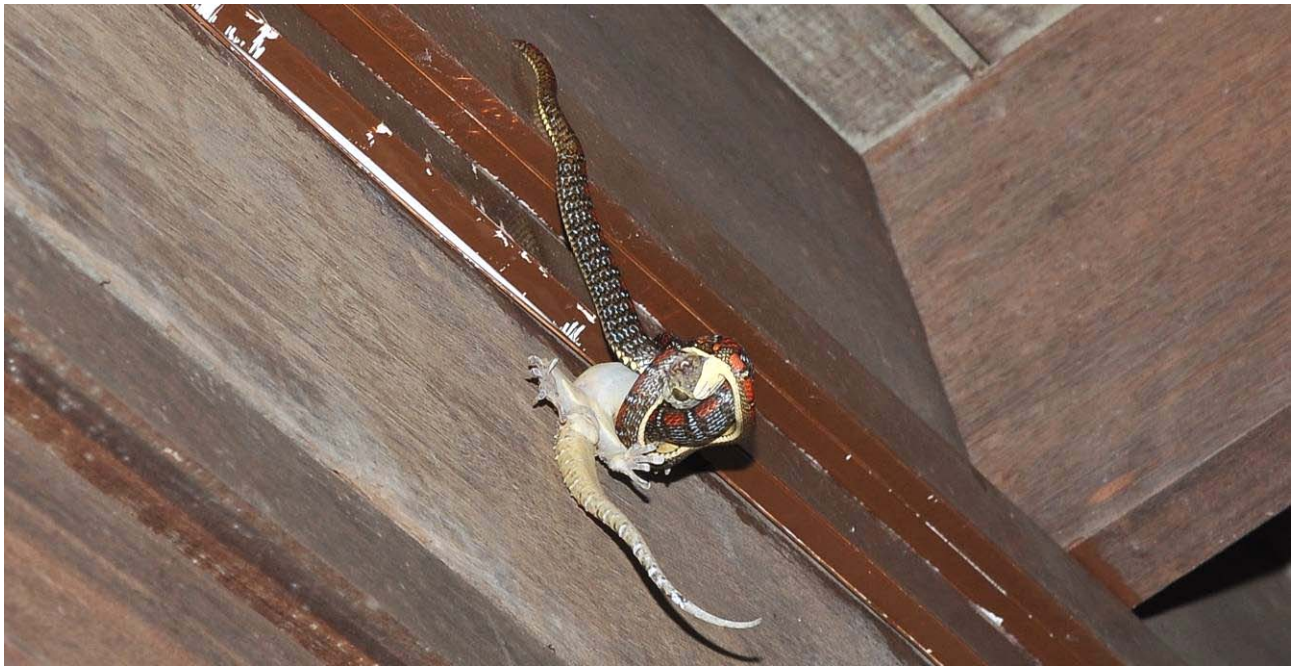

Fig. 3. By 2310 hours, the spotted house gecko was still able to struggle sporadically, in a futile effort to escape its predator. All this while, the twin-barred tree snake maintained a tight grip on the gecko, supporting its own weight and that of its prey by its tail end. (Photograph by: Leong Tzi Ming).

After ca. 5 minutes, the gecko ceased its struggling altogether and its body became limp. The gecko was most likely to have been overcome by the combined effects of the venom injected into its body, plus asphyxiation from the sustained constriction. The estimated time taken to kill its prey was between 15–20 mins. Shortly after, the snake then proceeded to expand its jaws further and by 2330 hours, had engulfed the gecko's head up to the mid-point of its eye (Fig. 5a). It remained at this point for ca. 20 minutes, without noticeable progress, after which it invested deliberate efforts to push past the eyes of the gecko. By this time (2350 hours), the lower jaw of the snake had been stretched to its limit, with the skin between the gular scales clearly visible (Fig. 5b). However, the snake was unable to advance beyond this point and its jaws were observed to retreat to the gecko's eyes at ca. 2355 hours.

At 0001 hours (12 Jul.2009), the visibly exhausted snake suddenly unfastened its coils around the gecko and repositioned itself to perch more securely back onto the horizontal ledge, but its jaws remained clasped onto the gecko, although we could detect the underlying strain of the gecko's body weight on the snake's head (Fig. 6). Although we predicted that the snake might haul the gecko up onto the ledge to re-attempt swallowing, this did not happen. Instead, the snake inadvertently released its grip of the gecko, which in the course of its descent, was latched onto the wooden frame by its left hind foot (Fig. 7). The lifeless gecko was then retrieved, examined and found to have a layer of mucus around its snout, especially on its lower jaw, clear remnants of the snake's diligent attempts at swallowing. This gecko was subsequently weighed and measured prior to preservation as a voucher specimen, then catalogued/deposited in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore (ZRC.2.6832, adult male, fresh weight: 20.2 g, total length: 20.1 cm, snout-vent: 9.2 cm). The documented upper limit for the total length of *Gekko monarchus* is ca. 23 cm (Manthey & Grossmann, 1997).

In addition, detailed dimensions of its head were also acquired, including head width: 19.5 mm, head height: 11.3 mm, head circumference: 58.0 mm. Quite clearly, the relatively broad head of this full-grown, spotted house gecko proved to be an insurmountable obstacle for the twin-barred tree snake to overcome. As snakes swallow their prey whole, the size of their ingestible food item would be constrained by the maximum size limit of the snake's gape (Forsman, 1996; Jayne et al., 2002).

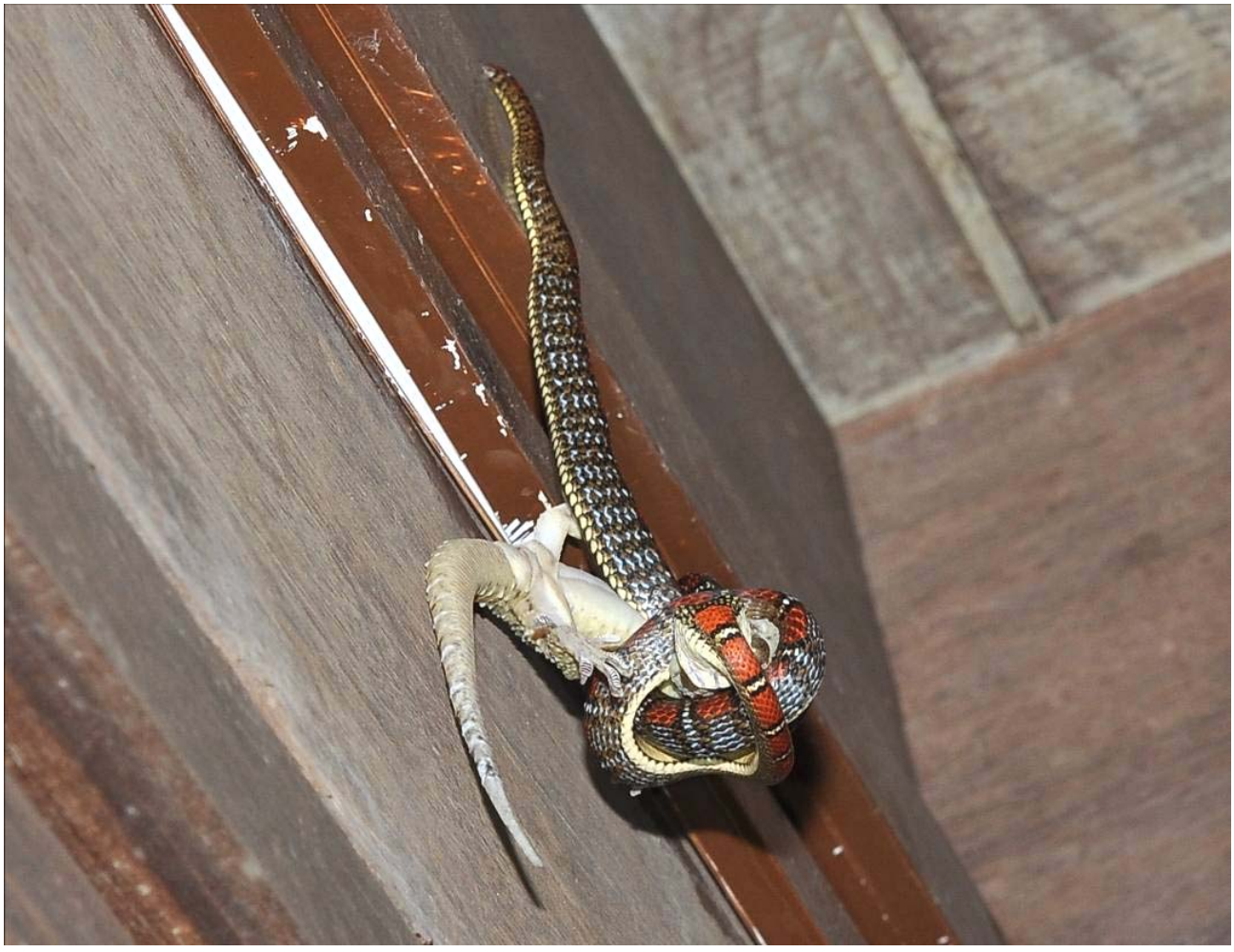

Fig. 4. At 2315 hours, the twin-barred tree snake readjusted its jaws to cup over the snout tip of the gecko, in an effort to further suffocate the prey and/or prepare itself to commence swallowing. Not long after this, the gecko ceased its struggling entirely and its muscles became limp. (Photograph by: Leong Tzi Ming).

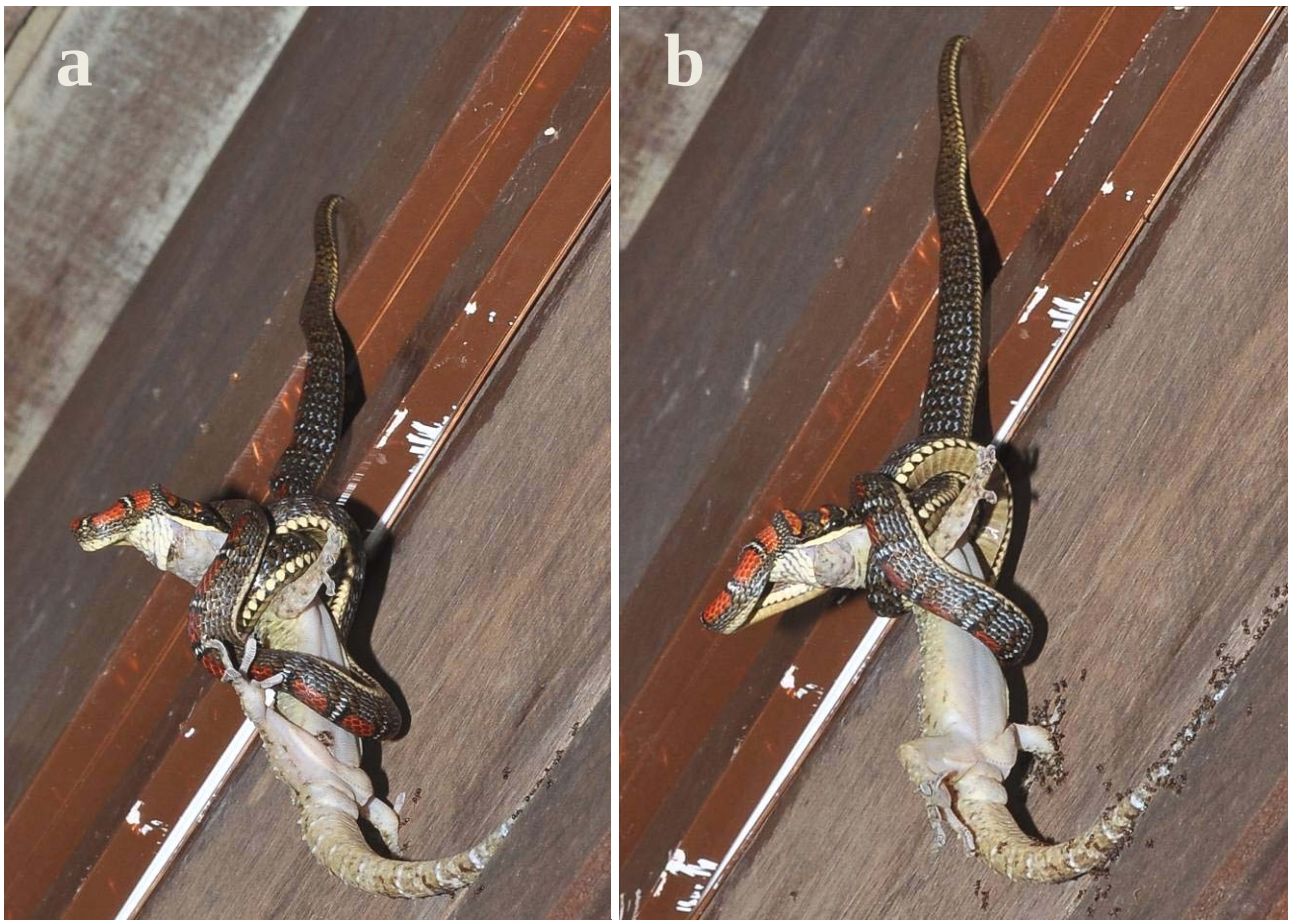

Fig. 5. At 2330 hours (a), the lower jaw of the twin-barred tree snake had reached the level of the gecko's eyes, but remained at this point for ca. 20 mins. At 2350 hours (b), the snake succeeded in enveloping the gecko's eyes and attempted to advance towards the jaw angle of the gecko. However, the snake was unable to proceed further and had clearly reached the threshold of its maximum attainable gape size. (Photographs by: Leong Tzi Ming).

Fig. 6. At 0001 hours (12 Jul.2009), the twin-barred tree snake released its coils around the spotted house gecko and retrieved more of its body upwards onto the horizontal ledge, in an apparent attempt to reposition itself. The entire weight of the gecko was now being borne largely by its jaws. (Photograph by: Foo Sai Khoon).

Fig. 7. At 0008 hours (12 Jul.2009), the twin-barred tree snake eventually released its jaw-hold of the spotted house gecko. During its descent, the limp and lifeless body of the gecko inadvertently latched onto the vertical, wooden frame, dangling by its left hindfoot. The gecko was then retrieved for subsequent measurements and preservation as a voucher specimen (ZRC.2.6832, fresh weight: 20.2 g, total length: 20.1 cm, snout-vent length: 9.2 cm). (Photograph by: Leong Tzi Ming).

DISCUSSION

Upon further examination of other preserved specimens of *Chrysopelea pelias* at the ZRC, we found an adult snake collected from Kelantan, Peninsular Malaysia, in 18 Sep.1930 (ZRC.2.3561), with a visibly distended stomach. This snake was then carefully dissected to reveal an adult common house gecko, *Hemidactylus frenatus* Duméril & Bibron, that was swallowed head-first. This gecko prey had not been digested as yet, still retaining diagnostic markings and skin texture of the species, and must have been consumed shortly before the snake predator itself was collected and preserved. In addition, measurements of the head widths of three adult *Chrysopelea pelias* were taken (all Singapore specimens: ZRC.2.6055, 6174, 6795) and ranged between 9.2–12.0 mm. These dimensions are approximately half that of the adult *Gekko monarchus* specimen (ZRC.2.6832, head width: 19.5 mm).

At the Central Nature Reserve office building, there have been previous sightings of the twin-barred tree snake either stalking prey, or resting around the wall lamps with distended bellies. The predominant geckonid in this area is *Hemidactylus frenatus*, although there is also a healthy population of *Gekko monarchus* as well. Size-wise, *Hemidactylus frenatus* is approximately half the size of *Gekko monarchus*, and would be the most suitable prey for *Chrysopelea pelias*. Nevertheless, juvenile individuals of *Gekko monarchus* would also be equally suitable prey candidates as well. At this same office locality, there has also been an earlier observation of unsuccessful predation by *Chrysopelea pelias* on *Gekko monarchus*, as noted by Subaraj Rajathurai on the afternoon of 12 Feb.2009. Although tree snakes are clearly diurnal, certain opportunistic individuals may adapt to the available artificial lighting to hunt. However, the judgment on prey size by the predator may occasionally be impaired in a scenario when a particularly hungry snake is highly driven by visual (and possibly olfactory) stimuli, leading to the primal instincts to strike, subdue and swallow its prey. Although the uneventful outcome of such an attempt may seem a wanton waste of energy expenditure, it might have taught the would-be predator a precious lesson in its assessment of prey size.

In Singapore, the widely distributed *Hemidactylus frenatus* is also preyed upon by the other species of tree snake, *Chrysopelea paradisi*. Locally, TML has personally witnessed an adult of this snake species in active pursuit of *Hemidactylus frenatus* along the road-side railings at Kent Ridge. Around this region, there are only a handful of published accounts on predator-prey interactions for the tree snake genus, *Chrysopelea* Schlegel. In Negros Oriental (Philippines), a *Chrysopelea paradisi* successfully consumed a skink, *Lampropeltis smaragdina philippinica* (Sauria: Scincidae) (Gaulke, 1986). In northern Peninsular Malaysia, a *Chrysopelea ornata* was found to have consumed a black-bearded tomb bat, *Taphozus melanopogon* (Microchiroptera: Emballonuridae) (Leong & Lim, 2003). In the Ampang Forest Reserve (Selangor, Peninsular Malaysia), a prolonged confrontation was reported between a *Chrysopelea paradisi* and an adult green-crested lizard, *Bronchocela cristatella* (Sauria: Agamidae), which eventually ended in a stalemate (Lim & Harun, 1959). In Singapore, there was a detailed observation and photographic documentation of a *Chrysopelea paradisi* preying on a bamboo bat, *Tylonycteris* species (Microchiroptera: Vespertilionidae) at the Singapore Botanic Gardens on the evening of 12 Jan.2008 (Vilma D'Rozario & Chan Kwok Wai, pers. obs.). As we were privileged to have witnessed, the apparent reputation for predatory tenacity and stamina in the *Chrysopelea* tree snakes, as proclaimed by Tweedie (1983), was unequivocally reinforced.

ACKNOWLEDGEMENTS

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