

# A STUDY OF ECTOPARASITIC ARTHROPODS OF MEDICAL IMPORTANCE INFESTING STRAY CATS (*Felis catus*) IN SECTION 7 OF SHAH ALAM, SELANGOR

Siti Naqiyah Tan Farrizam<sup>1</sup>, Mohd Sulaiman Bin Nordin <sup>1</sup>, Saleh Bin Ismail<sup>2</sup>

<sup>1</sup> Faculty of Biomedical and Health Sciences University Selangor

<sup>2</sup> Faculty of Health and Life Science Management and Science University

## Abstract

A study of ectoparasitic arthropods of medical importance on stray cats (*Felis catus*) was conducted in Section 7 region of Shah Alam, Selangor from May 2013 to October 2013. This study was carried out to update the information on medical importance of ectoparasites infesting cats and to determine infestation of ectoparasites on stray cats in Section 7 region of Shah Alam. Stray cats were captured humanly and undergone inspection of the whole body for ectoparasites sampling and collection. Ectoparasites obtained from stray cats then were preserved in 70% alcohol for identification purpose. A total of 35 stray cats (*Felis catus*) were examined and 150 ectoparasites were collected from stray cats examined. Stray cat's population showed the similar prevalence in host sex and host age according to numbers of hosts examined; however no significance difference was recorded between infestation of ectoparasites and these two factors. Three major species of ectoparasites were collected: Flea *Ctenocephalides felis*, Louse *Felicola subrostratus*, and Ticks (Ixodidae). Out of 35 stray cats examined in Section 7 region of Shah Alam, 21 were found infested and 14 were not infested. Infestation of *C. felis* was the most prevalent (54.3%) and was found significant ( $P < 0.05$ ) with 19 cats were found infested. Following this, *F. subrostratus* showed the second prevalent (14.3%) where a total of five stray cats were found infested with this louse ( $P > 0.05$ ). Only two stray cats were infested with hard tick Ixodidae with the least prevalent (5.7%) compared to other species of ectoparasites recovered through this study. However, no mites were recovered from all stray cats examined. This study has successfully carried out the prevalence and mean intensity, as well as the abundance of each type of ectoparasites on stray cats. The high occurrence of ectoparasites activity on stray cats was influenced by behaviour, immunological conditions, grooming and contaminated environment since these stray cats shared the same microenvironment with stray dogs, rodent and human as well. Thus, the potential of vector-borne diseases transmission towards human should become a major concern. Further study should be conducted to carry out complete information represents the stray cats population and diversity of medically important ectoparasites on stray cats in Section 7 Shah Alam, Selangor.

**Keywords:** Ectoparasites, *Ctenocephalides felis*, *Felicola subrostratus*, Ixodidae, stray cats, vector-borne diseases

## Introduction

Cats are the most popular pet in the world (Driscoll et al., 2009) and have been associated with human for at least 9,500 years. Since cats are often close and exposed to human, they play significant role in transmitting variety of diseases to

other animals and to human as well. Ectoparasites are a diverse and highly adapted group of animals that infest external body surface of vertebrate (Hanafi-Bojd et al., 2007). Ectoparasitic are known as any parasitic organism that

lives on the external surface of the host, sometimes they could be seen attached to the hair follicle of the host. As they live on the surface of their host, they require blood meal to complete their life cycles. Cat ectoparasites can cause skin disease and also transmitting diseases to human respectively. The study of Cat flea outbreaks in Kuching district, Sarawak by Lau(2010) stated that cat fleas were reported to attack human which resulting in an outbreak. The victim presented with red spots, slightly raised swollen and irritation of skin, mostly found on the ankles and legs. Several studies on ectoparasites of medical importance have been done before and some of the aetiology of the disease brought by ectoparasites has been discovered, yet has not known completely. This study therefore is to update information on the infestation rate of medically important ectoparasites on cats (*Felis catus*) in Section 7, Shah Alam.

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## **Materials and methods**

### *Study area*

This study was conducted in section 7 which located in central region of Shah Alam, Selangor. Shah Alam (3°4'32"N, 101°29'31"E) is the capital city of Selangor state and located nearby Klang city and Kota Pinggir city. Shah Alam is fast developing in population and economy. The ectoparasites were collected from cats (*Felis catus*) that available in the study areas.

### *Host collection and animal inspection*

Host collection and sampling were done from stray cats. All cats were captured humanly and undergone inspection. Cats (*Felis catus*) were carefully inspected with a fine-tooth comb and special attention was given on the tail, eye lids, hair and skin of the cats. Ectoparasites were also detected through visual examination and by brushing the hair of the animals and were removed by using forceps. All data of positive and negative hosts were recorded. The entire specimens were brought back to laboratory for further examination.

### *Preservation of ectoparasites*

All ectoparasites found were preserved in the bijou bottle containing 70% alcohol. A separate bijou bottle was used for each cat inspected. A purpose of this step was to maintain the morphological characters of each ectoparasite collected. Each specimen bottles were labelled with sufficient information such of host id number, location and date of collection. The entire specimen was kept until they were ready to be mounted for further observations.

### *Mounting of ectoparasites*

Mounting technique for each class of Ectoparasites was done differently. Ectoparasite samples then were mounted on slide with Hoyer's medium. The mounted slides then were left dried in a room temperature and were ringed and labelled.

### *Observation and Identification of ectoparasites*

The ectoparasites were observed under compound and dissecting microscope. Observations of ectoparasites' specimens were performed under 40x magnification of dissecting microscope to identify the characteristics that can be used as data. All ectoparasites were identified based on available keys of Schmidt and Roberts, 2000 and pictorial keys of Centre of Diseases and Prevention of United States, 1969.

### *Data analysis*

The data recorded then was analysed using the Quantitative Parasitology 3.0 (Reiezigel et al., 2000) software for prevalence, mean intensity, abundance, with 95% confidence interval of

ectoparasites. The Statistical software known as Statistical Package Social Science (SPSS) version 16.0 was used to run Chi-Square test and Pearson correlation test (Horak et al., 2013; Xhaxiu et al., 2009; Borji et al., 2011; Rozsa et al., 2000). Chi-Square test was used to test the association between infestation of ectoparasites and species of ectoparasites found in this study. Meanwhile the Pearson's test was used for correlation between infestation of ectoparasites and variables such as host age and host sex.

## **Results**

### *Stray cat population*

Up to 35 stray cats were examined in Section 7 of Shah Alam city during May 2013 to October 2013 to record the incidence of ectoparasites infestation and diversity of ectoparasites on stray cats (*Felis catus*). The stray cat population showed more females (n=21) captured compared to males (n=14) of which 60% were adults (n=21) and 40% were juveniles (n=14).

### *Distribution of ectoparasites in Section 7 of Shah Alam*

The total number of ectoparasites collected from stray cats in the study area was 150 respectively. Only three major species of ectoparasites were recovered namely *Ctenocephalides felis*, *Felicola subrostratus*, and hard ticks Ixodidae. *C. felis* showed the most prevalent of infestation rate with 54.3%, *F. subrostratus* showed the second most prevalent of infestation rate with 14.3% and hard ticks Ixodidae showed the least prevalent of infestation rate with 5.7%. Table 1 summarized the distribution of host examined and ectoparasites that were recovered from this study.

**Table 1 Host examined and distribution of ectoparasites infested host**

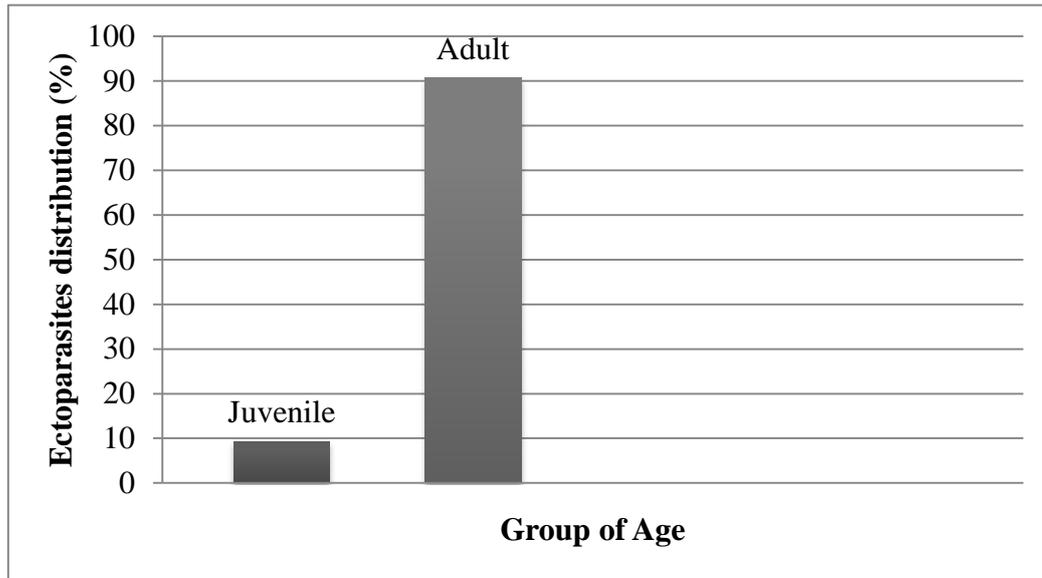
Host (Number examined)	Ectoparasites	No. host with ectoparasites (%)	No. collected ectoparasites (%)	Mean per host
<i>Felis catus</i> (n=35)	<b>Fleas</b>			
	<i>Ctenocephalides felis</i>	19 (54.3)	96 (64)	5.1
	<b>Louse</b>			
	<i>Felicola subrostratus</i>	5 (14.3)	36 (24)	3.2
	<b>Ticks</b>			
	Ixodidae	2 (5.7)	18 (12)	9.0

Both sexes of stray cats were found to be infested with ectoparasites recovered 59% on females and 41% on males stray cats.. Females were infested with all three major species of ectoparasites, *C. felis*, *F. subrostratus* and Ixodidae. Males however were not infested by Ixodidae. Both groups of adults and juveniles stray cats harboured ectoparasites of which 90.6% of ectoparasites recovered from adults and 9.3% ectoparasites recovered from juveniles. Only *C. felis* was found infested

juveniles and adults were infested with all three major species of ectoparasites recovered through this study. No significant differences were found associated with factors such as host age and host sex. Figure 1 to Figure 2 presented diversity of ectoparasites on stray cats according to host sex and host age factors.



**Figure 1. Frequency of total stray cats and distribution of ectoparasites on host according to host sex**



**Figure 2. Frequency of distribution of ectoparasites on host according to host age**

## Discussions

The overall ectoparasite diversity of the stray cat population in section 7 of Shah Alam showed low diversity compared to prior records in Peninsular Malaysia. Only three species of ectoparasites were recorded in this study; *C. felis*, *F. subrostratus* and Ixodidae of which have been recorded in most previous studies before (Jitapallapong et al., 2008; Borji et al., 2011; Bahrami et al., 2012).

Prevalence value of flea, *C. felis* showed that ectoparasite infestations on the cat population of urban areas were high and the frequency distribution of this flea to be over dispersed. This ectoparasite considered as the most common ectoparasitic organism to infest cats (Dashmir et al., 2009; Kreceka et al., 2010). *C. felis* is known as a vector to numerous diseases in humans (Nelder & Reeves, 2005) and also can serve as intermediate host of cestode known as dog tapeworm namely *Dipylidium caninum* and dwarf tapeworm namely *Hymenolepis nana* (Rust & Dryden, 1997). *C. felis* is a good vector of *Bartonella henselaen*, the causative agent of cat scratch disease, and

*Rickettsia felis* (Perez – Oscorio et al., 2008; Tsai et al., 2008). While cats can easily acquire plague, *C. felis* however, is a poor vector for *Yersinia pestis* (Rust & Dryden, 1997; Perry et al., 1997).

The cat population in this present study is also a host to the only a single louse species namely *F. subrostratus*. This parasite was the next most prevalent ectoparasite as also recorded the same pattern as in the previous studies that have been done (Bahrami et al., 2012; Salant et al., 2013). Even though this infection is not common but the parasite presents in the cat population and only found in large number on elderly and sick cats.

Ticks in this study were identified as Ixodidae and showed the least prevalent compared to other ectoparasites. Ticks infestations on cats were also recorded in previous studies (Salant et al., 2013; Horak et al., 2010). Ticks infestation rates in cats varied among geographical regions and have been reported to be 52.4% in a study from Hungary and as low as 1.4% in a study from Brazil (Mendesde et al., 2011; Capari et al., 2013). Previous studies of cats' ectoparasites in Malaysia recorded

*Haemaphysalis bispinosa* in cat population (Amin – Babjee, 1978 and Shanta et al., 1980) with low infestation rate. The ticks that were recovered from the present study however could not be further identified to species level because they were obtained in larval stage and the lack of features could not be identified. Ticks are rarely found in the urban cities as they prefer moist and humid environment such as shade trees, woods and shrubs.

All three species of ectoparasites found were present on female stray cats. *C. felis* was found the most prevalent on female stray cats compared to male stray cats with prevalence 61.9 % on females and 42.9% on males. Cat louse *F. subrostratus* showed the most prevalent on males compared to females. Meanwhile for hard ticks, Ixodidae showed 9.5% prevalence on female stray cats but no ticks were obtained from male stray cats. Infestation on female hosts was found prevalent compared to infestation on males. This was due to higher captured of female hosts than male hosts. Generally female cats were found wandering in the vicinity of public areas foraging foods as foraging behaviour a nature for them and their young's to survive. Previous studies also recorded this finding where females were found to be infested higher than males (Jittapalapong et al., 2008; Borji et al., 2011). Table 2 summarized the diversity of ectoparasites on both sexes of stray cats examined in this study.

Infestation rate on adult stray cats showed the most prevalent than infestation rate on juvenile stray cats with 90.6% on adults and 9.3% on juveniles. This may attributed to the habits and behaviour of the adults that frequent sources of infections. Ectoparasitic organism may take advantage of inevitable stray cat's behaviour such as foraging behaviour and

social behaviour to maximize their transmission. This finding was also recorded in previous studies where the number of adults stray cats were examined higher compared to the number of juvenile examined (Jittapalapong et al., 2008; Salant et al., 2013; Mateescu et al., 2012; Borji et al., 2011). Table 3 summarized the diversity of ectoparasites on both adults and juveniles stray cats examined in this study.

Some arthropod ectoparasites are irritating companion animal and human regardless of their significance as vector of diseases (Jitapallapong et al., 2008). *C. felis* was the most prevalent in this study and causes itchiness and small red lesion at the biting site and play a role as the intermediate host of the cat tapeworm, *Dipylidium caninum*. Human may be infected with this tapeworm by accidental ingestion of the infective fleas. Tick paralysis is a well-known syndrome that occurs in many vertebrate hosts throughout the world and induced by at least 46 species of ticks (Stone, 1988).

Parasitism activities infesting livestock and companion animal like cats (*Felis catus*) are important because it is known that cat can be a host of ectoparasites that known to be medically important and may causes pathogenic effect on cats and also to human as well. It is important that methods for prevention and control of the parasites be implemented and executed in order to reduce the environmental contamination with infective eggs and larvae (Labarthe et al., 2004).

**Table 2 Distribution of arthropod ectoparasites on host according to both sexes**

Ectoparasites	Prevalence (%)		Mean intensity		Abundance	
	Male	Female	Male	Female	Male	Female
<i>Ctenocephalides felis</i>	42.9	61.9	5.33	4.92	2.29	3.05
<i>Felicola subrostratus</i>	21.4	9.5	9.67	3.50	2.07	0.33
Ixodidae	0	9.5	0	9.0	0	0.86

**Table 3 Distribution of arthropod ectoparasites on host according to host age**

Ectoparasites	Prevalence (%)		Mean intensity		Abundance	
	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
<i>Ctenocephalides felis</i>	35.7	66.7	2.80	5.86	1.00	3.90
<i>Felicola subrostratus</i>	0	23.8	0	7.20	0	1.71
Ixodidae	0	9.5	0	9.0	0	0.86

Adult (=1.5 kg); Juvenile (<1.5 kg) (Sharif et al., 2007).

### Conclusion

A total of 35 stray cats were captured and examined within five months samplings in Section 7 of Shah Alam, Selangor. The stray cat's population showed more female hosts were captured. Diversity of ectoparasites on stray cats' population in the study area were found to be generally moderate with infestations 60% of stray cats were found infested. A total of three species of ectoparasites were identified namely *C. felis*, *F. subrostratus* and Ixodidae. However, since ticks were recovered in their larval stage, the identification could not be done until genus and species level as there were no

complete taxonomic key for identification purpose.

Ectoparasite distribution on host varied according to their species, host age and host sex. The infestation rate of ectoparasites showed *C. felis* was the most prevalent, following this was *F. subrostratus* and the least prevalent was Ixodidae. Distribution of ectoparasites was thought to be more prevalent on female hosts compared to male hosts. Infestation of ectoparasites between host sexes showed females were found more susceptible to ectoparasites infestation compared to males with 59% prevalence on female stray cats and 41% prevalence

on male stray cats. Moreover, the infestation was also prevalent more on adult stray cats compared to juvenile stray cats with 90.6% prevalence on adults and 9.3% on juveniles.

There was lack of information available for ectoparasites on stray cats because of lack of expertise and due to their vast number, small size and taxonomic difficulties which caused limited knowledge about the effects of ectoparasites to cats and human being as well. Stray cats are capable to be infested by numerous types of ectoparasites which some of them are known to have medical importance on the cats and was previously known to attack human as well.

The exposure of medical importance ectoparasites to human is a major concern because of the zoonotic diseases can be transmitted by arthropods infesting cats and since human and cats share the same microenvironment, the potential risk of infections by zoonotic parasites exist.

This study has provided a checklist of the cat ectoparasites in section 7 of Shah Alam, Selangor and the distribution of ectoparasites on stray cats examined. This can lead to gain better understanding of distribution of ectoparasites infesting cats. Since this study was not involved a large scale study of cats population, therefore further studies should be conducted in order to come out with complete information that represents the full diversity of medically important ectoparasites on cats in Shah Alam and to estimate the potential risk of arthropod-borne diseases transmission.

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