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An instance of *Boiga dendrophila dendrophila* (Boie, 1827) (Reptilia: Colubridae) being parasitized by *Amblyomma helvolum* Koch, 1844 (Acari: Ixodidae), with comments about the attachment sites of this tick species

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Short note

ABSTRACT

Ectoparasites, such as ticks, may exhibit preferences for particular attachment sites on various hosts, since the choice of attachment sites may affect tick survival. Herein we report an instance of a mangrove snake, *Boiga dendrophila dendrophila*, being parasitized by the tick *Amblyomma helvolum*, with comments on this tick's attachment sites. Our collection of *A. helvolum* appears to be the first record of this species from Sandakan, a city on the northeast coast of Borneo, in the Malaysian state of Sabah.

Keywords *Amblyomma helvolum*; attachment site; *Boiga dendrophila*; Borneo; Malaysia; Saba

Introduction

For ectoparasites, such as ticks, survival not only entails locating a suitable host, but also attaching at sites that facilitate feeding, while at the same time providing protection against host defensive behaviors and environmental abrasion accompanying host movements. However, not all tick species that parasitize a particular host necessarily utilize the same attachment sites, i.e., spatial niche segregation may occur (Anderson *et al.*, 2013). Even within a particular species the sexes and active developmental stages (larvae and nymphs) may make use of different attachment sites (Chilton *et al.*, 1992; Mysterud *et al.*, 2014). Additionally, for a particular tick species there can be variation in the attachment sites on different host species (Chilton *et al.*, 1992). An understanding of the natural history of tick species thus requires knowing not only which hosts they infest, but also the range of likely attachment sites on hosts.

The mangrove snake, *Boiga dendrophila* (Boie, 1827), is a relatively large arboreal member of the family Colubridae that inhabits lowland rainforests and swamps in southern Thailand, western peninsular Malaysia, Singapore, parts of Indonesia, Cambodia, Myanmar, Vietnam, and the Philippine Islands (Cox *et al.*, 1998; Mattison, 1999). The subspecies *Boiga dendrophila dendrophila* (Boie, 1827) is endemic to Borneo (Uetz and Hosek, 2018). *Boiga dendrophila* is

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Figure 1 Two *Amblyomma helvolum* females attached to the neck of the *Boiga dendrophila dendrophila* (Photo by Jean-Jay Mao).

a nocturnal species, and although it may occasionally be found on the ground, it is primarily arboreal (Groen, 2008). Herein we report on ticks that were collected from a *B. d. dendrophila* specimen, with comments on their attachment sites.

Observation

On September 6, 2015, an adult male *B. d. dendrophila* (measurements were not taken) was found on the side of a road within an African oil palm (*Elaeis guineensis* Jacq.) plantation in Sepilok (N5°52'03.02" E117°57'19.53"; elevation: 16 m), Sandakan, in the Malaysian state of Sabah on the northeast coast of Borneo. Upon inspection, it was found that the snake was being parasitized by three ticks, two of which were attached to the dorsal surface posterior to the head (Figure 1) and the other on the left ventral side of the mid-body of the snake (Figure 2). After the ticks were removed and placed in a plastic vial of 75% ethanol for further study, the snake was released back into the wild. Based on the keys in Anastos (1950), and Voltzit and Keirans (2002), the two ticks from the head of the *B. d. dendrophila* were determined to be females of *Amblyomma helvolum* Koch, 1844. The remaining specimen was an *Amblyomma* nymph, but since the immature stages in this genus are morphologically conservative with few diagnostic characters (Lampo *et al.*, 1997), we can only state that our nymph does not represent *A. helvolum*. The ticks were deposited in the Zoological Collection of the Forestry and Natural Resource Department of National Ilan University, Taiwan, R.O.C. (voucher number NIUFNR-PA-000019-Bd for the two *Amblyomma helvolum* females, and NIUFNR- PA-000020-Bd for the *Amblyomma* sp. nymph).



Figure 2 An *Amblyomma* sp. nymph attached under a lateral mid-body scale of the *Boiga dendrophila dendrophila* (Photo by Jean-Jay Mao).

Discussion

Amblyomma helvolum has a natural distribution that extends from the Nicobar Islands of India eastward through parts of Thailand, Laos, Malaysia, Singapore, Vietnam, Indonesia, the Philippines, and Taiwan (Auffenberg, 1988; Kolonin, 1995; Petney and Keirans, 1995; Chao *et al.*, 2013). Although this tick species has been collected from parts of Borneo (Kohls, 1957), we could not find reports specifically pertaining to Sandakan, so our observation appears to be a new distribution record.

Previous reports from Anastos (1950) and Robinson (1926) of *A. helvolum* parasitizing *B. dendrophila* are based on specimens collected by A.C. Oudemans on Berhala Island, also within the Malaysian state of Sabah. The apparent few records of this snake as a host of this tick is likely because the snake is rarely found on the ground, therefore making it an infrequent host for ticks. We are aware of only one East Asian ixodid tick species that might be described as arboreal, the unrelated *Haemaphysalis megalaimae* Rajagopalan, 1963, which is apparently specific to barbets (Aves: Piciformes, Megalaimidae) and has never been collected from ground-dwelling hosts (Geevarghese and Mishra, 2011). In addition no descriptions of the attachment sites were provided by Oudemans (1928). It is worth noting that Auffenberg (1988) and Lazell *et al.* (1991) reported on *A. helvolum* attaching to sites associated with wounds and scars on Luzon giant forest skinks, *Otosaurus cumingi* Gray, 1845, and a Sulawesi black racer, *Ptyas dipsas* (Schlegel, 1837), respectively, which suggests that these ticks will exploit sites that would enable efficient feeding (i.e., sites without protective scales). However, the choice of attachment site is likely not only determined by accessibility. Auffenberg (1988) also noted that although *A. helvolum* attached to similar sites on Gray's monitors, *Varanus olivaceus* Hallowell, 1837 (reported as *Varanus grayi*), and common water monitors, *Varanus salvator* (Laurenti, 1768), there were differences. On *V. olivaceus*, *A. helvolum* females mostly attached to the foreparts of the lizards, and were absent from the chin, while the males primarily attached

to the base of the claws (Auffenberg, 1988). On *V. salvator*, however, the attachment sites of *A. helvolum* females were restricted to the foreparts of the lizards, including the chin, while the males primarily attached to the ventral areas of the chin, throat, chest, belly, cloaca, and tail (Auffenberg, 1988). Attachment site preferences may vary in both lizards and snakes. Thus, Chao *et al.* (2013) reported an instance similar to ours, where three *A. helvolum* females were attached to the dorsal neck area (posterior to the head) of a king rat snake, *Elaphe carinata* (Günther, 1864), whereas Simmons *et al.* (2002) recorded 21 *A. helvolum* males that were attached along the dorsal and lateral surfaces of three king cobras, *Ophiophagus hannah* (Cantor, 1836).

Throughout its distribution range *A. helvolum* infests a variety of reptilian hosts, many of which are collected from the wild for the pet trade. Since potential pathogenic *Hepatozoon* and *Rickettsia* species have been detected in *A. helvolum* in part of its distribution range (Sumrandee *et al.*, 2014; Sumrandee *et al.*, 2015), proactive measures to minimize the introduction of this tick into areas outside of its natural distribution range are essential. Importation inspections can be greatly improved if the feeding behaviors (e.g., attachment site preference) of these ticks are better understood. The anecdotal observations reported herein are insufficient to definitively determine the attachment site preferences of *A. helvolum*, but they suggest that such preferences may vary with host species and sex, and possibly with tick life history stage. Additional empirical studies are needed to further examine this aspect of the natural history of *A. helvolum*.

Disclosures

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