

ECTOPARASITIC FAUNA OF SCAVENGING CHICKENS (*Gallus domesticus*) FROM PENANG ISLAND, PENINSULAR MALAYSIA

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ABSTRACT. A study was conducted on 240 scavenging chickens randomly obtained from various districts from the state of Penang, Peninsular Malaysia. The chickens were closely examined for visible ectoparasites in the laboratory. The ectoparasites were collected using a blunt forceps and stored in universal bottles containing 70% ethanol. Ten species of ectoparasites were noted which consisted of five species of lice, two species of mites, two species of ticks and one species of chigger. The lice identified were *Menopon gallinae*, *Menacanthus pallidulus*, *Lipeurus caponis*, *Goniocotes gallinae* and *Goniodes dissimilis*. These lice occurred in the fluff of the feathers of the body especially the neck, back, abdomen and wings. The mites were *Megninia* sp. and *Pterolichus* sp. Examinations of the ears and combs revealed *Haemaphysalis* sp., the hard tick. Meanwhile, *Ornithonyssus* sp., the soft tick was found on feathers, whereas chigger, *Leptotrombidium* sp. was found attached to the skins. The study also revealed that *M. gallinae* was the most common ectoparasite with 76.7% occurrence, followed by *Pterolichus* sp. (69.6%), *L. caponis* (63.3%), *M. pallidulus*

(41.7%), *Leptotrombidium* sp. (17.5%), *G. gallinae* (9.5%), *Haemaphysalis* sp. (6.7%), *Megninia* sp. (3.8%) and *Ornithonyssus* sp. (3.8%). The least common ectoparasite was *G. dissimilis* occurring in 2.1% of the chickens.

Keywords: ectoparasites, scavenging chickens, Penang, Peninsular Malaysia

INTRODUCTION

Chickens are the most abundant birds in the world which provide protein in the form of meat and eggs. Scavenging chickens or 'ayam kampung' meat has a strong flavour and is juicier than that of commercial chickens. Therefore, they command higher prices than commercial chickens, more so, if they have not been treated with antibiotics, hormones or antihelminthics. Most of the rural villagers still keep chickens in small flocks. They are allowed to range free around the house or the backyard. They require little attention and feed mainly on kitchen wastes, broken grains, worms, snails, insects and vegetation. Due to their free-range and scavenging habits, parasitic infections are commonly high. The chickens have an increased opportunity

to encounter infective eggs, larvae and intermediate hosts of parasites that can cause serious debilitating infections. On the other hand, inadequate hygiene and the physical environment such as rainfall, humidity, and ambient temperature provide optimum conditions to maintain helminth populations. Severe cases of parasitism can cause mortality (Soulsby, 1982). Heavy infestations can result in increased stress to the chickens and subsequently reduced egg production, poor health, anemia and severely affected chickens may die (Shanta *et al*, 1971).

There had been few studies on ectoparasitic fauna of chickens in Malaysia (Amin-Babjee and Ragavan, 1985; Sani *et al* 1986; Amin-Babjee and Lee, 1994; Wu, 1994). However, most of the chickens from these studies were either obtained from markets or confined to certain states within Peninsular Malaysia.

This study examined for ectoparasitic fauna of scavenging chickens kept in free-ranged systems, and randomly obtained from the State of Penang, Peninsular Malaysia. The state of nutrition or body condition of the scavenging chickens was recorded. In addition, parasite infection in relation to sex and age were described.

MATERIALS AND METHODS

The study was conducted on 240 scavenging chickens randomly obtained from various districts from the State of Penang, Peninsular Malaysia. The chickens had been left scavenging around

the backyards during daytime and confined during night. They fed mainly on kitchen wastes, broken grains, worms, snails, insects, vegetation, food remnants and offal. They were generally small in size with body weights ranging from 1.3 kg to 2.4 kg. All chickens were bought directly from the owners. Estimated age of the chickens was provided by owners. The age of chickens was classified into three groups: (i) below 6 months, (ii) 6 months to 12 months and (iii) 12 months to 24 months.

In the laboratory the chickens were closely examined for visible ectoparasites such as ticks on the ears, comb and wattle. The ectoparasites were collected using a blunt forceps and stored in universal bottles containing 70% ethanol.

Ectoparasites such as lice and mites were collected after slaughtering the chickens. The skin and the feathers were pulled off from the whole carcass, soaked in bottles containing 70% ethanol. Feathers and the skin were carefully examined under a dissecting microscope. Ectoparasites found attached were removed with a pair of fine forceps and preserved in universal bottles containing 70% ethanol for further identification. The specimens were removed from 70% ethanol and soaked in lactophenol (a clearing agent) for one week at room temperature. Small punctures were made with a fine needle at the abdomen of each specimen in order to remove body contents as well as to facilitate entry of lactophenol into the specimen. The specimens were

observed under a stereomicroscope. At least 10 specimens of each species were measured to calculate the mean dimension of the adult according to the procedures of Mustaffa Babjee (1977). Ectoparasite species were identified based on keys and illustrations developed by Soulsby (1968) and Mustaffa Babjee (1977). The severity of the infestation was noted and ranked as low, medium or high. These categories were designated depending on the number of ectoparasites on each chicken (low infestation: 1-50, medium infestation: 51-100 and high infestation: more than 100). It can be considered analogous to those used by Harshbarger and Raffensperger

(1961) and Sychra *et. al* (2008). With the exception of mites, species present were noted (+) but the number of individuals were not counted due to its overwhelming abundance.

RESULTS

Table 1 shows different species of ectoparasites isolated from scavenging chickens in Penang Island. Ten species of ectoparasites were noted which consisted of five species of lice, two species of mites, two species of ticks and one species of chigger. The lice identified were *Menopon gallinae*, *Menacanthus pallidulus*,

Table 1. Prevalence of ectoparasites in 240 scavenging chickens.

Ectoparasites	No. of chickens infested	Prevalence (%)	Mean abundance ± SE	Range of ectoparasites/chicken	Predilection sites
Lice					
<i>Menopon gallinae</i>	184	76.7	67.3 ± 8.244	1-210	feathers
<i>Menacanthus pallidulus</i>	100	41.7	11.0 ± 1.793	1-40	feathers
<i>Lipeurus caponis</i>	152	63.3	20.1 ± 4.394	1-125	feathers
<i>Goniocotes gallinae</i>	23	9.5	1.1 ± 0.466	1-9	feathers
<i>Goniodes dissimilis</i>	5	2.1	5.2 ± 1.338	1-43	feathers
Mites					
<i>Megninia</i> sp.	9	3.8	1.5 ± 1.143	1-40	feathers
<i>Pterolichus</i> sp.	167	69.6	+ (too numerous)	-	feathers
Ticks					
<i>Haemaphysalis</i> sp.	16	6.7	1.9 ± 1.439	1-48	combs/ears
<i>Ornithonyssus</i> sp.	9	3.8	14.0 ± 7.414	1-210	feathers
Chiggers					
<i>Leptotrombidium</i> sp.	42	17.5	23.8 ± 13.630	1-508	skin

+ Not counted

Lipeurus caponis, *Goniocotes gallinae* and *Goniodes dissimilis*. These lice occurred in the fluff of the feathers of the body especially the neck, back, abdomen and wings. The mites were *Megninia* sp. and *Pterolichus* sp. Examinations of the ears and combs revealed *Haemaphysalis* sp., the hard tick. Meanwhile, *Ornithonyssus* sp., the soft tick was found on feathers, whereas chigger, *Leptotrombidium* sp. was found attached to the skins.

The study revealed that *M. gallinae* was the most common ectoparasite with 76.7% occurrence, followed by *Pterolichus* sp. (69.6%), *L. caponis* (63.3%), *M. pallidulus* (41.7%), *Leptotrombidium* sp. (17.5%), *G. gallinae* (9.5%), *Haemaphysalis* sp. (6.7%), *Megninia* sp. (3.8%) and *Ornithonyssus* sp. (3.8%). The least common ectoparasite was *G. dissimilis* occurring in 2.1% of the chickens.

The highest mean abundance was recorded for *M. gallinae* with 67.3 (± 8.244), followed by *Leptotrombidium* sp. and *L. caponis* with 23.8 (± 13.630) and 20.1 (± 4.394) respectively. Meanwhile, *Ornithonyssus* sp., *M. pallidulus* and *G. dissimilis* were recorded with the mean abundance of 14.0 (± 7.414), 11.0 (± 1.793) and 5.2 (± 1.338) respectively. The lowest mean abundance were recorded for *Haemaphysalis* sp., *Megninia* sp. and *G. gallinae* with 1.9 (± 1.439), 1.5 (± 1.143) and 1.1 (± 0.466) respectively.

At least one species of ectoparasite was found on each infested chicken. It was found that 7% were infected with single infections and 75% with multiple

endoparasites infections. Most of the chickens had between three to five species of ectoparasites. The highest number of chickens was recorded to harbour four species of ectoparasites affecting 47 (20%) chickens, followed by three and five species of ectoparasites with 39 (16%) and 32 (13%) chickens respectively. None of the chickens harbored all ten species of ectoparasites. Only one chicken was heavily infested with nine species of ectoparasites (Figure 1).

Table 2 shows ectoparasite infestations with different groups of arthropods. Seventy-seven (32%) of the chickens were infested with just only lice, whereas 71 (30%) were infested with lice and mites. Twenty two (9%) chickens were infested with lice, mites and chiggers. Only 3 (1%) chickens were found infested with all four groups of arthropods (lice, mites, ticks and chiggers). Most of the chickens were found to be infested with at least one group of arthropod. However, none were found infected with chiggers alone.

As shown in Table 3, 108 chickens were recorded to have high ectoparasite infestation with the prevalence of 45%, followed by low infestation with 83 chickens infested by ectoparasites and the prevalence of 35%. Medium infestation was the least common degree of infestation, affecting 49 chickens and a prevalence of 20%.

Out of 43 chickens belonging to below 6 months of age, 11 (5%) were infested with high, 6 (3%) with medium and 6 (3%) with low infestations (Table

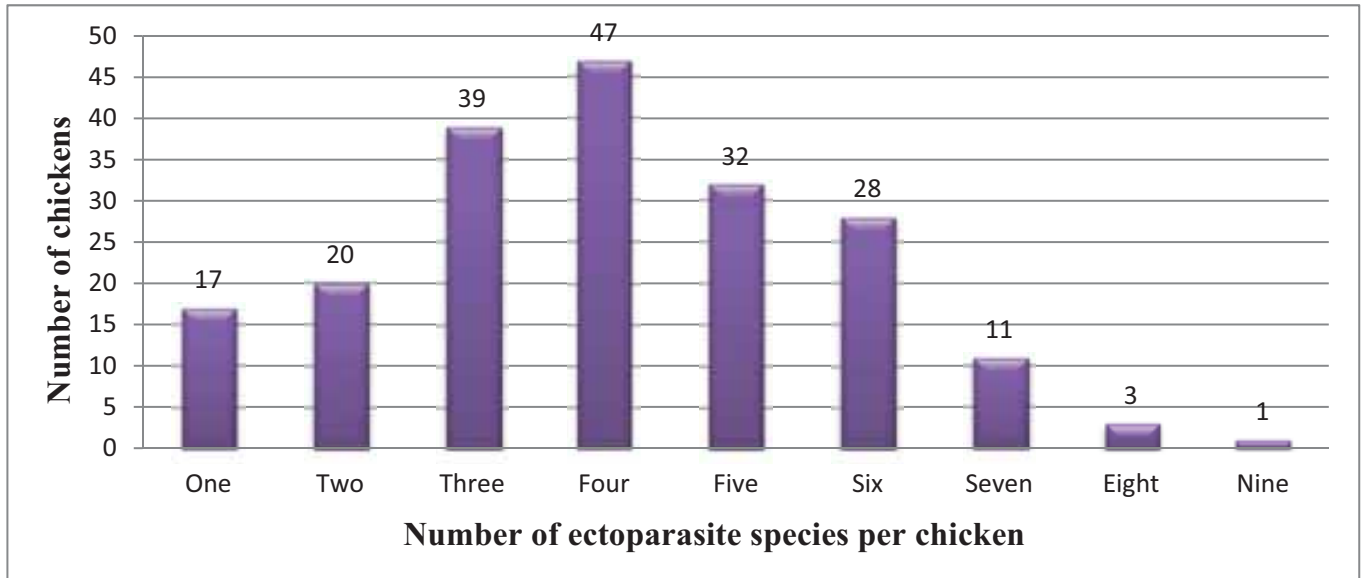


Figure 1. Number of ectoparasite species per chicken.

Table 2. Ectoparasite infestations with different groups of arthropods.

Arthropod group		No. of chickens infested
1)	Lice	77 (32%)
2)	Mites	5 (2%)
3)	Ticks	3 (1%)
4)	Chiggers	0
5)	Lice and mites	71 (30%)
6)	Lice and ticks	2 (0.8%)
7)	Lice, mites and ticks	15 (6%)
8)	Lice, mites and chiggers	22 (9%)
9)	Lice, mites, ticks and chiggers	3 (1%)

Table 3. Degree of ectoparasite infestation.

Ectoparasite infestations	No. of chickens infested
Low	83 (35%)
Medium	49 (20%)
High	108 (45%)

Table 4. Degree of ectoparasite infestations according to age group.

Age	Degree of ectoparasite infestations			Total chickens
	Low	Medium	High	
< 6 months	26 (11%)	6 (3%)	11 (5%)	43
6 months - 12 months	40 (17%)	25 (10%)	46 (19%)	111
> 12 months	17 (7%)	18 (7.5%)	51 (21%)	86

4). In the age group of 6 months to 12 months, 46 (19%) chickens were found with high infestation, followed with low and medium infestations with 30 (13%) and 25 (10%) chickens respectively. High infestation was the most common degree of infestation among chickens above 12 months of age, with 51 (21%) chickens, followed by medium and low infestations with 18 (7.5%) and 16 (7%) chickens respectively. Chickens above 12 months of age recorded the highest mean number of ectoparasite species with 5 species, followed by 6 months to 12 months of age and below 6 months of age with 3 and 2 species respectively (Table 5).

There was a significant difference somewhere among the mean number of ectoparasites species on the dependent variable for the three age groups [$F(2, 237)=29, p=0.000$]. Post-hoc comparisons using the LSD test indicated that the mean number of ectoparasite species for Group 1 ($M=1.98, SD=2.262$), Group 2 ($M=2.91, SD=1.998$) and Group 3 ($M=4.63, SD=1.898$) was significantly different from

one another. Table 6 shows the mean difference between the three age groups.

Figure 2 shows the prevalence of ectoparasite infestations according to gender. Out of a total of 240 scavenging chickens examined, 198 chickens infested which comprised of 105 (44%) males and 104 (43%) females. However, no infestation were recorded on 42 (13%) chickens.

As shown in Table 7, high infestation was the most common degree of infestation in males and females with 54 (23%) chickens infested respectively. Medium infestation was found in 28 (12%) male and 21 (9%) female chickens. However, low infestation was found in 38 (32%) male and 45 (38%) female chickens.

Table 8 shows the mean number of ectoparasite species according to gender. Male and female chickens have the same mean number of ectoparasite species. The mean number of ectoparasite for both genders was three species.

There was no significant difference in the mean number of ectoparasites species for males ($M=3.26, SD=2.167$) and

Table 5. Mean number of ectoparasite species at different ages.

Age	Mean number of ectoparasites species
< 6 months	2
6 months - 12 months	3
> 12 months	5

Table 6. Mean difference of ectoparasites at different ages.

(L) Age	(J) Age	Mean ± SE
< 6 months	6 -12 months	-0.933 ± 0.362*
	> 12 months	-2.651 ± 0.376*
6 -12 months	< 6 months	0.933 ± 0.362*
	> 12 months	-1.718 ± 0.289*
> 12 months	< 6 months	2.651 ± 0.376*
	6 -12 months	1.718 ± 0.289*

* The mean difference is significant at the 0.05 level

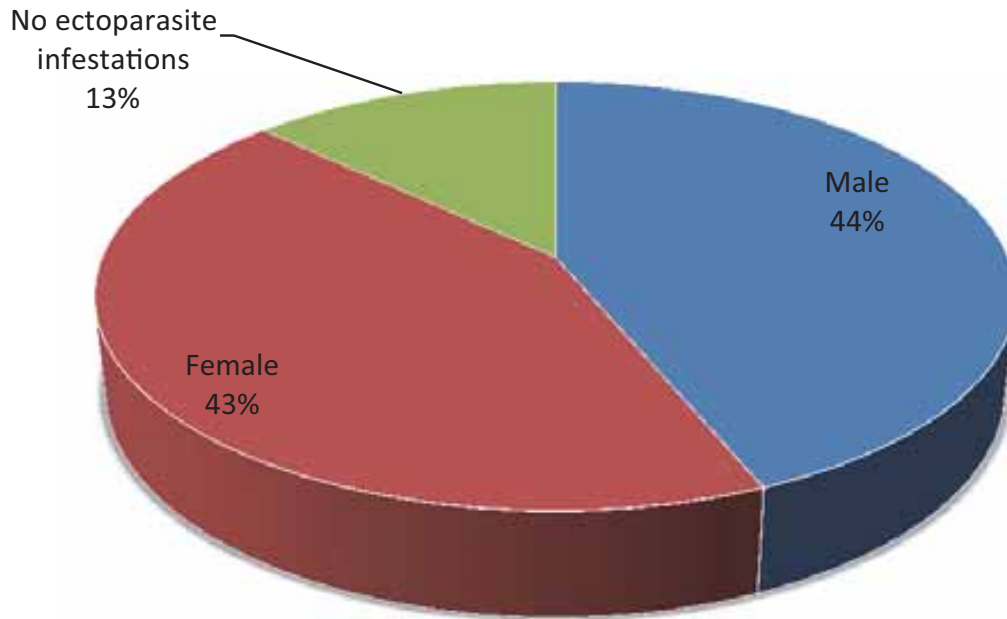


Figure 2. Prevalence of chickens infested with ectoparasites according to gender.

Table 7. Degree of ectoparasite infestations according to gender.

Gender	Degree of ectoparasite infestations			Total
	Low	Medium	High	
Male	38 (32%)	28 (12%)	54 (23%)	120
Female	45 (38%)	21 (9%)	54 (23%)	120

Table 8: Mean number of ectoparasites species according to gender.

Gender	Mean number of ectoparasites species
Male	3
Female	3

females [$M=3.46$, $SD=2.322$; $t(238)=-0.69$, $p=0.491$]. Meanwhile, the magnitude of the differences in the means was very small ($\eta^2=0.002$).

DISCUSSION

In Malaysia, production of poultry meat and eggs are dominated by commercial broiler sector although most of rural villagers in this country still continue

rearing native chickens under the backyard system (Aini, 1990).

Scavenging chicken or ‘*ayam kampung*’ is of a dual-purpose type, reared for both its meat and eggs. It has a low egg-laying performance and the eggs are smaller than that of commercial chicken eggs. Generally, ‘*ayam kampung*’ meat is preferred by most consumers, probably due to the specific texture and taste, more so, it is free of drug residues. Nowadays,

'*ayam kampung*' has become popular in rural households, where there is an emerging trend of consumer awareness towards organically grown chickens, with customers increasingly willing to pay higher prices for good quality meat.

Most of the rural villagers in Peninsular Malaysia still keep chickens in small flocks. The free-range system is the most popular and viable production system practiced, because it requires very little inputs for housing, feeding and health care (Ramlah and Shukor, 1987). The chickens are allowed to range free around the house or the backyards and find their feeds from the surrounding environment that takes the forms of kitchen wastes, worms, snails, insects, food remnants or offal. They enjoy more freedom of movement as compared to chickens reared under the intensive system, where they are cramped and may lack movement.

According to Soulsby (1982), poultry can easily be infected with diseases mainly caused by bacteria, viruses, fungal and parasitic pathogens. However, parasitic infections are often neglected. It often constitutes to low productivity and impairs the health status of chickens. Parasitic infection is commonly high in scavenging chickens due to an increased opportunity to encounter the infective eggs, larvae, and intermediate hosts of parasites. These can cause considerable damage due to anemia, malnutrition, weight loss, lowered egg production as well as mortality in young and weak chickens (Fatunmbi and Adene, 1979; Soulsby, 1982; Pandey *et. al* 1992).

The majority of the chickens examined were found to be infested with ectoparasites. There were four groups of arthropods (lice, mites, ticks and chiggers) reported in this study with ten species of ectoparasites consisting of five species of lice, two species of mites, two species of ticks and one species of chigger. The finding is similar to the study conducted in Selangor with ten species of ectoparasites as reported by Sani *et. al* (1986). The majority of the chickens examined were infested with at least one species of lice. The lice identified were *M. gallinae*, *M. pallidulus*, *L. caponis*, *G. gallinae* and *G. dissimilis*. These lice occur in the fluff of the feathers of the body especially the neck, back, abdomen and wings. The mites were *Megninia* sp. and *Pterolichus* sp. Examinations of the ears and combs revealed *Haemaphysalis* sp., the hard tick. Meanwhile, *Ornithonyssus* sp., the soft tick was found on feathers, whereas chigger, *Leptotrombidium* sp. was found attached to the skins.

Benbrook (1965) reported that the most common ectoparasite of chickens were lice. In the present study, the shaft louse, *M. gallinae* was recorded as the most common ectoparasite with the highest mean abundance. A similar finding has reported by Hagos and Eshetu (2005) in a study conducted on ectoparasites of local scavenging chickens in Central Ethiopia although Amin-Babjee *et. al* (1997) showed that the tick, *Haemaphysalis wellingtoni* was the most common ectoparasite observed in Selangor, Malaysia. This louse

was found on the shafts than beneath the wings and body surfaces. The typical symptom of *M. gallinae* infection is feather-loss (Ikpeze *et. al* 2008).

In this study, *Pterolichus* sp. was observed for the first time in this country. This feather mite was found attached on the wing feathers of the chickens. Besides, it is very rare to find infestation of chigger (larval trombiculid mites) in domestic chickens. However, this study revealed that chiggers from the genus *Leptotrombidium* was found attached to the skin of 35 chickens. Although it had been described previously by Nadchatram and Dohany (1974) in a pictorial key of Southeast Asian chiggers, this six-legged larva had not been reported on *G. domesticus* in Malaysia. However, chiggers, *Neoschongastia gallinarum* reported by Amin-Babjee *et. al* (1997) and *Eutrombicula hirsti* listed in the check-list of domestic chickens by Lee *et. al* (1991) were absent.

Multiple ectoparasite infestation was recorded in the chickens investigated in which the highest number of chickens was recorded to harbor four species of ectoparasites. The greater diversity of ectoparasites in scavenging chickens was due to the free-range habit where the chickens have high exposure to the environment as well as low input management system. Besides, Mekuria and Gezahegn (2010) also stated that suitable environmental conditions may enhance the propagation and life cycle progression of the diverse ectoparasites species.

Actual enumeration of ectoparasites obtained was used to access the severity of infestations. The overall rate of infestation in chickens examined was high, with more than 100 ectoparasites per chicken. High infestation of ectoparasites was probably because the chickens were left to scavenge and not confined, where they have more access to outdoor areas which exposure them to the sources of infestations.

In the present study, there was a significant difference in the mean number of ectoparasite species between young and adult chickens. According to Nnadi and George (2010), adults may have high infections due to their gregariousness to the environment. They scavenge over greater areas as compared to growers or younger individuals. This could partly explain findings that adult recorded the highest mean number of ectoparasite species compared to growers or younger chickens.

On the other hand, this may be associated with long periods of exposure. Besides, the variation in ectoparasite infestations in different ages may also be related to the habitat or environments with poor hygiene. Despite differences in ectoparasite infestations between age groups, this study also examined the ectoparasites infestations in male and female chickens. It showed that there was no difference between the mean number of ectoparasite species and the sexes of chickens. According to Mekuria and Gezahegn (2010), infestations might be

by chance and there is no direct relation to animal reproductive system.

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