



Interaction of ectoparasites-small mammals in tropical rainforest of Malaysia

A. Madinah^{1,3}, F. Abang¹, A. Mariana², M.T. Abdullah¹ and J. Mohd-Azlan¹

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 Centre, Institute for Medical Research, Jalan Pahang, 50588 Kuala Lumpur, Malaysia

³ Corresponding author: a.madinah@gmail.com, Tel: +6082583180, Fax: +6082583160

Keywords: Host-ectoparasite, Rodents, Scandents, Specialization index, Zoonotic disease.

Abstract: The literature regarding the diversity of ectoparasites and their interaction with their hosts remains largely inadequate in Malaysian tropical rainforest. We investigate the interaction patterns and specialization of ectoparasites infesting terrestrial small mammals (rodents and scandents) in Peninsular and Malaysian Borneo from samples made in 16 localities between 2008 and 2010. A total of 3,235 individuals of ectoparasites were collected during field surveys, resulting in an interaction network involving 47 ectoparasites that were distributed on 23 species of small mammals. The overall specialization index H_2' of all ectoparasites and host species was 0.67 which was considered moderate. Ticks appeared to be generalist with specialization index ($H_2' = 0.35$) while lice showed higher specialization ($H_2' = 1$) in selecting host species. The most diverse parasite assemblage was found on *S. muelleri* ($H_{s,w} = 1.96$). Specialization indices among ectoparasite species (d_p) ranged from 0.03 to 1 while the indices among host species (d_h) ranged from 0.20 to 1. Incomplete field data may have contributed to the high specialization indices. This study is significant as it can enhance our understanding the emergence and management of potential zoonotic diseases in Malaysia.

Nomenclature: Standard references throughout this study follow Payne et al. (2005) and Wilson and Reeder (2005) for small mammals, Kohls (1957) for ticks, Strandtmann and Mitchell (1963) for mites, Johnson (1964) for lice, and Nadchatram and Dohany (1974) for chiggers.

Introduction

Malaysia (Peninsular Malaysia and Malaysian Borneo) is one of the 17 countries that have been described as a mega-diversity country. In fact, Malaysia is in one of the four biodiversity hotspots containing high concentrations of endemic species and is experiencing rapid deforestation and habitat degradation (Myers et al. 2000). This includes terrestrial small mammals (mostly rodents and scandents) which are diverse groups of mammals that can be found in a wide variety of habitats (Fleming 1975, Corbet and Hill 1992, Payne et al. 2005, Abdullah et al. 2010). These species play a significant role in maintaining ecosystem functionality as seed dispersal agents and arthropod control, and are medically important as reservoirs of zoonotic diseases (Wells et al. 2007, Nadchatram 2008, Chaisiri et al. 2010). Rodents and scandents are hosts to many ectoparasites and a single host can carry many different species of Acari and Insecta (Nava et al. 2003, Nadchatram 2008).

In general, ectoparasites from rodents and scandents can be classified into five main groups, namely, Mesostigmata (mites), Acarina (ticks), Prostigmata (chiggers), Phthiraptera (lice) and Siphonaptera (fleas) (Paramasvaran et al. 2009). Several studies in Malaysia reported that vertebrate hosts

carry various groups of ectoparasites such as ticks, mesostigmatid mites, listrophorid mites, trombiculid mites (chiggers), lice, fleas, myobiids and cheyletid mites (Shabrina and Salleh 1995, Mariana et al. 2009, Azima et al. 2007, Madinah et al. 2011).

Among the ectoparasites, lice and certain gamasid mites are known as permanent parasites while fleas and certain mites are nest-dwellers. Nest-dwellers only visit the host for feeding and copulation (Thanee et al. 2009). Some ectoparasites are host specific and can only be found on certain rodents and scandents (Bittencourt and Rocha 2003) while others are generalist. The occurrence of a particular ectoparasite species living on more than one host species is a result of complex interactions between the parasites and the host and the co-existence among the parasites (Thanee et al. 2009). This may be related to the intra and interspecific relationships, behaviour and the microhabitats utilised by the host (Bittencourt and Rocha 2003).

The distribution of ectoparasites is influenced by the hosts' microhabitat because ectoparasites may encounter other hosts especially when habitats are disturbed, resulting in the change of the host assemblage (Gettinger and Ernest 1995, Bittencourt and Rocha 2003). Therefore, the diversity and structure of host communities in different environmental