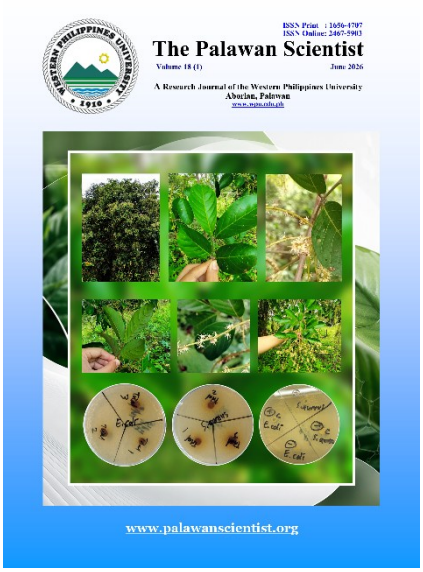

Notes on tick infestation in free-ranging Philippine Pangolins (*Manis culionensis*)

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ABSTRACT

The article provides quantitative and qualitative data on the infestation of wild Philippine Pangolin with the tick species *Amblyomma javanense* (Supino, 1897). Samples were gathered during routine health checkup of 71 pangolins when these were turned over or rescued between 2015 and 2025. Prevalence with *A. javanense* was 67.6%. The mean abundance of ticks was 8.1 and the mean intensity was 12.0.

Keywords: ectoparasites, Palawan Pangolin, *Amblyomma javanense*

Pangolins host different endo- and ectoparasites. The most conspicuous are ticks. The Philippine Pangolin *Manis culionensis* (de Elera, 1915), that is endemic to the Province of Palawan, is known to host the tick species *Amblyomma javanense* (Supino, 1897) (Carpos-Raros 1993; Jaffar et al. 2018). Information on the infestation is limited to a statement by Schoppe et al. (2020), who found a prevalence of 86% for 14 wild *M. culionensis*.

Katala Foundation Incorporated (KFI), a non-profit NGO working on highly threatened wildlife in the Province of Palawan, adopted the Philippine Pangolin as one of its flagship species and implements a comprehensive, holistic conservation program for the species since 2007. Part of KFI's health protocol is the examination for ticks, hence information on tick infestation was gathered from 71 free-ranging *M. culionensis* that were either caught during populations surveys (Figure 1) or turned over or rescued, and from one confiscated and repatriated individual. Of these 71 pangolins, 43 (60.6%) are male and 28 (39.4%) are female; 40 (56.3%) are adults (25♂ and 15♀) and 31 (43.7%) are juveniles (18♂ and 13♀). Ticks were removed with forceps and preserved in 75% denatured alcohol. Species identification was based on morphological characteristics using Voltzit and Keirans (2002). Identification, assignment of life history stages and counting required the magnification under a stereo microscope.

Amblyomma javanense was the only ectoparasite species detected on the Philippine Pangolin (Figure 1). Prevalence with *A. javanense* was 67.6% (48 out of 71 were infested). More males (62.5%) than females (37.5%) were among the infested pangolins (Figure 2). Most of the ticks were found under the scales and very few only on the unprotected belly.

Figure 1. A pangolin in its natural habitat and the ticks concealed beneath its scales (inset).

The 48 infested pangolins were almost equally composed of mature (52.1%) and immature (47.9%) individuals (Figure 2). Among the adults infested, more male (64.0%) than female (36.0%) pangolins had ticks (Figure 3). The infestation rate by municipality and by year was compared. In all except one municipality, the infestation was higher than 50% (Figure 4). Over the years, the percentage of infested pangolins was lowest in 2020 (33%) and highest in 2022 and 2024 (both 100%), with 5 and 8 pangolins recorded, respectively (Figure 4).

For 31 of the 48 infested pangolins, quantitative data on the tick are available. A total of 577 ticks were collected. The number of ticks per pangolin ranged from 1-92 (median = 12.0; mean = 18.6 ± sd 22.8) (Figure 5). The mean abundance (MA) of ticks, that is the total number of ectoparasites divided by the total number of pangolins, was 8.1. The mean intensity (MI), that is the total number of ectoparasites divided by the number of infested pangolins, was 12.0.

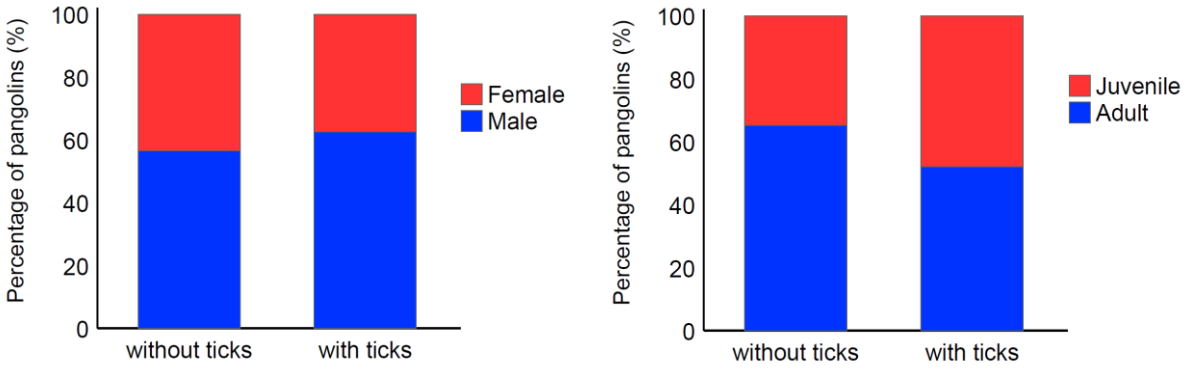

Figure 2. Percentage of female and male pangolins (Left) and percentage of juvenile and adult pangolins (Right) that were infested (n = 48) or tick-free (n = 23).

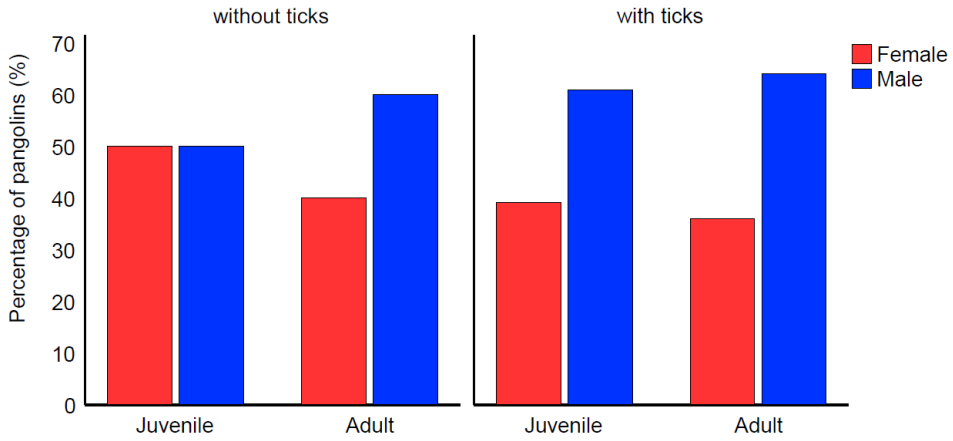

Figure 3. Sex composition (%) of juvenile and adult pangolins with and without ticks. Percentages were calculated within each life stage and tick-status category (each category sums to 100%).

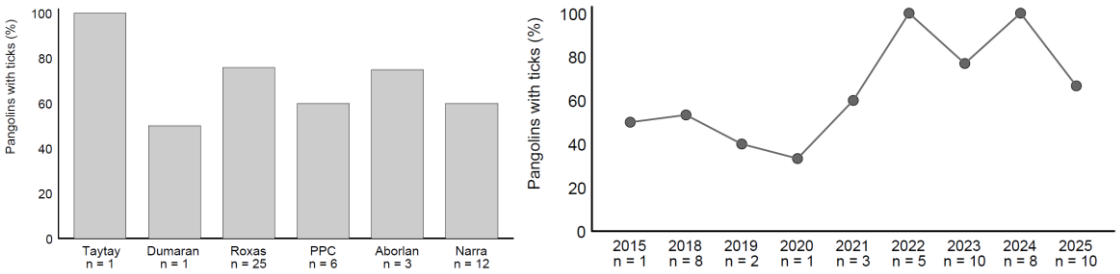

Figure 4. Percentage of pangolins infested with ticks (n = 47) by municipality (Left) and percentage of pangolins infested (n = 48) with ticks by year (Right). The reduced number per municipality was because one was repatriated and, hence, could not be attributed to a municipality.

For 19 pangolins we have information on the life history stages of the ticks. There were 375 ticks collected: 53.2% were adults while 15.5% were nymphs and 31.3% larvae (Table 1). Adult ticks were dominated by males (88.9%).

The presented tick infestation of *M. culionensis* was similar to the one of 16 confiscated Sunda Pangolin with *A. javanese* prevalence of 68.8% (Hassan et al. 2013) but lower than the one for 21 free-ranging Sunda Pangolins (100%) studied by Chong et al. (2023). Hassan et al. (2013) had found more juveniles (100%) than adults (63.6%) *M. javanica* infested, and adult males seemed more susceptible than adult females (Hassan et al., 2013). The same trend was found for *M. culionensis*. Likewise, Hassan et al. (2013) had also found more adult than immature ticks, and more male (81.7) than female ticks.

There was no information on the infestation rate of Philippine Pangolins that were confiscated from trade. Access was available to only one individual, which had been repatriated to Palawan and arrived without ticks; however, it is unknown whether ticks had been removed prior to repatriation. Likewise, there is no published information on the tick-borne diseases of *M. culionensis.*

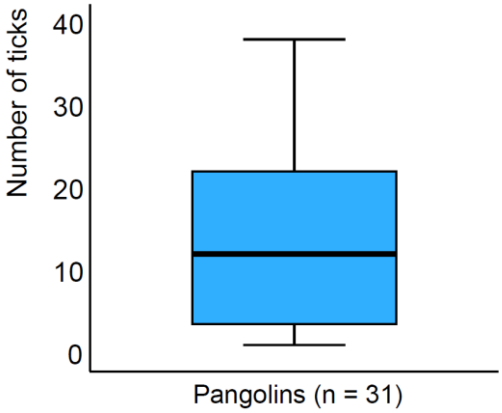

Figure 5. Tick abundance on infested pangolins (n = 31).

Table 1: Life history stages of *Amblyomma javanense* collected from free-ranging *Manis culionensis* (n=19).

Pangolin ID	Larva	Nymph	Adult female	Adult male	Total
1	0	2	2	1	**5**
2	1	2	0	14	**17**
3	12	0	1	0	**13**
4	0	4	5	47	**56**
5	0	2	0	1	**3**
6	9	0	0	10	**19**
7	0	0	0	1	**1**
8	0	1	0	9	**10**
9	0	26	0	12	**38**
10	0	1	1	2	**4**
11	92	0	0	0	**92**
12	0	0	2	0	**2**
13	0	3	0	28	**31**

Pangolin ID	Larva	Nymph	Adult female	Adult male	Total
14	1	3	0	11	**15**
15	0	1	2	11	**14**
16	2	8	2	4	**16**
17	0	2	6	17	**25**
18	0	1	0	5	**6**
19	0	2	1	4	**7**
Total	**117**	**58**	**22**	**177**	**374**
%	**31.3**	**15.5**	**5.9**	**47.3**	

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GENERATIVE AI STATEMENT

The concepts, results, and discussion within this paper are the authors' original work and no AI was used.

ETHICAL CONSIDERATIONS

The handling of pangolins was permitted under MOA between KFI and PCSDS, and gratuitous permits. The study followed all institutional and national ethical guidelines for the care and use of animals.

DECLARATION OF COMPETING INTEREST

The authors declare no competing interests.

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