Parasitic infestation and site preference of the tick *Amblyomma gervaisi* on the monitor lizard *Varanus bengalensis* in India

GAURAV BARHADIYA^{1*} & CHIRASHREE GHOSH¹

¹Department of Environmental Studies, University of Delhi *Corresponding author e-mail: Gaurav7wild7@gmail.com

Ticks are the most common arthropod group that parasitise reptiles and are particularly abundant in warm and humid climates (Auffenberg & Auffenberg, 1990). They are well-known as a cause of dermatological problems in reptiles (Cooper, 2006) and the organisms spread by ticks are a major constraint to animal health and productivity by causing morbidity and mortality (Ghosh & Nagar, 2014). Of 102 species of the tick genus *Amblyomma* (previously Aponomma), 37 species feed exclusively on reptiles (Buczek et al., 2006). Here we describe tick infestation of the Bengal monitor *Varanus bengalensis*.

From 4 September 2017 to 31 July 2019, 11 free- living *V. bengalensis* from different locations of the union territory of Delhi were examined for ectoparasites. The monitor lizard specimens studied included road-kills, live rescued animals from the local area, and animals that had died naturally in the wild. All visible ticks were collected using sterile forceps and were transferred to vials containing 70 % ethanol. The ticks collected were examined under a light microscope and identified using the key of Sen & Fletcher (1962). After collection of the ticks, the rescued monitor lizards were released back into the wild.

A total of 337 ticks were recorded from 9 of the 11 specimens of *V. bengalensis* (Table 1). These ticks were all identified as *Amblyomma (Aponomma) gervaisi* (Lucas, 1847) and were mostly concentrated in the axilla, inguinal and perianal regions. Female ticks (Fig. 1A) were recorded exclusively on anterior parts, i.e. neck region, axilla and inguinal (fore and hind limbs), while male ticks were recorded exclusively near the cloaca and posterior tail regions (Fig. 1B & C). Male ticks were generally present in much greater numbers than females (Table 1). There were two instances where a few males ticks were copulating with females on the inguinal regions.

Ticks of the genus *Amblyomma* have often been recorded in south India from captive and wild snakes such as the rat snake *Ptyas mucosus*, Indian cobras *Naja naja*, king cobra *Ophiophagus hannah*, Indian rock python *Python molurus* and reticulated python *Malayopython reticulatus* (Rajesh et al., 2015; Pandit et al., 2011) and there is a single previous record of a monitor lizard infested with *A. gervaisi*, from the Delhi region (Nagar et al., 1977). The tick *Amblyomma gibsoni* has also been recorded on *V. bengalensis* from Maharashtra (Harkare et al., 2007). But to date, there are apparently no reports that male and female *A. gervaisi* occupy different



Figure 1. Ticks (*A. gervaisi*) attached to a monitor lizard (*V. bengalensis*)- **A.** Female ticks attached to the neck and axilla region, **B.** Clusters of male ticks on the posterior part of the tail, **C.** Male ticks attached near the cloaca

	Lizard details		Tick numbers			
Date of observation	Snout vent length (cm)	Gender	Adult males	Adult females	Nymphs	Total ticks
04-Sep-17	96	Male	14	5	7	26
31-Oct-17	84	Female	22	12	6	40
24-Feb-18	43	Male	0	0	0	0
19-Mar-18	41	Male	34	17	0	51
30-Mar-18	59	Male	17	4	6	27
02-Apr-18	39	Female	9	4	1	14
12-Jun-18	56	Male	36	19	14	69
08-Oct-18	49	Male	0	0	0	0
20-Oct-18	82	Female	38	11	9	58
15-Dec-18	54	Male	19	3	2	24
07-Jan-19	66	Female	16	9	3	28
		Totals	205	84	48	337

Table 1. The number of the ticks (*A. gervaisi*) recorded from specimens of monitor lizards (*V. bengalensis*)

locations on the bodies of monitor lizards. It would be of interest to undertake further research to elucidate why this is the case. There are two hypotheses that could be tested to explain the effect 1) Males and females may have different dietary preferences such that females may need easy access to the protein in blood so favour areas of thin skin overlying vascular tissue (armpits, necks, etc.) whereas males may be less dependent on protein and so may target the fat stored in the tail region, and/or 2) Female ticks may be more mobile than males, as unlike males they have been recorded from the burrows of monitor lizards, consequently the transfer of female ticks possibly occurs directly between hosts, especially during combat. For host to host transfer, females benefit from positioning on the main body as it is more favourable than on the tail; female ticks may also reach the host by launching themselves from the tips of grasses and herbs. But this is not the case for the less mobile male ticks that may be restricted to the underside of the tail and cloaca region and may generally be transferred only during copulation.

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