STUDY OF PARASITES IN COMMERCIAL FREE-RANGE CHICKENS IN NORTHERN PENINSULAR MALAYSIA

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ABSTRACT. A study was conducted on 16 commercial free range chickens (8 males and 8 females) sourced from Alor Setar, Kedah in order to determine the prevalence of ecto and endoparasites. Results showed that there were 12 different species of ecto- and endoparasites from these chickens. Four (4) species of ectoparasites which consist of three lice and a tick have been discovered. The highest prevalence of ectoparasite was *Menopon gallinae* (93.8%). The other ectoparasites were *Menacanthus pallidulus* (81.3%), *Haemaphysalis* sp. (37.5%) and *Lipeurus caponis* (18.8%). On the other hand, eight species of endoparasites which consist of four nematodes and four cestodes were discovered. *Rallietina echinobothrida* showed the highest prevalence of endoparasite (100%) followed by *Heterakis gallinarum* (93.8%), *Acuaria spiralis* (87.5%), *Ascaria galli* (81.3%), *Rallietina tetragona* (43.8%), *Gongylonema ingluvicola* (37.5%), *Hymenolepis carioca* (12.5%) and *Hymenolepis cantiana* (12.5%). Endoparasites infestation was recorded highest on male chicken (52.6%) compared to female (47.4%). However, there was no statistically significant difference between the number of endoparasites and both sexes; t (14) = 0.817, p>0.05.

***Keywords*:** chickens, commercial, free-range, ectoparasite, endoparasite.

INTRODUCTION

Gallus gallus domesticus is ubiquitous and commonly found in almost all developing countries across the world. It is a domesticated fowl under the subspecies of the Red Jungle fowl. They may live up to ten years, depending on the species. These scavenging chickens have better meat taste and they are free from growth hormones and roaming outdoors indirectly encouraged movement, which help develop muscle growth and discouraged fat accumulation, thus produce leaner and meatier meat. The community nowadays is more aware of the benefits of the meat of scavenging chickens compared to commercial broiler chickens, therefore causing a higher demand of scavenging chickens in the market. There are two categories of housing scavenging chickens: commercial large-scale production and small-scale chicken farming. The commercial large-scale production system kept the birds in a special and spacious area. They are bred in a huge numbers for commercial purposes. Commercial farmers who raise the chickens would normally have a proper

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feeding system and feed their chickens with specific food such as rice and bran apart from allowing them to peck on grounds to acquire worms and insects. Small-scale chicken farming is common and popular among rural villagers. The chickens are left scavenging around the housing area during daytime to get something to feed on and normally they are reared as a hobby. They have to find most food by scavenging for insects, grubs, offal, snails, seeds and fallen fruits.

However, due to free-range and scavenging habit, they are prone to parasitic infections compared to chickens from closed house system. Scavenging chickens are likely to pick up infective eggs, larvae, and intermediate hosts of parasite during scavenging. According to Abdul Wahab et al. (2009), parasitism is a problem in poultry production performance. Generally both ecto and endoparasites are infesting and infecting chickens with helminths reported as the most common endoparasite found in scavenging chickens (Termizi, 2011) while ectoparasites that commonly infest scavenging chickens are ticks, lice and mites (Mccrea *et al*., 2005). Heavy infections and infestations of these parasites will increase the chickens' stress level, leads to poor health, eventually reduce the production of eggs and chickens that are severely affected may die (Permin & Hansen, 1998). Previous studies on parasites of Malaysia poultry were confined to rural scavenging chickens in small flocks (Abdul Wahab *et al*., 2009 and Khairul Anuar & Khamis, 1978). However, the information on the prevalence of ecto- and endoparasites of scavenging chicken in Malaysia, especially from commercial enterprises is still lacking. This study was aimed to provide more information on the prevalence of ecto- and endoparasites in commercial scavenging chickens in Malaysia. The objectives of this study were to study the prevalence of ectoparasites and endoparasites in commercial free-range chickens and to compare the infestation of ectoparasite and infection of endoparasites according to the gender of the chickens.

MATERIALS AND METHODS

Sampling of scavenging chickens

Chickens used in this study were obtained from a commercial free range farm in Alor Setar, Kedah. These scavenging chickens were reared scavenging around an enclosed area (25 feet x 200 feet). They feed on snails, vegetation, worms, insects and broken grains. The owner didn't injected the chickens with any growth hormone or antibiotics and only monitored the cleanliness of the area, food and water containers. Sixteen chickens (aged between 35 to 40 days) consisting of eight males and eight females were randomly chosen and transferred to Universiti Sains Malaysia for further investigation.

Collection and identification of ectoparasites

The chickens were slaughtered in the laboratory. Ectoparasites on the chickens were examined closely. Inspection were carried out on comb, wattle, legs and

plumage at the body and tail using hands and forceps. Ectoparasites such as ticks and lice were collected using forceps and were kept in labelled universal bottle that filled with 70% ethanol for identification and image capturing purposes. Ectoparasites were observed under the stereomicroscope and identified using keys from Permin & Hansen (1998).

Evisceration

The skin was peeled off after the incision was made by using a scapel starting from posterior end of the keel bone up to neck. The breast part of the chicken was opened by doing incision from the posterior end of the keel bone up to the clavicle bone to expose the internal organs. With the help of scapel, esophagus was removed by pulling it gently downwards. The entire digestive system organs were put in a tray and separated accordingly.

Helminths examination

The whole gastrointestinal tract was placed in a huge tray. Separation began from the oesophagus to crop, the proventriculus, the gizzard, the duodenum, the small intestine, the caeca, large intestine and the rectum. All of the segments were washed with distilled water through a strainer. Each of these segments were cut open using scissors and put in respective petri dishes with normal saline solution. The mucosa layer of each gastrointestinal organ was scrapped out. All worms found were placed in a universal bottle filled with 70% ethanol solution for further identification. All endoparasites were identified using identification keys of Shah-Fischer & Say (1989).

STATISTICAL ANALYSIS

Independent sample t-test was performed using SPSS 20 (IBM Corporation) to compare the number of ecto- and endoparasites respectively between male and females chickens.

RESULTS

Ectoparasite of scavenging chickens

Four species of ectoparasites (lice and ticks) were discovered and identified in all 16 commercial free-range chickens (Table 1). There were no mites and chiggers found on any of the chickens. Lice were the most frequent ectoparasite found in this study. Three species of lice were identified: *Lipeurus caponis*, *Menopon gallinae* and *Menacanthus pallidulus*. They were mostly found on feathers. Only one species of tick (*Haemaphysalis* sp.) was found on the head area of the chicken.

Higher number of ectoparasite infestations was recorded on male chickens (mean: 19.88 ± 14.6) compared to female chickens (mean: 14.48 ± 15.1) (Figure 1). *Menopon gallinae* was the most prevalent lice identified in both sexes while *Lipeurus caponis* was found lowest infesting the male chickens and *Haemaphysalis* sp. infested smallest number of female chickens. However, there was no significant difference on the number of ectoparasites between male and female chickens $t(14) = 0.771$, $p>0.05$.

Endoparasite of scavenging chickens

In the chickens' gastrointestinal organs, eight species of endoparasites were determined and it belongs to nematodes and cestodes. Trematode was not observed in the chicken organs.

Four out of eight species found in the chickens were nematodes and the rest were cestodes. The four species from the nematodes were *Ascaria galli*, *Acuaria spiralis*, *Gongylonema ingluvicola*, and *Heterakis gallinarum*. The other four species of cestodes found were *Hymenolepis carioca*, *Hymenolepis cantiana*, *Rallietina echinobothrida* and *Rallietina tetragona.*

Nematodes were found in the areas of crop, proventriculus, gizzard, duodenum, small intestine, large intestine, caecum and also cloaca. On the other hand, cestodes were found in the duodenum, small intestine, large intestine, caecum and cloaca.

There were a total of 348 worms that were collected from the gastrointestinal organs of the chickens. The mean intensity for endoparasite was 21.75 ± 12.6. The highest number of nematode parasite was *Heterakis gallinarum* found in 78 individuals (22.41%) and the lowest number of nematode species is *Gongylonema ingluvicola* found in 11 individuals (3.16%). On the contrary, the highest number of cestode parasite was *Rallietina echinobothrida* with 115 counts (33.05%) while the lowest number of cestodes was *Hymenolepis carioca* with only 2 counts (0.57%).

According to the Table 3, the highest prevalence was *Heterakis gallinarum* (93.75%) and the lowest prevalence was *Gongylonema ingluvicola* (37.5%) both are nematodes.. Most of the cestodes were found at duodenum and small intestine. For cestodes, the highest prevalence was *Rallietina echinobothrida* (100%). The lowest prevalence of cestodes was *Hymenolepis carioca* and *Hymenolepis cantiana* (12.5%). Most of the nematodes can be found at caecum, large intestine and cloaca while the highest number of cestodes was found at duodenum and small intestine.

Endoparasites infection was recorded highest on male chicken (22.88 ± 8.96) compared to female chicken (20.63 ± 9.73). *Rallietina echinobothrida* was found highest infecting all male and female chickens while *Hymenolepis carioca* was found lowest infecting male and female chickens. However, there was no significant difference on the number of endoparasites between male and female chickens $t(14) = 0.817$, $p>0.05$.

DISCUSSION

Ectoparasites

In this study, four species of ectoparasites have been recorded consisting of lice (three species) and tick (one species). Lice species includes *Menopon gallinae*, *Menacanthus pallidulus* and *Lipeurus caponis.* The only tick species discovered was *Haemaphysalis* sp. Fifteen out of sixteen chickens examined were found to be infested with ectoparasites and only one chicken found to be free from ectoparasite

infestation. At least two external parasites infested the chickens and mostly it was *Menopon gallinae.*

A similar finding was reported by Mekuria & Gezahegn (2010), where the highest ectoparasite discovered from chickens was *Menopon gallinae* (49%). Furthermore, *Menopon gallinae* was the most prevalent ectoparasite species found in local scavenging chickens of Central Ethiopia. Lice feed on blood and other body fluids causing birds to become restless and irritated, eventually affect feed intake, digestion, growth and egg production (Hogsette *et al*., 1996). Results in this current study showed that the prevalence of lice infestation was higher than ticks, which coincides with other studies (Ikpeze *et al*., 2008; Mekuria and Gezahegn, 2010; Amede *et al*, 2011; Bala *et al.,* 2011; Banda, 2011) which reported that the most common ectoparasite infesting free-range chickens were lice. Lice spend the entire life cycle from egg to adult on animal host (Mccrea *et al.*, 2005), thereforelice are more abundant and commonly found in chicken rather than ticks. Particularly, *Menopon gallinae* has a preference for hot humid conditions (Banda, 2011).

Our finding appears to contradict to those of Termizi (2011) who discovered 10 ectoparasite species in 240 free-range chickens in Penang Island. The 10 external parasites consisted of five lice, two mites, two ticks and one chigger. *Pterolichus* sp. was also observed and was noted to be the first found in Malaysia. The difference of findings between our study and Termizi (2011) might be due to lower sample number of scavenging chicken involved in this current study as compared to the number of chickens in Termizi (2011). Another possible explanation on the lower diversity of ectoparasites in this current study than those reported by Termizi (2011) was the scavenging area. The commercial free-range chickens in our study were reared in an enclosure area and were not exposed too much to the environment, while studies by Termizi (2011) used the chickens that have long exposure to the environment as well as low input management system. Mekuria and Gezahegn (2010) reported that high prevalence of ectoparasites was caused by warmer temperatures which is suitable for diverse ectoparasite species propagation and life cycle progression. Ticks feed on the chickens during the night and seek shelter in cracks and crevices at roost house (Strother, 2008). In this study, there were no significant differences between the prevalence of ectoparasites in both male and female chickens. This result is similar to the findings of Mekuria and Gezahegn, (2010), Amede *et al*., (2011), Bala *et al.,* (2011) and Termizi (2011) which stated that there is no significant difference due to similar management system in both sexes.

Endoparasites

A total of eight different species of nematodes and cestodes were discovered with no trematodes recovered from the scavenging chickens. The species recorded in this study were low compared to other studies. For example, Magwaisha *et al.,* (2002) reported 26 helminths with 18 nematodes and eight cestodes in 100

chickens in Morogoro, Tanzania while Mukaratirwa & Khumalo (2010) recorded 16 species from 79 free-range chickens in KwaZulu-Natal province of South Africa. The absence of trematode from scavenging chicken in this current study coincides with the finding of Abdul Wahab *et al.,* (2009), where eight helminths including four nematodes species and four cestodes species with no trematodes found in 60 free-range chickens in Penang Island, Malaysia. The absence of trematodes in this current study might due to lack of intermediate host for trematodes at the scavenging area.

The most prevalent endoparasite was *Rallietina echinobothrida* (100%) followed by *Heterakis gallinarum* (93.75%), *Acuaria spiralis* (87.50%) and *Ascaria galli* (81.25%). This finding is similar with Abdul Wahab *et al.,* (2009) with the prevalence of 93.3% for both male and female free-range chickens on *Heterakis gallinarum* and *Rallietina echinobothrida.*

Irungu (2004) reported that *Rallietina* sp. had the highest prevalence of endoparasites in Kenya and Pinckney *et al*., (2008) reported that this gastrointestinal parasite are very common in the backyard type poultry flocks. The humid conditions of the earth in certainsmall holder farms also contribute to the development of *Ascaris galli* and *Heterakis gallinarum* (Ziela, 1999). Even though there is a variation in the prevalence of endoparasites, it is quite probable that commercial free-range chickens were not heavily parasitized with gastrointestinal helminths. This may be a good cause for eating organic chickens as they are healthy. The commercial closed farming chickens were free of helminths as a result of modern farming practices which provide supplementary commercial food with vitamins and anthelmintics (Rayyan *et al*., 2010).

There was 100% of prevalence of infection regardless of age and also sex. This point is also sustained by the work of Abdul Wahab *et al*., (2009) where there was so significant difference in sex of the chickens which is similar with this study. Thus, it can be concluded that infection of parasites in scavenging chicken could occur regardless of the sex.

Free range chickens that scavenging for food are most likely to encounter parasite infective stages and intermediate parasites. Thus the chickens are susceptible to parasite infection. However, parasite infection in commercial free-range chickens can be considered low as compared to rural scavenging chicken in small flocks, as they were placed in an enclosed area and they were fed with standard food. Therefore, further study on parasites in free-range chicken should be carried out as it will provide authentic and accurate results as the birds are not treated with any anthelminthic to prevent the infestation and infection of parasite.

CONCLUSION

The free range chickens in this study was infected by nematodes and cestodes (endoparasites) with total prevalence of 100% for both sexes. However,

ectoparasites infestation showed a lower prevalence and were found infected by lice and ticks.

It follows that the number of parasite in these chickens were low compared to previous studies yet the parasite infestation and infection are considered high. With this indication, improvement on the technical and implementation on extension services coupled with proper and good sanitation ensured these chickens are more fit and healthier. Further study on the impact of these parasites on the growth performance of free-range chickens should be carried out. Besides, feasible technical and economic viable control strategies for ecto- and endoparasite of free-range chickens must be emphasize to ensure optimum productivity of chickens as well as to meet the growing demand for high-value animal protein.

Table 1. Prevalence of ectoparasites in commercial free-range chickens (n=16).

Ectoparasites	No. of chicken infested	Prevalence (%)	Predilection sites
Lice			
Lipeurus caponis	3	18.8	Feathers
Menopon gallinae	15	93.8	Feathers
Menacanthus pallidulus	13	81.3	Feathers
Tick			
Haemaphysalis sp.	6	37.5	Head

Table 2. Total worm count of endoparasites in commercial free-range chickens.

Group	Species	Total worm count (%)
Nematodes	*Ascaria galli*	70 (20.1%)
	Acuaria spiralis	57 (16.4%)
	Gongylonema ingluvicola	11 (3.2%)
	Heterakis gallinarum	78 (22.4%)
Cestodes	*Hymenolepis carioca*	2 (0.6%)
	Hymenolepis cantiana	3 (0.9%)
	Rallietina echinobothrida	115 (33.1%)
	Rallietina tetragona	12 (3. 5%)

Table 3. Prevalence of endoparasites in commercial free-range chickens (n=16).

Endoparasites	No. of chicken infected	Prevalence (%)	Predilection sites
Nematode			
Ascaria galli	13	81.3	Caecum, duodenum, large intestine and small intestine
Acuaria spiralis	14	87.5	Proventriculus and gizzard
Gongylonema ingluvicola	6	37.5	Crop
Heterakis gallinarum	15	93.8	Caecum, large intestine and cloaca
Cestode			
Hymenolepis carioca	2	12.5	Duodenum and small intestine
Hymenolepis cantiana	2	12.5	Small intestine and cloaca
Rallietina echinobothrida	16	100	Duodenum, small intestine and caecum
Rallietina tetragona	7	43.8	Duodenum and small intestine

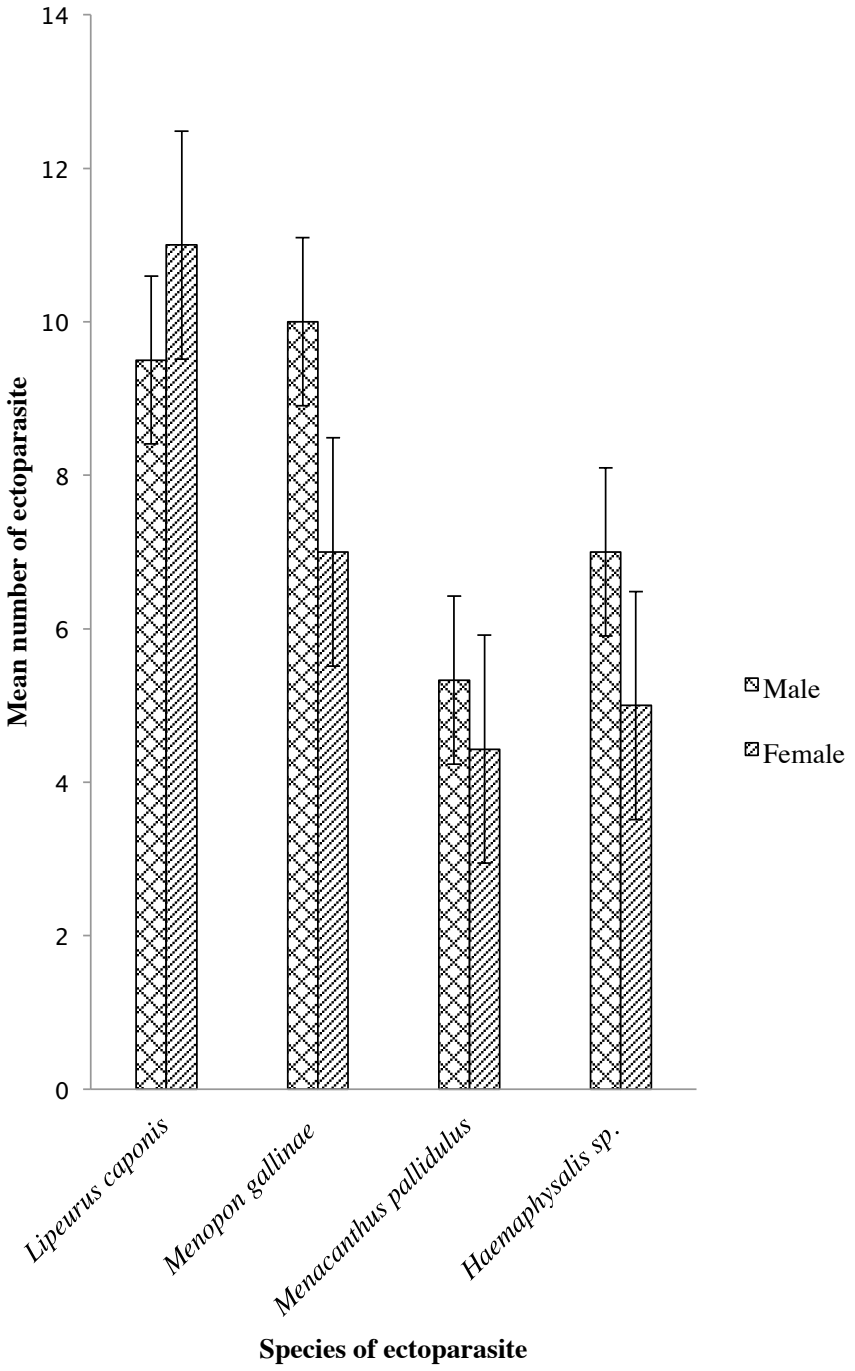

Figure 1. Mean number (± SE) of ectoparasites infesting male and female chickens.

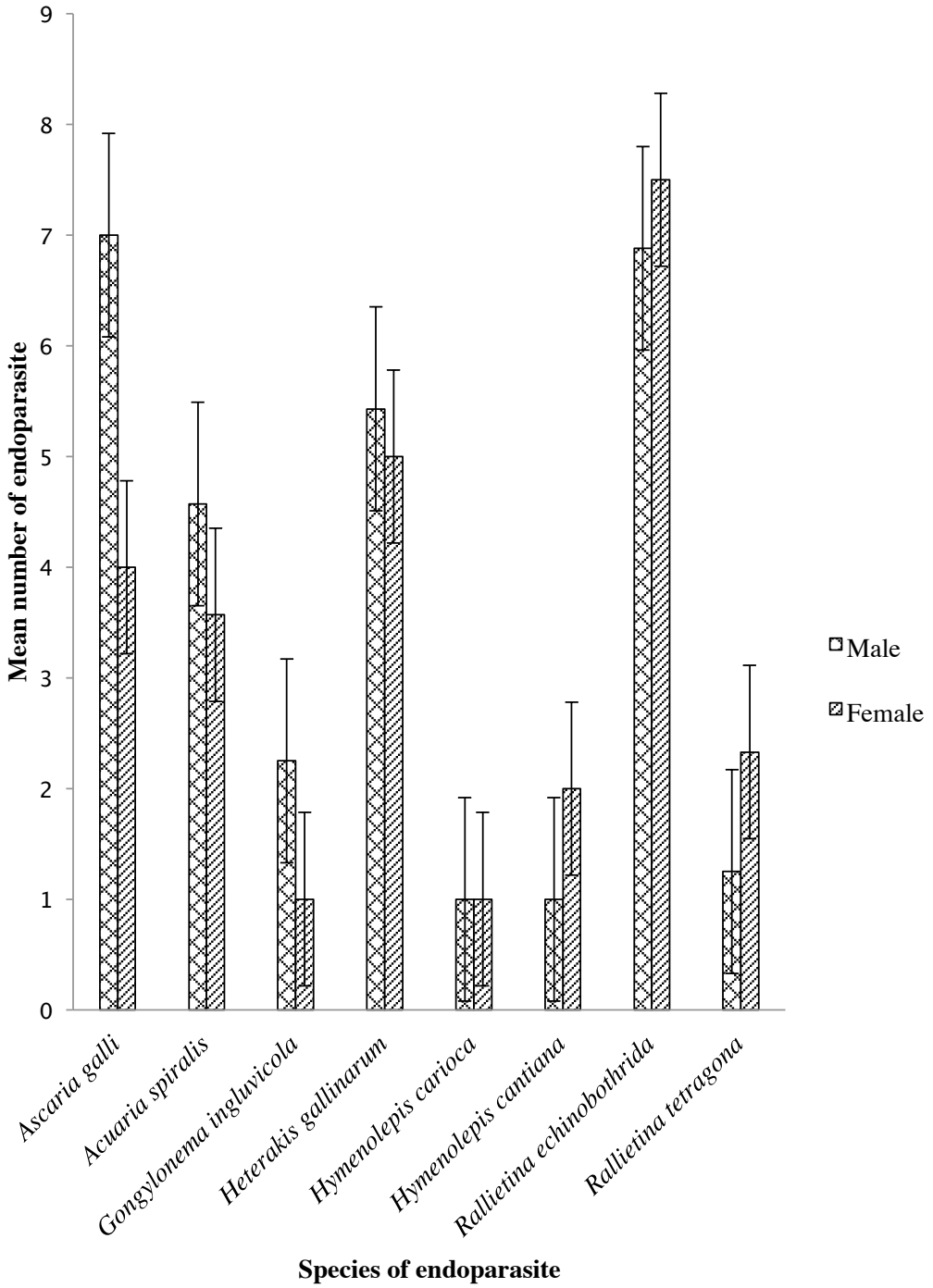

Figure 2. Mean number (± SE) of endoparasites infecting male and female chickens.

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