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Parasites of house rats (*Rattus rattus* complex) in Mataram, Lombok, Indonesia

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Abstract

House rats are commensals and have been incriminated to transmit zoonotic diseases to humans. The rats in this study were captured from the coastal, downtown and suburban areas in Mataram. Endoparasites from faecal and intestine samples and ectoparasites of the captured rats were collected for identification. They were infected with four species of ectoparasites, and six species of helminths. The ectoparasites found in the study were mites (*Laelaps echidninus* and *Ornithonyssus bacoti*), lice (*Polyplax spinulosa*), and fleas (*Xenopsylla cheopis*). Endoparasites in the faecal and intestine samples included *Hymenolepis nana*, *H. diminuta*, *Strongyloides* sp., *Trichostrongylus* sp., *Trichuris* sp., and *Moniliformis dubius*. The predominant ectoparasites were *Laelaps echidninus*, *Polyplax spinulosa*, and *Xenopsylla cheopis*. The abundant helminth species were *Hymenolepis diminuta* and *Trichostrongylus* sp.

Keywords: House rats, Parasites, Mataram, Indonesia.

Introduction

House rats are commensals that cause serious damages to the households. The house rats worldwide have been shown to belong to a species complex and the taxon in Indonesia has been referred to as *Rattus rattus diardii* (Aplin *et al.*, 2011; Yong and Eamsobhana, 2013).

Rats can be primary hosts to numerous helminths (Mafiana *et al.*, 1997). Besides the endoparasites, rats can also be infected with ectoparasites. Many of these parasites can be potentially zoonotic.

Rats been incriminated to transmit zoonotic diseases to humans (Smith and Carpenter, 2006) as the diseases include plague, salmonellosis, murine typhus, scrub typhus, arboviral infections (Suyanto *et al.*, 1984) and the causative agent of angiostrongylosis (Yong and Eamsobhana, 2013). There are possibilities of unexpected zoonoses arising from the parasites found in the peridomestic rats (Ogunniyi *et al.*, 2014). Parasitic infection in the house rats of Mataram, Indonesia was not

assessed before. We report here the parasites infecting rats in Mataram.

Material and Methods

The study was conducted in the coastal, downtown and suburban human settlement in Mataram. A total of 30 rats were captured during May–July 2014 using rat traps baited with roasted coconut and salted fish. Ten rat traps were placed randomly inside residential houses in each location. Rats were taken to the laboratory for examination of parasites.

Rats were kept in the traps for one day to obtain faecal samples. Faecal samples were examined for the eggs and larval stages of parasites by floatation methods using zinc sulphate (Claveria *et al.*, 2005). Rats were then euthanized with chloroform for recovery of ectoparasites and gastrointestinal parasites. Hair was dampened by 70% ethanol, was combed to collect ectoparasites. The intestines were dissected for gastrointestinal parasites. Samples were examined under a microscope for identification, and then documented. Taxonomic identification was based on Roberts *et al.* (2000).

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Results and Discussion

Of the 30 house rat samples examined, four species of ectoparasite and six species of endoparasites could

be detected. Each species of parasite had different prevalence and distribution. Table 1 summarizes the number of rats with parasites from different locations in Mataram.

Table 1. Number of rats infected with parasites from coastal, downtown and suburban areas of Mataram, Lombok, Indonesia

Parasite	Coastal (n=10)	Prevalence of infection (%)	Down-town (n=10)	Prevalence of infection (%)	Suburb (n=10)	Prevalence of infection (%)
<i>Laelaps echidninus</i>	7	70	5	50	8	80
<i>Ornithonyssus bacoti</i>	1	10	0	-	0	-
<i>Polyplax spinulosa</i>	2	20	1	10	5	50
<i>Xenopsylla cheopis</i>	3	30	4	40	1	10
<i>Hymenolepis nana</i>	3	30	1	10	0	-
<i>H. diminuta</i>	3	30	1	10	3	30
<i>Strongyloides</i> sp.	1	10	0	-	1	10
<i>Trichostrongylus</i> sp.	4	40	3	30	6	60
<i>Trichuris</i> sp.	-	-	2	20	-	-
<i>Moniliformis dubius</i>	1	10	-	-	-	-

Four species of ectoparasites (Fig. 1) were recovered from the rats including mites (*Laelaps echidninus* and *Ornithonyssus bacoti*), louse (*Polyplax spinulosa*), and flea (*Xenopsylla cheopis*). Of these ectoparasites, the highest prevalence was for *L. echidninus* with 80% in suburb and 70% in coastal area. This parasite had a wide range of distributions in Mataram. It could be found in all areas, from coastal to suburb. Other ectoparasites

has a narrow distribution. It could be found only in coastal area. Rahman (1988) reported that this species occurred in all parts of the world with a tropical climate, especially in the harbors. According to Yang et al. (2009), ectoparasitic arthropods also occur in *R. norvegicus* and *R. rattus* in the Island of Oahu, Hawaii.

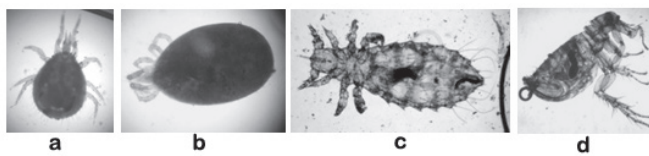


Fig.1. Ectoparasites from house rats in Mataram (a) *Laelaps echidninus*, (b) *Ornithonyssus bacoti*, (c) *Polyplax spinulosa*, (d) *Xenopsylla cheopis*

which had a broad distribution were *P. spinulosa* and *X. cheopis*. These ectoparasites are cosmopolitan and have a wide distribution throughout the world (Oguniyi et al., 2014). A high prevalence due to *L. echidninus* life cycle was reported only in one hospes (Yang et al., 2009). *Ornithonyssus bacoti* is an ectoparasite which

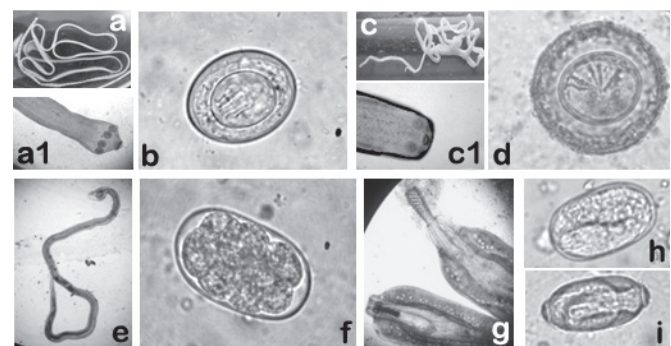


Fig.2. Helminths in fecal and intestinal samples of house rats from Mataram (a) *Hymenolepis nana* adult, (b) *H. nana* egg, (c) *H. diminuta* adult, (d) *H. diminuta* egg, (e), *Trichostrongylus* sp. adult, (f) *Trichostrongylus* sp. egg, (g) *Moniliformis dubius* adult, (h) *Strongyloides* sp. egg, and (i) *Trichuris* sp. egg. (a1, c1 and e-X10; b, d, f, h and i- X100)



Six species of endoparasites (Fig. 2) including *Hymenolepis nana*, *H. diminuta*, *Strongyloides* sp., *Trichostrongylus* sp., *Trichuris* sp., and *Moniliformis dubius* were obtained from intestinal contents. Three species were found both as mature parasites and eggs (*H. nana*, *H. diminuta*, and *Trichostrongylus* sp.), two species only as eggs (*Strongyloides* sp., and *Trichuris* sp.) and one species only in adult form (*Moniliformis dubius*). Mafiana et al. (1997) showed that the Nigerian house rats are the primary hosts for cestodes such as *Hymenolepis diminuta*, *Hymenolepis nana*, *Taenia taeniaeformis*, and *Raillietina* sp. *Hymenolepis diminuta* and *H. nana* can be transmitted to human but do not cause a serious disease (Mowlavi et al., 2008). The rats were also found to be infected with nematodes such as *Mastophorus muris*, *Trichuris muris*, and *Syphacia* sp. (Mafiana et al., 1997).

The most abundant endoparasites were *H. diminuta* and *Trichostrongylus* sp. These two species were found in the study area of Mataram. They are cosmopolitan and have a worldwide distribution (Roberts et al., 2000; Mowlavi et al., 2008). The host of *H. diminuta* is rats (Tena et al., 1998; Marangi et al., 2003; Mowlavi et al., 2008), while *Trichostrongylus* sp. have livestock as their host. This worm can infect rats through the contamination of food and water (Marangi et al., 2003). Between these two species, *Trichostrongylus* sp. had the highest prevalence, 60% in suburb and 40% in coastal area.

Hymenolepis nana and *Strongyloides* sp. were only found in the coastal area as they prefer hot, dry, and sandy environments. Adult *Strongyloides* sp. were not found in the rat's intestine, but their eggs were found in the stool. *Trichuris* sp. also found in the egg form in faecal samples. *Moniliformis dubius* was found only in the coastal area. Their intermediate hosts, molluscs and clams, are found in the coastal area (Crompton, 1972).

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