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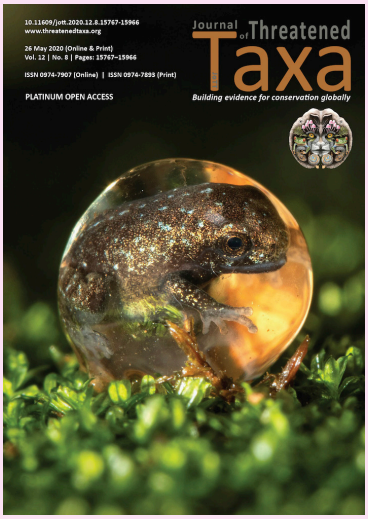


## Note

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NOTE

# Diurnal observation of a Malayan Krait *Bungarus candidus* (Reptilia: Elapidae) feeding inside a building in Thailand

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In altered habitats, species must face challenges resulting from interactions with humans in a complex landscape mosaic, particularly in agricultural and urban areas (Knoot & Best 2011). Remnant forest fragments, gardens, and other "green spaces" can play a vital role in maintaining species in human-dominated landscapes (McKinney 2006; Hughes 2017). Some fauna capitalize on proximity to humans (Vanderduys & Kutt 2013) by exploiting abundant resources (namely food) among human-modified habitats (Prange et al. 2004). Fauna capable of tolerating human presence are also often involved in human-wildlife interactions, which can lead to injury or death of wildlife or humans (Woodroffe et al. 2005). Here we describe an instance of a potentially dangerous snake, the Malayan Krait *Bungarus candidus*, coming into contact with humans during the pursuit of prey in the early morning inside a building located on a large university campus in Nakhon Ratchasima, Thailand.

Kraits are among the most medically significant snakes throughout their range owing to their behavior and potent venom (World Health Organization 2016). A substantial proportion of human victims are bitten while indoors at night, presumably by kraits which enter habitations in search of prey (Kularatne 2002; Tongpoo et al. 2018). The Malayan Krait *Bungarus candidus* (Linnaeus, 1758) is distributed throughout southeastern Asia. As nocturnal foragers, *B. candidus* feed on a variety of prey including snakes (Kuch 2004), lizards (Slowinski 1994; Siow & Figueroa 2016), amphibians (Grossmann & Schäfer 2000), and small mammals (Kuch 2001). In Thailand, *B. candidus* frequently occurs in human-modified habitats such as agricultural land and rural settlements (Chanhome et al. 2011; Crane et al. 2016; Knierim et al. 2018).

The observation took place on Suranaree University of Technology (SUT) campus in Nakhon Ratchasima, Thailand (Image 1). The campus is ideal for supporting snakes in many green refugia, with 26 forest fragments on the SUT property ranging from 0.45–1.5 ha making it a good study area for assessing human-snake interactions. The university grounds are comprised of a variety of human-modified lands interspersed with degraded secondary dipterocarp forest fragments. Many of the larger buildings at the university contain open-roofed

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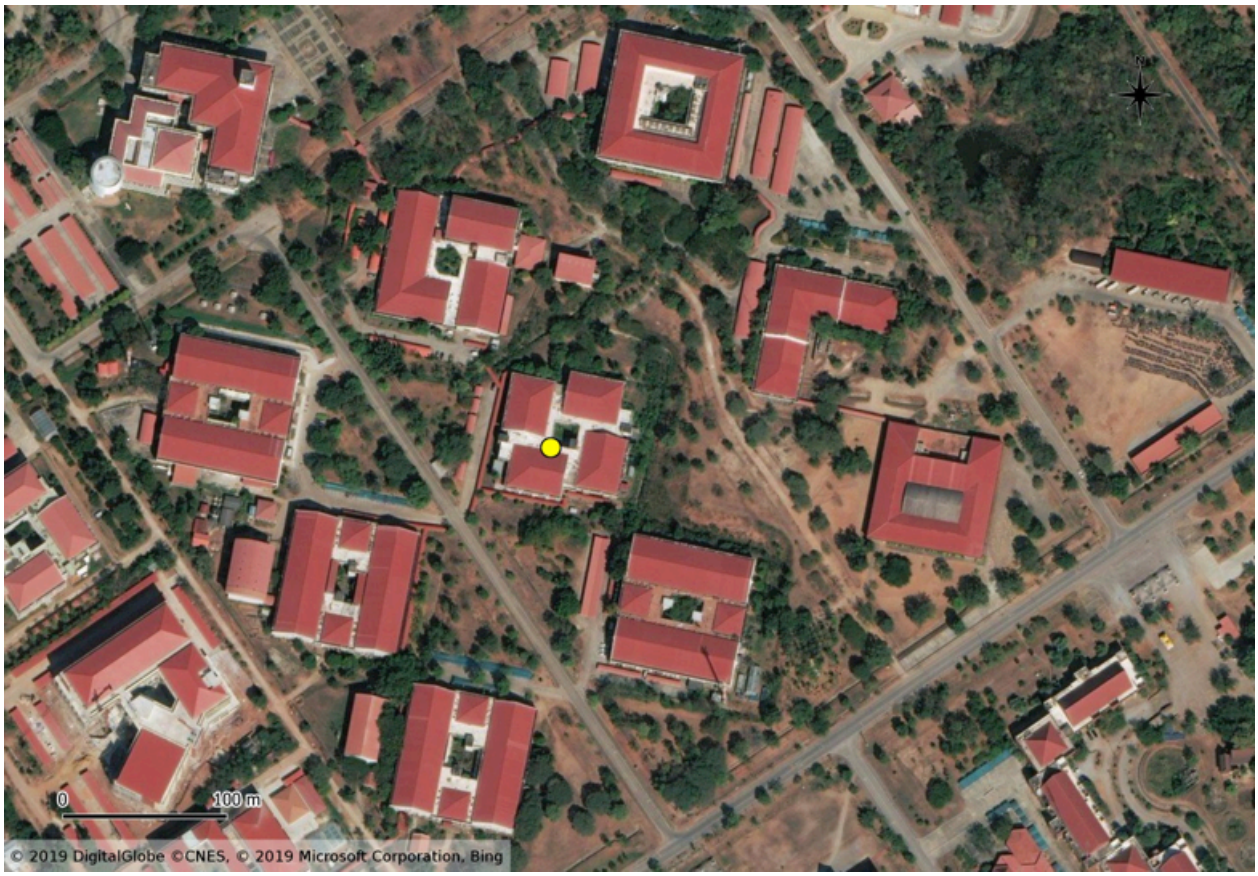


**Image 1. Satellite imagery of central SUT campus in Nakhon Ratchasima, Thailand. The yellow circle indicates the location where the observation occurred inside a university building (Satellite imagery is from Bing [2019]).**

garden areas at the center of their structures. These "green" atriums only measure about 200m$^2$, however, they typically contain an assortment of flora as well as small, semi-permanent water features, thus providing suitable habitat for a variety of fauna.

In conjunction with an ongoing investigation of *B. candidus* movement at SUT, we offer a free snake-removal and relocation service for "nuisance snakes" found in campus households. As a result, each year since our project began in late 2017 we have been notified about approximately 100 snakes that residents have encountered among their homes, gardens, or university buildings. We have documented a total of 17 snake species which came into contact with humans within our study site through these notifications. Those most frequently removed from buildings include the harmless *Chrysopelea ornata*, *Oligodon fasciolatus*, *Ptyas mucosa*, *Ptyas korros*, *Lycodon capucinus*, *Coelognathus radiata*, and *Python bivittatus*, and the highly venomous *Naja siamensis*, and *Bungarus candidus*. Non-target species are relocated to the nearest suitable habitat upon capture, while *B. candidus* are taken to the laboratory for morphometric data collection, including measuring the weight, snout-vent length (SVL), and tail length (TL), before being released. All rescued snakes are typically released within 100m from the capture location (well within the home range of most species).

At 07.05h on 08 January 2019, campus security contacted our team after a custodian staff member discovered two snakes interacting inside a large laboratory building. We arrived on scene at 07.15h to observe an adult female *B. candidus* (mass = 216.7g, SVL = 91.2cm, TL = 12.7cm) swallowing a small Golden Tree Snake *Chrysopelea ornata* (Shaw, 1802), in the hallway adjacent to the building's garden atrium (14.877°, 102.018°; Image 2). We documented the event from a distance of approximately 10m to avoid disrupting the animal's behavior. At the initial time of discovery the *B. candidus* had just begun to swallow the *C. ornata* head-first. By the time we arrived, the *B. candidus* had nearly completed ingestion of the *C. ornata*, which was unresponsive. The *B. candidus* pulled the prey item further down its esophagus with a series of corresponding side-to-side head and jaw movements,


**Image 2. An adult *Bungarus candidus* preying on a *Chrysopelea ornata* in the hallway of a laboratory building on a large university campus in northeastern Thailand.**

as is typical feeding behavior in snakes. The prey item was no longer visible at 07.20h, approximately 40min after sunrise. Thereafter, we captured the snake and housed it within a plastic box so it could digest the prey item prior to taking morphological measurements and adding the individual to our ongoing *B. candidus* spatial ecology study. The *B. candidus* regurgitated the partially digested *C. ornata* approximately 24 hours post-ingestion (TL = 22cm).

This observation confirms that *B. candidus* forages for prey around and within buildings. The prey species, *C. ornata*, is known to commonly venture inside human habitations to feed on geckos which congregate there (Pauwels et al. 2003). Likewise, *B. candidus* may also be attracted to human settlements in order to take advantage of potential prey. This possibly increases the potential for snake-human encounters with the risk of life-threatening snakebites, and intentional and unintentional killings of snakes by humans (Ahsan & Rahman 2017; Knierim et al. 2017; Meek 2012). We suggest further investigation into the kraits' use of human settlements, including habitat selection, movement ecology, and human responses to snakes.

We provide evidence that *B. candidus* will occasionally remain active shortly after sunrise when engaged in feeding behavior, as this individual did not begin ingestion of the *C. ornata* until approximately 25min after sunrise. As characteristically nocturnal and highly cryptic snakes, kraits are generally at less risk of being detected by humans than are diurnal snake species (Viravan et al. 1992). As a consequence, diurnal activity in *B. candidus* may lead to more pronounced conflict with humans. Kraits that forage among anthropogenic settlements during the daylight are likely at greater risk of being killed by humans. Similarly, humans are likely to be at greater risk of being bitten by *B. candidus* that are active during daylight. Our finding may help support the statistics of how nearly 27% of 78 reported bites by *B. candidus* in Thailand occurred during daylight hours (Tongpoo et al. 2018).

## References

**Ahsan, M.F. & M.M. Rahman (2017).** Status, distribution and threats of kraits (Squamata: Elapidae: *Bungarus*) in Bangladesh. *Journal of Threatened Taxa* 9(3): 9903–9910. https://doi.org/10.11609/jott.2929.9.3.9903-9910

**Chanhome, L., M.J. Cox, T. Vasaruchapong, N. Chaiyabutr & V. Sitprija (2011).** Characterization of venomous snakes of Thailand. *Asian Biomedicine* 5: 311–328.

**Crane, M., K. Oliver, I. Silva, A. Aksornneam, T. Artchawakom & C.T. Strine (2016).** A report of a Malayan Krait snake *Bungarus candidus* mortality as by-catch in a local fish trap from Nakhon Ratchasima, Thailand. *Tropical Conservation Science* 9: 313–320.

**Grossmann, W. & C. Schäfer (2000).** Eine Blindwühle der Gattung *Ichthyophis* Fitzinger, 1826 als Beute des Malayen-Kraits *Bungarus candidus* (Linnaeus, 1758). *Sauria* 22: 45–46.

**Hughes, A.C. (2017).** Understanding the drivers of Southeast Asian

biodiversity loss. *Ecosphere* 8: e01624.

**Knierim, T., C.H. Barnes & C. Hodges (2017).** *Bungarus fasciatus*: diet/scavenging. *Herpetological Review* 48: 204–205.

**Knierim, T.K., B.M. Marshall, L. Hayes, S. Waengsothorn, P. Suwanwaree & C.T. Strine (2018).** The movements and habitat preferences of a Malayan krait (*Bungarus candidus*) in an agrarian landscape. *Herpetological Bulletin* 143: 30–33.

**Knoot, T.G. & L.B. Best (2011).** A Multiscale approach to understanding snake use of conservation buffer strips in an agricultural landscape. *Herpetological Conservation and Biology* 6: 191–201.

**Kuch, U. (2001).** Notes on the diet of the Malayan Krait, *Bungarus candidus* (Linnaeus, 1758). *Herpetological Bulletin* 10–14.

**Kuch, U. (2004).** *Bungarus candidus* (Malayan Krait) Diet. *Herpetological Review* 35: 274.

**Kularatne, S.A.M. (2002).** Common krait (*Bungarus caeruleus*) bite in Anuradhapura, Sri Lanka: a prospective clinical study, 1996–98. *Postgraduate Medical Journal* 78: 276–280.

**McKinney, M.L. (2006).** Urbanization as a major cause of biotic homogenization. *Biological Conservation* 127: 247–260.

**Meek, R. (2012).** Anthropogenic sources of mortality in the western whip snake, *Hierophis viridiflavus*, in a fragmented landscape in Western France. *Herpetological Bulletin* 120: 4-8.

**Pauwels, O.S., P. David, C. Chimsunchart & K. Thirakhupt (2003).** Reptiles of Phetchaburi Province, Western Thailand: a list of species, with natural history notes, and a discussion on the biogeography at the Isthmus of Kra. *Tropical Natural History* 3: 23–53.

**Prange, S., S.D. Gehrt & E.P. Wiggers (2004).** Influences of anthropogenic resources on raccoon (*Procyon lotor*) movements and spatial distribution. *Journal of Mammalogy* 85: 483–490.

**Slowinski, J.B. (1994).** The diet of kraits (Elapidae: *Bungarus*). *Herpetological Review* 25: 51–53.

**Siow, H. & A. Figueroa (2016).** Malayan Krait *Bungarus candidus* preying on skink on Pulau Langkawi, Peninsular Malaysia. *Southeast Asia Vertebrate Records* 2016: 49–50.

**Tongpoo, A., C. Sriapha, A. Pradoo, U. Udomsubpayakul, S. Srisuma, W. Wananukul & S. Trakulsrichai (2018).** Krait envenomation in Thailand. *Therapeutics and clinical risk management* 14: 1711–1717.

**Vanderduys, E.P. & A.S. Kutt (2013).** Is the Asian House Gecko, *Hemidactylus frenatus*, really a threat to Australia's biodiversity? *Australian Journal of Zoology* 60: 361–367.

**Viravan, C., S. Looareesuwan, W. Kosakarn, V. Wuthiekanun, C.J. McCarthy, A.F. Stimson, D. Bunnag, T. Harinasuta & D.A. Warrell (1992).** A national hospital-based survey of snakes responsible for bites in Thailand. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 86: 100–106.

**Woodroffe, R., S. Thirgood & A. Rabinowitz (2005).** *People and wildlife, conflict or co-existence?* Cambridge University Press, Cambridge, 497pp.

**World Health Organization (2016).** *Guidelines for the Management of Snakebites. 2nd Edition.* WHO, Regional Office for South-East Asia, 201pp.

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