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A comparative morphological study of flea recovered from dog and cat in Guwahati

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Abstract

A study was conducted to investigate the prevalence of fleas in dogs and cats in Guwahati city from August 2020 to July 2021. A total of 244 dogs and 120 cats were examined, out of which 55 dogs and 24 cats were found to be infested with fleas. For morphological identification, 388 fleas and 252 fleas were collected from infested dogs and cats respectively. Fleas were highly prevalent in stray dogs (76.0%) and cats (62.4%) than in pet dogs (17.5%) and cats (13.2%). The prevalence of flea infestation was higher in young dogs (51.4%) and cats (36.3%) than in adult dogs (37.1%) and cats (32.3%). Two species of fleas were identified namely *Ctenocephalides canis* and *Ctenocephalides felis*. On dogs, the prevalence of *C. canis* alone was 62.0%, whereas that of *C. felis* alone was 38.0%. Prevalence of *C. felis* only on cats was 90.0% whereas that of *C. canis* alone was 10.0%. Mixed infestation of *C. canis* and *C. felis* were recorded in 10 dogs and 2 cats. These two flea species *C. canis* and *C. felis* infesting the host causes irritation, dermatitis and also act as a vector of many diseases, therefore the proper control of these flea is necessary in dogs and cats to prevent flea borne diseases.

Keywords: Fleas, *Ctenocephalides canis*, *Ctenocephalides felis*, cats, dogs, morphology

Introduction

Ectoparasites are a common and important cause of pruritic and non-pruritic skin disorders in dogs and cats which cause hypersensitivity disorders (Ettinger and Feldman, 1995). In addition, many species of arthropod are responsible for the transmission of disease to other animals or are vectors for some diseases that are transmitted to humans. Amongst others, fleas are an important ectoparasite of class Insecta under the order Siphonoptera. Members of the genus *Ctenocephalides* are thought to have originated in Africa, but have been introduced to countries around the world. *Ctenocephalides canis* occurs worldwide and is the predominant flea found on dogs in most parts of the world. They not only infest the host and cause irritation but also act as the carrier of the disease in case of the host animal like dog and cat. They are not markedly specific for their host and may feed on other hosts. The dog flea has been reported on many mammalian hosts including dogs, cats, rabbits, rats, gray foxes, red foxes, woodchucks, and humans (Fox, 1940) [6]. *C. canis* can act as intermediate hosts for parasitic worms including the double-pored tapeworm, *Dipylidium caninum* and the nematode, *Acanthocheilonema reconditum*. The cat flea (*C. felis*) is an extremely common ectoparasite whose principal host is the cat. It is considered the most pervasive flea with veterinary significance principally centered around owned dogs and cats (Tsoi *et al.*, 2020) [15]. *C. felis* and *C. canis* are the most important flea parasites of dogs and cats throughout the world; they themselves affect the host and act as vectors of diseases (Ali *et al.*, 2020) [2]. *C. felis* is more adaptable than *C. canis*, since it infests more host species and has therefore become established in more extensive areas (Linardi and Santos, 2012) [14]. *C. felis* is one of the few flea species that is truly cosmopolitan. Throughout the rest of the world, cat fleas are found wherever suitable hosts reside (Hubbard, 1968; Roberts and Janovy, 2000) [7, 11]. In this part of the country, no detailed morphological studies on the mentioned flea species were performed. In the present work, fleas collected from dogs and cats in and around Guwahati city have been morphologically examined.

Materials and Methods

Study area: The study was carried out in Guwahati, Assam, India (26°07N, 91°82E) from August 2020 to January 2021. Fleas were collected from several areas of Guwahati city such as Khanapara, Beltola, Dispur, and Ulubari from stray and pet dogs and cats, including Teaching Veterinary Clinical Complex (TVCC) Khanapara. Both pet dogs and cats were restrained with the help of their owners, while stray dogs and cats were restrained with the help of assistant by covering the mouth with muzzle.

Collection of samples: For morphological identification, fleas were collected from 244 numbers of dogs and 120 numbers of cats irrespective of their age, breed and sex. The fleas collected from dogs and cats were stored separately in properly labelled vials containing 70% alcohol for morphological study.

Morphological identification: To facilitate identification by temporary mount, fleas were placed in petridish containing lactophenol for 24 hours to clear, placed on a glass slide, cover slip was put and observed under microscope (4X and 10X) objectives of a microscope. All the fleas were identified morphologically as per the keys provided by Soulsby 1982 [16].

Results

The flea infestation in dogs and cats with *Ctenocephalides canis* and *Ctenocephalides felis* were recorded through the year. Season-wise, infestation of flea was found to be highest in Pre-monsoon (66.67%) followed by monsoon (40.98%), post-monsoon (39.02%) and lowest in winter (18.00%) season in dogs and in cats also flea infestation was found to be highest in Pre-monsoon (47.50%), monsoon (31.25%) followed by post-monsoon (23.53%) and lowest in winter (16.13%) season (Table 1). Out of 244 dogs and 120 cats examined, 106 dogs and 38 cats were found to be infested with fleas. The prevalence of flea was recorded higher in dogs (43.44%) and lower in cats (31.67%) (Table 1). The flea infestation was recorded higher in stray dogs and cats than domesticated dogs and cats. Among stray dogs and cats, comparatively higher infestation of flea was recorded in stray dogs. A total of 388 fleas from dogs and 252 fleas from cats were collected. Morphological identification revealed the presence of *C. canis* and *C. felis* (Table 2 and Figure 1). Mixed infestation of *C. canis* and *C. felis* were recorded in 10 dogs and 2 cats. In our study, the prevalence of *C. canis* was mostly found in all the dogs from the study areas of Guwahati city and among few cats living in close proximity with the dogs. Higher flea infestation was recorded in dogs (63.33%) than cats (35.00%) in Dispur. In Beltola, flea infestation was recorded in dogs (54.05%) and in cats (39.13) (Table 3).

Discussion

In the present study, prevalence of fleas was recorded throughout the year. Season wise, infestation rate in both dogs and cats was 66.67% and 47.50% respectively as the highest during Pre monsoon season and with corresponding 18.00% and 16.13% as the lowest rate of infestation during winter season. The χ^2 test revealed significant differences ($p < 0.01$) in the prevalence of fleas amongst the seasons. Cruz-Vazquez (2001) [3] reported the overall prevalence of 16.80% and 7.70% of *C. canis* in dogs and cats, 81.10% and 92.30% of *C. felis* in dogs and cats, higher infestation was

recorded by him in summer than in winter and rainy seasons from Mexico. Kumar (2015) [9] reported the highest prevalence of *C. canis* (91.57%) during pre-monsoon and lowest (46.67%) during winter from Delhi, which was similar to our findings. The highest prevalence of fleas during pre-monsoon season is due to favourable temperature and relative humidity of environment which is conducive for the growth and reproduction of fleas and also due to presence of hosts. But during winter season due to drop in environmental temperature and humidity, growth and reproduction of flea population decreases.

Different flea species, *C. canis*, *C. felis felis*, *C. felis orientis* and *Xenopsylla cheopis* were recorded from dog, cat, mice, goat and cattle by Devi *et al.* (2011) from Assam, the predominant species in dog were recorded as *C. felis orientis* (40.42%) and *C. canis* (10.63%) and that of cat were *C. felis felis* (50.00%), *X. cheopis* (27.78%), *C. canis* (16.67%) and *C. felis orientis* (5.56%). They could also record that rate of flea infestation to be highest in dog (68.66%). In Assam, Arunachal Pradesh and Nagaland, Khan *et al.* (2016) [12] recorded the presence of *C. felis* as a potential vector of rickettsial diseases. In India, Khan *et al.* (2022) [13] recorded the prevalence of the fleas as *C. felis*, *C. canis* and *Pulex irritans* from eastern Himalayan region.

The flea *C. canis* was characterized by rounder head, presence of eyes, the short, clubbed antenna were sunked in antennal groves on the side of the head, the first spine of the genal comb was shorter than the second. In female *C. canis*, spermatheca containing long hilla, three numbers of the bristles on the Lateral Metanotal Area (LMA) were also observed (under 10X magnification). In case of cat flea *C. felis*, head was found to be about twice as long as it was wide, consists of eye, the short, clubbed antennae were sunked in antennal groves on the side of the head. The first genal spine of the genal comb was almost as long as the second, in female *C. felis* spermatheca contained short hilla as compared to *C. canis*. Two numbers of the bristles on the Lateral Metanotal Area (LMA) in female *C. felis* was also observed (under 10X magnification). These morphological findings were same as described by Akram *et al.*, 2016; Ali *et al.* 2020 [1, 2]. Cat flea has four to five "teeth" or notches on the tibia of all six legs, whereas the dog flea has seven to eight teeth on the tibia of all six legs (Kramer and Mencke, 2001) [10].

In our present study, higher infestation of fleas was recorded among stray dogs and cats than in pet dogs and cat in Guwahati city. The higher prevalence of fleas *C. canis* in dogs may be due to the presence of large number of dogs as pet and stray animals than cats in the Guwahati city which was similar to that reported by other workers elsewhere (Hsu, Wu, 2001; Ali *et al.*, 2020) [8, 2]. In this study, more infestation of fleas in stray dogs and cats may be due to non-use of anti-flea products and lack of grooming of stray animals.

Infestation of fleas like *C. canis* and *C. felis* causes alopecia, dermatitis in their host dogs and cats. *C. canis* and *C. felis* also act as an intermediate host of helminth, for example *D. caninum* in dogs and cats. *C. felis* also act as a vector of the rickettsial disease murine typhus caused by *Rickettsia mooseri* in humans and it has been already reported from our Northeastern part of India. So proper methods should be used to control the flea infestation in dogs and cats, as well as for the prevention of *D. caninum* infection in dogs and cats and also for the control of rickettsial diseases in humans.

Table 1: Month -wise prevalence of fleas in dogs and cats

Sl. No	Month/Season Involved	Total No. of animal examined		No. of positive animal		No. of positive %		χ^2 Value
		Dog	Cat	Dog	Cat	Dog	Cat	
1	March	20	9	16	6	80.00	66.67	2.21*
	April	21	10	14	6	66.67	60.00	
	May	20	11	12	4	60.00	45.45	
	June	20	10	12	3	60.00	40.00	
	Pr-emonsoon	81	40	54	19	66.67	47.50	
2	July	20	10	6	4	30.00	40.00	
	August	20	12	9	3	50.00	25.00	
	September	21	10	10	3	47.62	33.33	
	Monsoon	61	32	25	10	40.98	31.25	
3	October	20	9	9	2	45.00	22.22	
	November	21	8	7	2	33.33	25.00	
	Post-monsoon	41	17	16	4	39.02	23.53	
4	December	20	10	2	2	20.00	20.00	
	January	21	11	4	2	19.05	18.18	
	February	20	10	5	1	25.00	10.00	
	Winter	61	31	11	5	18.00	16.13	
	Total	244	120	106	38	43.44	31.67	

*Significant $p < 0.01$ **Table 2:** Morphological differences *C. canis* an *C. felis*

Morphological Characteristics	<i>C. canis</i>	<i>C. felis</i>
Shape of the head	Dorsal profile of the head is rounded in appearance	Head is about twice as long as it is wide and the dorsal profile of the head is elongated in appearance
Length of the 1 and 2 spine of genal comb	First genal spine is shorter than the second	First genal spine is almost as long as the second
Female: length of the hilla of spermatheca	Spermatheca contains long hilla	Spermatheca contains short hilla
Number of the bristles on LMA	Three	Two
Number of notches on tibiae	7-8 numbers	5 numbers

Table 3: Infestation of dogs and cats with fleas in different location of Guwahati city

Location	Animal (n=364)	Animal infested (n=144) (%)
1. Teaching Veterinary Clinical Complex Khanapara	Dog (n=145)	49 (33.79)
	Cat (n=60)	17 (28.33)
2. Beltola	Dog (n=37)	20 (54.05)
	Cat (n=23)	9 (39.13)
3. Dispur	Dog (n=30)	19 (63.33)
	Cat (n=20)	7 (35.00)
4. Ulubari	Dog (n=32)	18 (56.25)
	Cat (n=17)	5 (29.41)
Total	Dog (n=244)	106 (43.44)
	Cat (n=120)	38 (31.67)

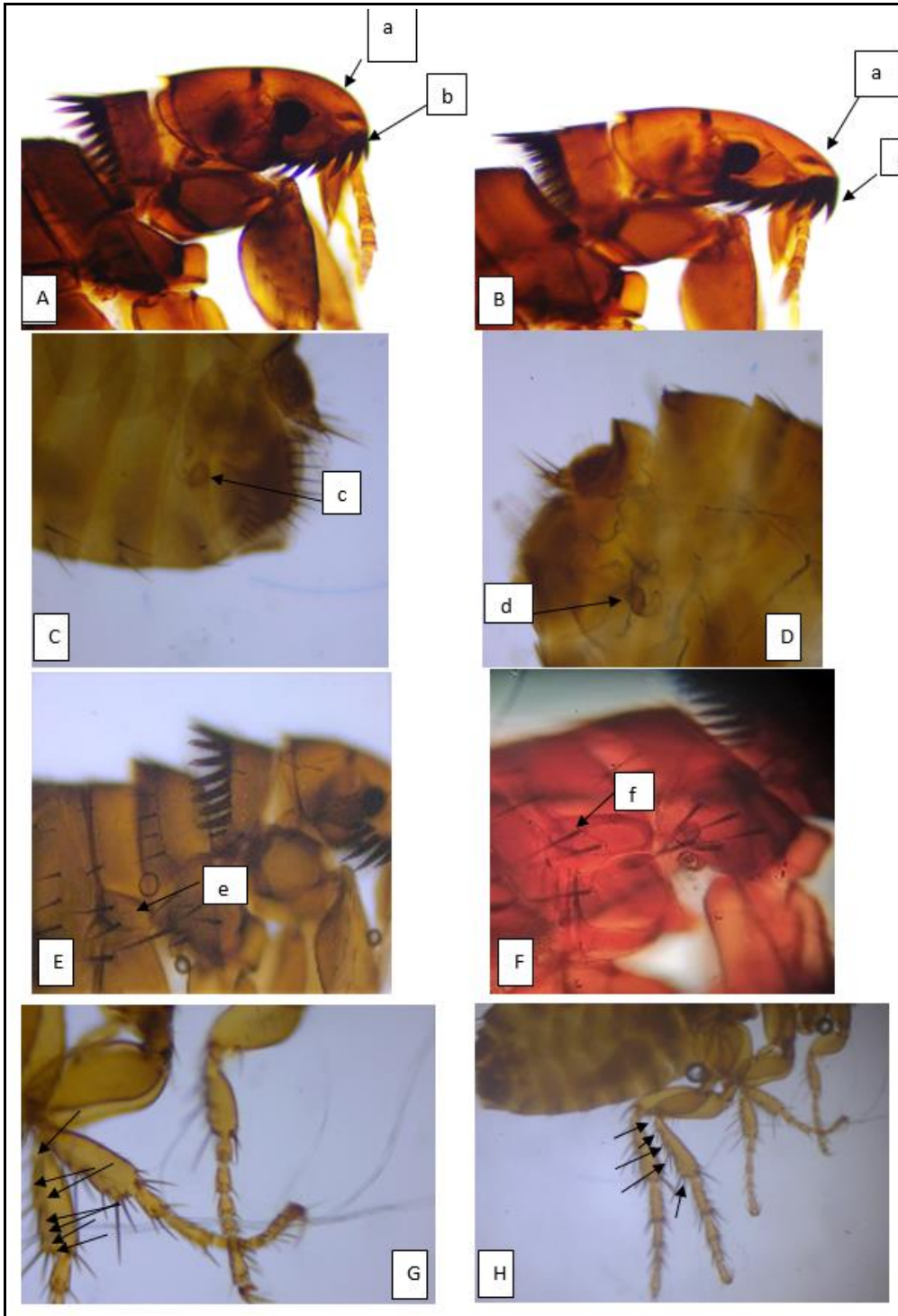


Fig: 1 A- Female of *C. canis*, a- shape of the head, b- length of the first spine of the genal comb; B-Female of *C. felis*, a- shape of the head, b- length of the first spine of the genal comb; C-Female of *C. canis*, c- length of hilla of spermetheca, D-Female of *C. felis*,d-length of hilla of spermetheca; E- Female of *C. canis*, Number of the bristles on the Lateral Metanotal Area (LMA) e F-Female of *C. felis* Number of the bristles on (LMA) G-number of notches on the hind tibia (7 Black arrows), H-Female of *C. felis*,number of notches on the hind tibia (5 Black arrows).

Conclusion

Fleas are the important ectoparasites among the companion animals like dogs and cats. Fleas were found prevalent through the year with their highest prevalence rate during pre-monsoon season. Morphological identification reveals the presence of *Ctenocephalides canis* and *Ctenocephalides felis* in our present study. Both *C. canis* and *C. felis* infestation were found higher in stray dogs and cats. Flea bite not only cause allergic dermatitis in the dogs and cats but can also lead to secondary bacterial infection. Since fleas suck blood heavy flea infestation can cause anaemia.

Fleas can act as an intermediate host of various cestode and nematode in dogs and also act as a vector of rickettsial disease in human. So adequate flea control strategies should be implemented in different areas of Guwahati.

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References

1. Akram A, Dalimi A, Mohebbali M, Mohammadiha A, Zarei Z. Morphological and molecular characterization of *Ctenocephalides* spp isolated from dogs in north of Iran. *J Entomol Zool Stud*. 2016 May;4(4):713-717.
2. Ali Y, Barman A, Abdullah SMM, Islam KBMSM, Mohanto UK. Morphological identification and prevalence of the dog flea *Ctenocephalides canis* (Curtis, 1826) and the cat flea *Ctenocephalides felis* (Bouché, 1835) in Dhaka city, Bangladesh. *Parasitology*. 2020 May. Available from: <https://www.researchgate.net/publication/344295638/> DOI: 10.31857/S1234567806020066.
3. Cruz-Vazquez C, Gomez EC, Fernandez MP, Parra MR. Seasonal Occurrence of *Ctenocephalides felis felis* and *Ctenocephalides canis* (Siphonaptera: Pulicidae) Infesting Dogs and Cats in an Urban Area in Cuernavaca, Mexico. *J Med Entomol*. 2001 Jan;38(1):111-113.
4. Devi S, Deka DK, Neog R, Islam S, Uphadhaya TN, Das M. *Dipylidium caninum* in dogs and screening of fleas as possible vectors in Greater Guwahati. *Journal of Vet Parasitol*. 2011 Jan;25(1):76-78.
5. Ettinger SJ, Feldman EC. Textbook of veterinary internal medicine: diseases of the dog and cat. 1st ed. WB Saunders Co; Philadelphia. c1995.
6. Fox I. Fleas of Eastern United States. Ames, IA. Collegiate Press. 6th ed. USA; c1940.
7. Hubbard C. Fleas of Western North America. 1st ed. Hafner Publishing. New York; c1968.
8. Hsu MH, Wu WJ. Off-host observations of mating and post-mating behaviors in the cat flea (Siphonaptera: Pulicidae). *J Med Entomol*. 2001 May;38(3):352-360.
9. Kumar A. Seasonal abundance of *Ctenocephalides canis* (Curtis). *J Exp Zool India*. 2015 Dec;18(1):245-247.
10. Kramer F, Mencke N. Flea Biology and Control: The Biology of the Cat Flea, Control and Prevention with Imidacloprid in Small Animals. 1st ed. Springer, Berlin, Germany; c2001.
11. Robert L, Janovy J. Foundations of parasitology. Sixth Edition, USA: McGraw-Hill; c2000.
12. Khan SA, Bora T, Chattopadhyay S, Jiang J, Richard AL, Dutta S. Seroepidemiology of rickettsial infections in Northeast India. *Trans R Soc Trop Med Hyg*. 2016 Apr;1-8 doi:10.1093/trstmh/trw052.
13. Khan SA, Saikia J, Bora T, Khamo V, Rahi M. Rickettsiae in fleas infesting domestic pets of eastern Himalayan terrains of India. *Trans R Soc of Trop Med Hyg*. 2022 Jan;116:595-598. Available from: <https://doi.org/10.1093/trstmh/trab184>.
14. Linardi PM, Santos JLC. *Ctenocephalides felis felis* vs. *Ctenocephalides canis* (Siphonaptera: Pulicidae): some issues in correctly identify these species. *Rev Bras Parasitol Vet*. 2012 Dec;21(4):345-354.
15. Tsoi FMN, Salpeta J, Reynolds M. *Ctenocephalides felis* (cat flea) infestation in neonatal dairy calves managed with deltamethrin pour-on in Australia. *Vet Parasitol*. 2020;279:109039. DOI: 10.1016/j.vetpar.2020.109039. Epub 2020 Jan 31.
16. Soulsby EJ. Helminths. Arthropods and Protozoa of domesticated animals; c1982. p. 291.