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Observations of Basking in *Varanus bengalensis nebulosus* from Northeastern Thailand

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Abstract - Basking activity in *Varanus bengalensis nebulosus* was observed between 3 - 10 April, 2009 at Phu Khiew Wildlife Sanctuary (northeastern Thailand). The monitor exhibits basking activity twice a day, in the morning and afternoon. Morning basking begins around 0800 h and continues until 1030 - 1100 h. Afternoon basking activity begins around 1400 - 1500 h, and continues until 1730 - 1830 h. Basking activity was delayed if it rained.

Introduction

Four species of varanids are found in Thailand. Among them, two species (*Varanus bengalensis nebulosus* and *V. salvator macromaculatus*) are recognized as having a wide distribution, almost extensive throughout the country (Taylor, 1963; Luxmoore and Groombride, 1990; Cox et al, 1998; Lauprasert and Thirakhupt, 2001; Nabhitabhata et al., 2004; Nabhitabhata and Chan-ard, 2005). Several reports have been published by various authors on the varanids of Thailand; unfortunately, the studies have focused more attention on the geographical distribution of the latter species *V. salvator* (see e.g., Lauprasert and Thirakhupt, 2001; Nabhitabhata et al., 2004; Borden, 2007; Duengkae, 2008; Duengkae and Chuaynkern, 2009).

Although the study of thermoregulation in varanids has seen much attention (see e.g., Christian and Bedfored, 1996; Traeholt, 1997; Seebacher and Grigg, 2001; Rathnayake et al., 2003), surprisingly, reports on thermoregulation in varanid taxa from Thailand are lacking. Here, we report observations on the basking activity of *V. bengalensis nebulosus* in Thailand, which should help fill in gaps of knowledge on this species and allow for comparisons with congeneric taxa from other countries.

Methods

Field observations on the basking behavior of *V. bengalensis nebulosus* were conducted by the primary author (PD) at Phu Khiew Wildlife Sanctuary (Chaiyaphum Province, northeastern Thailand) over eight consecutive days from 3 - 10 April 2009. Using binoculars (10 x 40), daily observations were made from 0600 to 1900 h at a tree hollow occurring in a Hiang tree *Dipterocarpus obtusifolius* (Dipterocarpaceae) located at 16°23'18"N; 101°34'25"E (coordinates determined

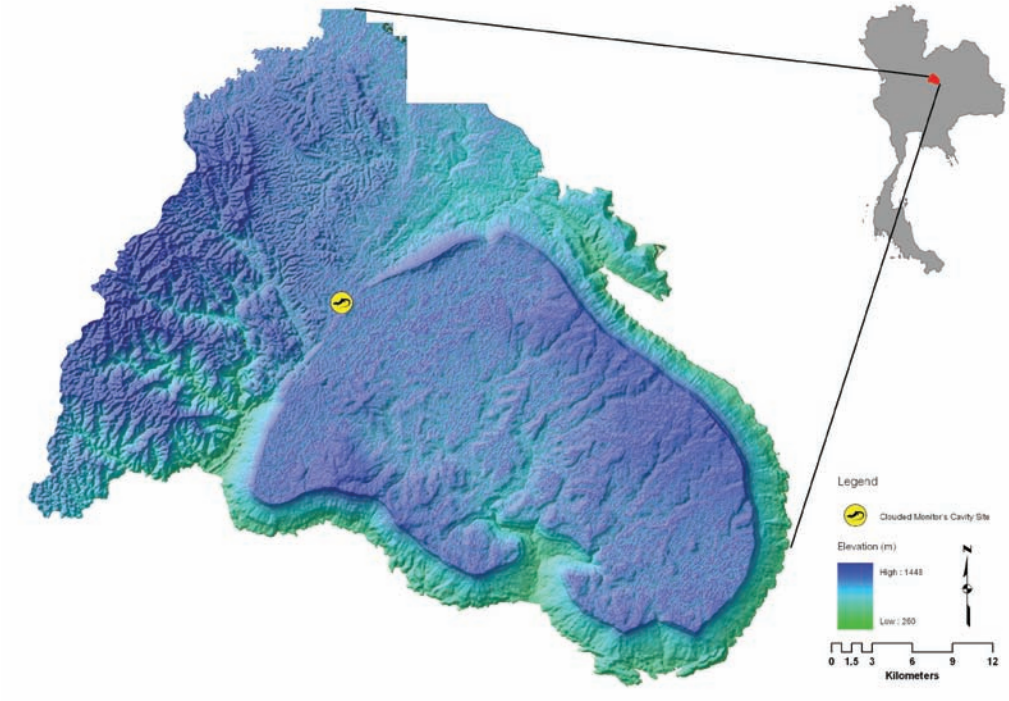

Fig. 1. Map of Phu Keiw wildlife sanctuary in northeastern, Thailand, with the location of the tree hollow occupied by the *Varanus bengalensis nebulosus*.

using a Garmin model 60CSX GPS device), and at an elevation of ca. 859 m (Fig. 1). Climatic data were obtained from the meteorological station at the Phu Khiew Wildlife Sanctuary headquarters, located ca. 1.5 km from the study site.

Results

The Hiang tree with the cavity (Fig. 2) was located in a dry dipterocarp forest (DDF) mixed with pine (*Pinus kesiya*). The tree measured 25 m tall, and at a height of ca. 1.3 m had a trunk diameter of 58 cm. The cavity was located at a height of 15 m, with the opening facing south.

Typically, the *V. bengalensis nebulosus* (total length ca. 140 cm; Fig. 3) sticks its head out from the tree hollow between 0700 - 0730 h as it waits for sunlight. When the sunlight reaches the tree around 0800 h, the monitor climbs out and moves to the east side of the trunk and begins its basking activity. When basking, its body is vertically oriented with the head directed upward. It remains motionless for a few hours (usually between

Fig. 2. The *Dipterocarpus obtusi-folius* tree with the occupied tree hollow. Photograph by **Prateep Duengkae** 6 April 2009.

Fig. 3.*V. bengalensis nebulosus* sticks its head out from the tree hollow in the morning as it waited for sunlight. Photograph by **Prateep Duengkae**. 5 April 2009

Fig. 4. *V. bengalensis nebulosus* basks on tree trunk in direct sunlight to gain heat in the morning. Photograph by **Prateep Duengkae**. 9 April 2009.

0800 - 1030 h), slowly wobbling its head when disturbed (Fig. 4). At around 1030 - 1100 h, the *V. bengalensis nebulosus* climbs down to the ground and begins other daily activities in the surrounding area.

The *V. bengalensis nebulosus* comes back to its tree in the afternoon between 1400 - 1500 h, climbing up to the same height as in the morning but in a different position. Here, the *V. bengalensis nebulosus* faces west and begins its afternoon basking activity, continuing until 1730 - 1830 h (Fig. 5) when it returns to its refuge inside the tree cavity.

During the study period, rain occurred on 3, 7 and 10 May. Daily climatic data are given in Table 1. When it rained during the morning of 3 May, the *V. bengalensis nebulosus* came out from the hollow and began basking at around 0900 - 1000 h. When it rained during the afternoon of 7 May, the monitor returned to its tree early and began basking around 1300 - 1400 h.

Discussion

Varanus bengalensis nebulosus basks by taking advantage of sun exposure as documented for other reptiles (see e.g., Johnson, 1973; Heatwole and Taylor, 1987; Vitt and Caldwell, 2009). Its body temperature is increased to the optimum level that physiological functions (i.e., heart rate, cardiovascular control and body temperature regulation) can be well operated

Fig. 5. *V. bengalensis nebulosus* faces west and begins its afternoon basking activity. Photograph by **Prateep Duengkae**. 5 April 2009.

Table 1 Climatic data of daily rainfall (mm) and mean temperature (°C) with minimum and maximum in parentheses.

Day/month/year	Rainfall	Temperature
3-Apr-09	12.8	24.20 (17.2-31.2)
4-Apr-09	0	24.25 (17-31.5)
5-Apr-09	0	23.25 (18-28.5)
6-Apr-09	0	23.70 (19-28.4)
7-Apr-09	4.1	23.20 (18.4-28)
8-Apr-09	0	22.45 (17.3-27.6)
9-Apr-09	0	23.65 (17.8-29.5)
10-Apr-09	0.6	24.25 (18-30.5)

Fig. 6. The Hiang tree acts as a good shelter for *V. bengalensis nebulosus* in northeastern Thailand.
Photograph by **Prateep Duengkae**. 6 April 2009.

(Christian and Bedford, 1996; Seebacher and Grigg, 2001). The present observations are in accordance with Traeholt (1997), in which the monitor followed sunlight to receive solar radiation and to increase its body temperature before daily activities. There are further similarities to *V. salvator* from central Sri Lanka, in which basking was seen in late morning and during the afternoon (Rathnayake et al., 2003). When it rained in the morning, the *V. bengalensis nebulosus* emerged later and basked before commencing its daily activity. This observation is in agreement with the compiled knowledge that many reptiles regulate their body temperatures by basking in the sun until the temperature rises to the level requisite for their normal activity (Heatwole and Taylor, 1987; Vitt and Caldwell, 2009). Basking before returning to its refuge should be required in order to maintain physiological activity (Christian and Bedford, 1996; Seebacher and Grigg, 2001).

V. bengalensis nebulosus does not make its own refuge. As was found in previous research (see e.g., Phophinit, 1991; Pattanavibool, 1993; Poonswad, 1997), *V. benalensis nebulosus* prefers to inhabit tree hollows or cavities rather than burrows. Hence, hollows occurring in live trees are an essential factor that supports the occurrence of *V. bengalensis nebulosus* in the area and should be considered as an important factor for the management and conservation of this species or its congeners. Pattanavibool and Edge (1996) report that 92 % of tree hollows are in live trees from Huai Kha Khaeng Wildlife Sanctuary, and the Forest Research Center (1989) reports that the Hiang tree constitutes 5 % in DDF at Phu Khiew Wildlife Sanctuary. Therefore, this tree acts as a good shelter for *V. bengalensis nebulosus* in northeastern Thailand (Figure 6).

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