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Research Note

A preliminary field survey of ectoparasites of rodents in urban park, Sarawak, Malaysian Borneo

Madinah, A.[1*], Mariana, A.[2], Fatimah, A.[1] and Abdullah, M.T.[1]
[1]Department of Zoology, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia
[2]Unit of Acarology, Infectious Diseases Research Center, Institute for Medical Research, Jalan Pahang, 50588 Kuala Lumpur
[*]Corresponding author email: a.madinah@gmail.com
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Abstract. A survey of ectoparasites was carried out during Eco-Zoonoses Expedition in Bukit Aup Jubilee Park (BAJP), Sibu, Sarawak, Malaysian Borneo from 5th to 9th June 2008. A total of nine individuals comprising two species of rodents were captured. The species of rodents screened for ectoparasites were *Sundamys muelleri* and *Callosciurus notatus*. Four genera and six species of ectoparasites were collected, namely, *Ixodes granulatus*, *Ixodes* sp., *Laelaps sedlaceki*, *Laelaps nuttalli*, *Hoplopleura dissicula* and *Listrophoroides* sp. Three species of the ectoparasites are known to have potential health risk. The species were *Ixodes granulatus*, *Laelaps nuttalli* and *Hoplopleura dissicula*. This survey produced the first list of ectoparasites in Bukit Aup Jubilee Park, Sarawak, Malaysia.

Bukit Aup Jubilee Park (BAJP) is located 20 minutes away from Sibu town. The park covers a 24-acre (10ha) cluster of low hill forest surrounded by plantations, longhouses and the Igan River. It is a well known and popular area for sight-seeing, picnics, jogging and other recreational activities by the local community.

Rodents are considered as the most important hosts because taxonomically this group includes the largest number of species (Nieri-Bastos *et al.*, 2004). They are also important to help in maintaining our ecosystem and known as reservoirs of zoonotic disease (Paramasvaran *et al.*, 2009a; Thanee *et al.*, 2009). Some ectoparasites of rodents in Malaysia are known to be of public health importance. There is currently no survey of ectoparasites on rodents conducted in BAJP. The aim of this study is therefore to identify the ectoparasites present in BAJP that is of known public health importance and to determine whether there is any potential public health risk in the area.

Trapping was conducted in BAJP (N 2°21'17.61" E 111°49'51.79") from 5th to 9th June 2008. A total of 100 standard cage traps were set per day for five consecutive days. Cage traps were placed on the ground and tree branches along the existing trail with approximately five meters interval. Cage traps were baited with bananas and checked twice daily. Baits were replenished every day in the morning and evening. Caught animals were placed in cloth bags and brought back to a field laboratory in BAJP for further processing.

Identification of the animals was based on Payne *et al.* (2005). The animals were then individually anesthetised with chloroform in a separate plastic bag or cloth bag prior to screening for ectoparasites (Gannon & Willig, 1995). Individual processing of host was observed to avoid contamination of

ectoparasites between hosts (Bittercourt & Rocha, 2002). The anesthetised animal was removed from bag, placed on a white enamel white tray and combed thoroughly with a fine tooth comb to dislodge ectoparasites from the animal onto the tray (Mariana *et al.*, 2005). Contents of the tray were then carefully examined and any ectoparasites seen were recovered using a sharpened wooden applicator stick dipped in 70% ethanol. The ectoparasites were then placed in a collection vial containing 70% ethanol. A separate vial was used for each animal. The vial containing ectoparasites were labeled with information such as host species, location, ecology, sex and date of collection (Madinah *et al.*, 2011; Madinah, 2012). For live animals, ectoparasites were collected directly from eye-lids, ear-lobes, ear fringes, chin, muzzle and other parts of the body using fine forceps (Madinah *et al.*, 2011). All ectoparasites were brought back to the laboratory in Zoological Museum in Universiti Malaysia Sarawak for mounting and identification. The hosts were deposited in the museum following Abdullah *et al.* (2010).

Ectoparasites were first sorted into their respective order under dissecting microscope. The technique for mounting acarines (ticks and mites) followed those by Mariana *et al.* (2005) and Chuulun *et al.* (2005). Mounting for different orders of ectoparasites was as follows: mesostigmatid mites were first cleared in lactophenol before mounting in Hoyer's medium. Listrophorid mites were placed in lactic acid and heated on a hot plate at 200°C for five minutes before mounting in Hoyer's medium while lice were directly mounted in Hoyer's medium. For ticks, slides were prepared only for the larval stages as adults can be identified without mounting. Mounted slides were incubated at 40°C for a week to harden the mounting medium. The coverslips were ringed with paint to prevent desiccation of the medium during storage.

The slides were then examined under a compound microscope with magnification of 40x, 100x, 400x and 1000x for detailed identification. Ticks were identified using a stereo microscope. Ectoparasites were identified to the species level where possible using available keys, published taxonomic drawings and references (Kohls, 1957; Strandtmann & Mitchell, 1963; Jameson, 1965; Johnson, 1972).

Trapping in BAJP yielded only Rodentia and no other taxa of mammals. A total of nine individuals of rodents comprising Muller's rat, *Sundamys muelleri* (family Muridae) and plantain squirrel, *Callosciurus notatus* (family Sciuridae) were caught and examined for ectoparasites during the five days of trapping. The most animals caught were *S. muelleri* with seven individuals while *C. notatus* was represented by only two individuals. Among the rodents examined, 55.6% were found to be infested with ectoparasites.

Four groups of ectoparasites were recovered from the rodents. The ectoparasites were ticks, mesostigmatids, lice and listrophorid mites. Six species of ectoparasites were identified, namely, *Ixodes granulatus*, *Ixodes* sp., *Laelaps sedlaceki*, *Laelaps nuttalli*, *Hoplopleura dissicula* and *Listrophoroides* sp. Ticks were found only on three individuals of *S. muelleri* with the codes BA2, BA3 and BA4. All were ixodid ticks belonging to the genus *Ixodes*. The only ticks that could be identified to the species level were *Ixodes granulatus* (Figure 1), which were found on two individuals of *S. muelleri* (Table 1). Studies over many years in Malaysia, particularly in peninsula Malaysia have shown that *I. granulatus* in all its stages continues to be one of the most common species of ticks on rodents (Nadchatram, 2008). It is a common acarines of rodents in Malaysia and has a distribution extending from Southeastern Asia to Eastern India and China (Nadchatram, 2008).

Mesostigmatids were found only on three individuals (33.3%) from the total of rodents caught (host code BA1, BA3 and BA5). Two species of mesostigmatids identified were *L. sedlaceki* (Figure 2) and *L. nuttalli*. They are members of the family Laelapidae from the genus *Laelaps* that are known as the most dominant genus of ectoparasitic mites (Strandtmann & Mitchell, 1963). *Laelaps sedlaceki* was reported as a dominant species found in Borneo (Sabah and Sarawak) whilst *L. nuttalli* was reported to

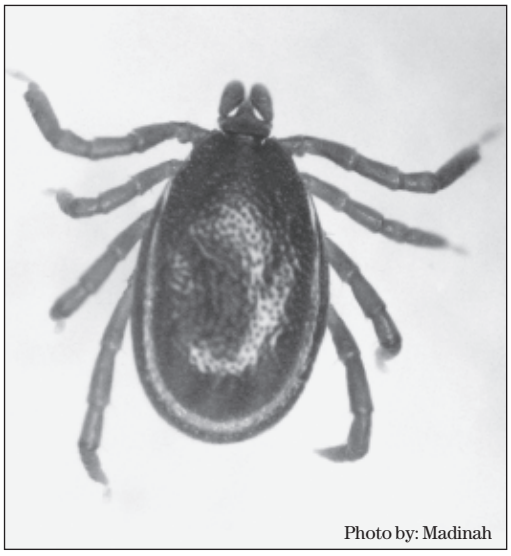

Figure 1. Dorsal view of a potential vector, *Ixodes granulatus* ♂

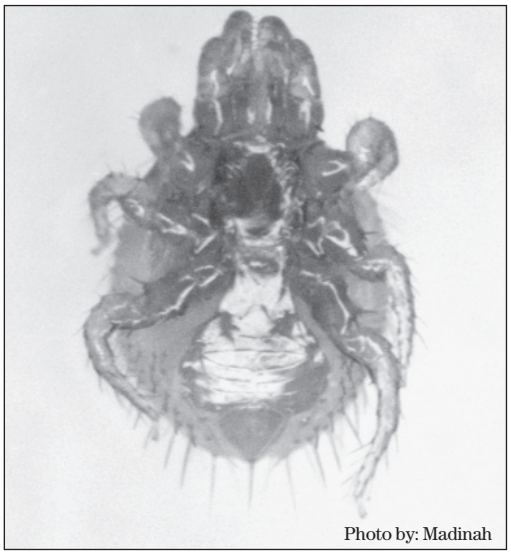

Figure 2. Ventral view of *L. sedlaceki* ♀, a dominant species of mesostigmatids found in Sarawak

Table 1. Various ectoparasites found on rodents in Bukit Aup Jubilee Park, Sarawak. Malaysia (5th to 9th June 2008). (Figures in parenthesis denote actual number of ectoparasites obtained)

Host code	Host species	Ectoparasites extracted			
		Ticks	Mesostigmatid mites	Lice	Listrophorids
BA 1	*Sundamys muelleri*		*Laelaps nuttalli* (4)		
BA 2	*Sundamys muelleri*	*Ixodes granulatus* (6)			
BA 3	*Sundamys muelleri*	*Ixodes granulatus* (10)	*Laelaps sedlaceki* (7)	*Hoplopluera dissicula* (6)	*Listrophoroides* sp. (34)
BA 4	*Sundamys muelleri*	*Ixodes* sp. (1)			
BA 5	*Sundamys muelleri*		*Laelaps sedlaceki* (1)		

have a cosmopolitan distribution where it parasitizes many species of rats in tropical and warm temperate area (Strandtmann & Mitchell, 1963; Shabrina & Salleh, 1995).

A species of lice, *Hoplopluera dissicula* was collected only from *S. muelleri* (host code BA3) caught in the area. The species has also been reported to infest *S. muelleri* in peninsula Malaysia and north Borneo (Johnson, 1972). Besides that, it has also been found on other species of rodents such as *Rattus tiomanicus*, *Niviventer cremoriventer*, and *Rattus rattus diardii* (Shabrina, 1990; 1991; Shabrina & Salleh, 1995). A total of 34 fur mites of the family Listrophoriidae were found on one individual of *S. muelleri* (host code BA3). The listrophorids were identified as *Listrophoroides* species. The mites are obligate parasites that live in the fur of mammals, specifically rodents throughout the world (Fain & Bochkov, 2004).

Three species of the ectoparasites found in the area, namely, *Ixodes granulatus*, *L. nuttalli* and *H. dissicula* are of public health importance. One of them is a tick, *I. granulatus* that has been identified as a vector of Langat Virus (Smith, 1956) and was proven to transmit pathogen (Marchette, 1965). The Langat virus was first recovered

in Malaysia in 1956 from the species of tick infesting *S. muelleri* and *Leopoldamys sabanus* caught in Hulu Langat Forest Reserve, Selangor (Smith, 1956; Nadchatram, 2008). *Ixodes granulatus* was also found to be involved in the cycles of tick typhus (*Rickettsia* sp.) and Q fever (*Coxiella burneti*) in climax forest of peninsula Malaysia (Marchette, 1965).

The other two species of ectoparasites are less important but may pose potential health risk to the public. *Laelaps nuttalli* was reported to attack and bite humans (Sandosham & Keling, 1967; Azad, 1986) and thus can cause occasional irritation (Azad, 1986). *Hoplopleura dissicula* has the potential to harbour plague bacilli, can transmit tularemia and bartonellosis to humans, and also play important roles in transmiting the murine typhus and plague from rat to rat (Zahedi *et al.*, 1984; Paramasvaran *et al.*, 2009b).

The presence of all this three species of ectoparasites is only an indication of a potential risk of infection to human who visit BAJP and probably expose to those potential vectors. To confirm the actual risk, there is a need to determine whether those potential vectors found in the area were infected with any disease microorganism and their capability to transmit it to human. This survey produced the first list of ectoparasites in BAJP. Further surveys need to be carried out for a longer period in order to build up a further extensive wealth of information on various aspects such as host-parasite relationship, biology and ecology.

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