ECTOPARASITE SPECIES FOUND ON DOMESTIC DOGS FROM PATTAYA DISTRICT, CHON BURI PROVINCE, THAILAND

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Abstract. The prevalences of ectoparasites and their densities were determined. A total of 460 ectoparasites were collected from 83 untreated household dogs in Pattaya District, Chon Buri Province. Four hundred and six ticks were found and classified into two species: *Rhipicephalus sanguineus* (n = 356, 77.4%), and *Boophilus microplus* (n = 50, 10.9%). All fleas found on the studied dogs were *Ctenocephalides canis* (n = 54, 11.7%). Sixty-seven dogs were infested with ticks and the prevalence rate of tick-harboring domestic dogs was 80.7%. Only 21 dogs were infested with fleas, resulting in a prevalence rate of 26.5%. The densities of *R. sanguineus, B. microplus* and *Ct. canis* infestations in the dogs were 5.4, 2.6, and 2.6, respectively. The stages of *R. sanguineus* were larvae (0.6%), nymphs (1.7%), adult males (49.4%) and adult females (48.3%). The stages of *B. microplus* were nymphs (16%) and adult females (84%). For *Ct. canis*, only adult stages (5.7% males and 94.3% females) were found. The results indicate that *R. sanguineus* is the most prominent species of ectoparasite found on household dogs, followed by *Ct. canis*. *B. microplus*, which is commonly found on cattle, was also found on dogs. The fleas seemed to be less of a problem than ticks, and flea larvae were not discovered on domestic dogs in this area.

INTRODUCTION

Ectoparasites, such as ticks and fleas, live on domestic dogs. They can cause severe dermatitis and may act as vectors for pathogenic agents, resulting in serious diseases not only in dogs, but also in humans. Hard ticks, *Rhipicephalus sanguineus*, are the vectors of a wide range of important diseases worldwide, including viruses, bacteria, and protozoa. These include: rocky mountain spotted fever (spotted fever group, SFG), boutonneus fever, african tick fever, russian tick typhus, Q fever, encephalitis, tularemia, relapsing fever and Lyme disease (Service, 1996). More recently, ticks have been implicated as vectors of additional diseases in North America, including anaplasmosis, babesiosis, and ehrlichiosis. Ticks are also involved in tick paralysis, the condition caused by a toxin or toxins found in the saliva of ticks. *Ctenocephalides canis*, *Ctenocephalides felis felis*, *Pulex irritans* and *Echidnophaga gallinacea* (from poultry) are fleas usually detected in dogs. Their presence is generally associated with skin disorders (dermatitis), pruritus, severe itching and allergic reactions in infested hosts. They may also cause pest problems in contaminated environments. They also act as vectors of pathogenic agents, such as rickettsia disease (murine typhus), bacterial disease (plague) and viral disease (myxomatosis)(Koutinas *et al*, 1995). Dog fleas and cat fleas are identified as intermediate hosts for dog tapeworms (*Dipylidium caninum*) and dwarf tapeworms (*Hymenolepis nana*)(Kettle, 1984).

In urban or suburban areas, people traditionally raise dogs as pets. Thus, pet owners may contact disease from ectoparasites via their dogs. One way to prevent disease is to treat pets as family members. Health check-ups protect pets from infestation by ectoparasites. One potential and effective way to prevent diseases is to provide a good environment for the pet. Thus, a knowledge of types of species, density and prevalence of ectoparasites is needed to effectively control them.

Several surveys have pointed out the importance of ectoparasites in small animals. However, there are differences in respect to their frequency and geographical locations (Chesney, 1995; Koutinas et al, 1995; Nithikathkul et al, 2002, 2005; Shimada et al, 2003). The

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presence of *P. irritans*, *C. canis* and *C. felis* has been described in dogs and cats in Chile (Alcaino *et al*, 2002). In Thailand, Ixodid ticks on domestic animals in Samut Prakan Province and ectoparasites on domestic dogs (*Canis lupus familiaris*) were studied in Mueang District, Khon Kaen (Nithikathkul *et al*, 2002, 2005). Surveys of flea species from dogs were conducted in Nakhon Chaisi District, Nakhon Pathom Province (Nateeworanart *et al*, 2005). However, information regarding ectoparasites on domestic dogs in Chon Buri Province have not yet been reported.

The purpose of this study was to identify ectoparasites found on domestic dogs in Pattaya District, Chon Buri Province, Thailand. The species, the percentage, density and prevalence of ectoparasites collected from selected domestic dogs at three veterinary clinics located in Pattaya District were studied.

MATERIALS AND METHODS

Dogs of various breeds, sexes and ages were examined for ectoparasites at three veterinary clinics in Pattaya District between January and March 2004. All dogs presenting for a clinical veterinary consultation on one regular working day per week, per practice, were examined. Dogs were examined regardless of prior therapeutic or prophylactic insecticide treatment.

Ectoparasites were collected by hand from the ears, tails, necks and legs of dogs over a 15-minute period. Captured specimens were counted and placed small plastic containers. They were then fixed in 70% alcohol in a vial (with the labeled host and time data *eg*, details about breed of dogs, date and time and address of household where the dogs live). Captured specimens were preserved in 70% alcohol until identification was finished. The ectoparasites were kept in 10% KOH (clearing agent) 2-3 day before identification. Species determination was based on microscopic examination; the nomenclature of Peus (1938) was used for identifying specimens. The stage and species of ectoparasites were identified.

The percentage, density and prevalence of infestation were calculated using the following formula: Percentage of ectoparasites = (number of specific ectoparasites/total number of ectoparasites) x 100; Density of infestation = number of specific ectoparasites/number of dogs with their corresponding specific ectoparasite infestion; Prevalence of infestation = number of existing cases/total population at a specific point in time; Estimated prevalence of infestation = number of animals infested with an ectoparasite species/number of dogs sampled) x 100.

RESULTS

A total of 460 ectoparasites (406 ticks, 54 fleas) were collected from 83 untreated household dogs in Pattaya District, Chon Buri Province. By taxonomy, 406 ticks were classified into 2 species of ectoparasites: *Rhipicephalus sanguineus* (77.4%, n=356) and *Boophilus microplus* (10.9%, n=50). The most common tick was *R. sanguineus* and the least common tick was *B. microplus*. A total of 54 fleas were found, all of them *Ctenocephalides canis* (11.7%, n=54).

The prevalence of ectoparasites and their density were determined in 83 untreated dogs. Sixty-seven dogs were infested by ticks. The overall prevalence rate for ticks on domestic dogs was 80.7%. *R. sanguineus* was found in 79.5% (n=66) and *B. microplus* in 22.9% (n=19). Only 21 dogs were infested by fleas, with a prevalence rate of 26.5%. The densities of *R. sanguineus, B. microplus* and *Ct. canis* infestations in dogs were 5.4, 2.6, and 2.6, respectively (Table 1).

The stages of *R. sanguineus* included larvae (0.6%), nymphs (1.7%), adult males (49.4%) and adult females (48.3%). The stages of *B. microplus* were nymphs (16%) and adult females (84%). For *R. sanguineus*, all stages of ticks were found. However, only nymphs and adult females of *B. microplus* were found. The only species of fleas found in domestic dogs from Pattaya District was *Ct. canis*. Adult males (5.7% and and females (94.3%) *Ct. canis* were found (Table 2). Flea larvae were not discovered on any of the studied domestic dogs.

DISCUSSION

In household dogs, *R. sanguineus* was the

Table 1
Species, percentage, estimated prevalence and density of ectoparasites found on domestic dogs in Pattaya District.

Species	Percentage of all ectoparasites (%)	Estimated prevalence of ectoparasites (%)	Density of ectoparasites
Rhipicephalus sanguineus	77.4	79.5	5.39
Boophilus microplus	10.9	22.9	2.63
Ctenocephalides canis	11.7	26.5	2.57

Percentage of ectoparasites = (number of specific ectoparasites/total number of ectoparasites) x 100; Density of infestation = number of specific ectoparasites/number of dogs with corresponding ectoparasite infestion; Estimated prevalence of infestation = number of animal infested by an ectoparasite species/number of dogs sampled) x 100.

Table 2
Stages of ectoparasites found on domestic dogs in Pattaya District.

Species/ Stage	Adult male (%)	Adult female (%)	Nymph (%)	Larvae (%)
R. sanguineus	49.4	48.3	1.7	0.6
B. microplus	-	84.0	16.0	-
Ct. canis	5.7	94.3	-	-

most common species, followed by *Ct. canis* and *B. microplus*. These findings are similar to those found by other investigators (Guglielmone *et al*, 1991; Michael *et al*, 1996). *Haemaphysalis longicornis*, *H. flava* and *I. ovatus* were more common in dogs living in rural areas than urban or suburban areas. Infestation with *R. sanguineus* in dogs was associated with being in an enclosed yard while exposure to woodlands was associated with *H. flava* and *I. ovatus* infestation (Shimada *et al*, 2003). All stages of *R. sanguineus* were found. However, only nymphs and adult females of *B. microplus* were found. *B. microplus* is commonly found on cattle (Kettle, 1984). We postulated the development of transportation in Pattaya District has altered the animal life. Cattle and dogs live in the same area. Over time, *B. microplus* may have adapted themselves to live on dogs.

Nithikathkul *et al* (2002) reported only two species of Ixodid ticks, *R. sanguineus* and *B. microplus* were found. *R. sanguineus* was the most common species in *Canis lupus familiaris* and *B. microplus* was the most common species in cattle (*Bos indicus* and *Bos taurus*, cross-bred) in Bang Phli District. The density of *R. sanguineus* was highest in the winter; the density of *B. microplus* was highest in the summer. The number of ticks depended on the geographic location, animal host and season. The high percentage of *R. sanguineus* may be due to the temperature in the winter is optimum for these ticks; temperature affects the growth, development, reproduction and survival of *R. sanguineus*. In contrast, temperature and/or moisture may not affect the growth and reproduction of *B. microplus* (Nithikathkul *et al*, 2002).

Fleas seemed to be less of a problem for dogs. *Ct. canis* was the only flea species found. *Ct. felis* and flea larvae were not discovered on domestic dogs in this area. These findings are not consistent with the findings of the polyxenous nature of fleas studied by other investigators (Chesney, 1995; Clark, 1999; Visser *et al*, 2001; Alcaino *et al*, 2002). *Ct. canis* tends to be a predominant species in rural locations and *C. felis* is more common in urban areas (Alcaino *et al*, 2002; Beck *et al*,

2006). Koutinas *et al* (1995) identified dog fleas collected from 129 dogs and 38 cats. *Ct. canis* was the most common species found on dogs (71.3%). The prevalence on cats was substantially lower (5.3%). *Ct. felis* was found on 97.4% of cats and 40.3% of dogs surveyed from various parts of northern Greece. Among the less prevalent flea species, *Pulex irritans* (0.8%) and *Xenopsylla cheopis* (0.8%) were detected on dogs. There were mixed infestations in 13.2% of dogs and 2.6% of cats in the Greek study. Flea-associated dermatoses were observed in 26 dogs (20.2%) and 4 cats (10.5%). Flea-allergic dermatitis, with its typical manifestations, was found in 10 dogs (38.5%) possessing skin lesions. Of 4 flea-allergic cats, three presented with miliary dermatitis and one the symmetrical hypotrichosis (Koutinas *et al*, 1995).

Alcaino *et al* (2002) studied flea species on dogs in three cities of Chile. The only species of fleas found on dogs were *Ctenocephalides felis felis* (41.8%), *Ctenocephalides canis* (39.4%) and *Pulex irritans* (18.8%). The three species were found in three cities, and differences regarding their frequencies were detected ($p<0.05$). *Ct. felis* was the predominant species found on dogs in Santiago and Concepcion. However in Osorno, the most southern city, the predominant species was *Ct. canis* (78.7%). Osorno is much more rural than Santiago, which is the capital city, and according to other authors, *Ct. canis* is a predominant species in rural areas, while *Ct. felis* is more common in urban locations (Beresford-Jones, 1981). Similar findings were seen in England (Edward, 1969), and Denmark (Kristensen *et al*, 1978). In contrast, Beck *et al* (2006) studied the epidemiology and population dynamics of flea infestations in dogs and cats; the preliminary results did not indicate a relationship between climatic conditions and flea infestation rates. Similarly, no differences in infestations rates were detected between urban and rural areas.

From the results of this study, environmental conditions are likely to change ectoparasite behavior, growth, development, survival rates and reproduction. Season and geographical area appeared to affect ectoparasite prevalence and density in domestic animals. These differences may be due to temperature and/or moisture variations each season which affect the growth and reproduction of ectoparasites (Nithikathkul *et al*, 2002). The development of transportation and relocation of animals possibly affects the density, prevalence and epidemiology of ectoparasite infestations in domestic dogs in Pattaya District. However, there were differences in the spectrum of ectoparasite species related to geographical areas (rural versus urban; mountains versus plains and/or waterfront), seasonal occurrence, and the host susceptibility to these ectoparasites (Harman *et al*, 1987, Scheidt, 1988; Cruz-Vazquez *et al*, 2001).

In conclusion, data of the current study show *R. sanguineus*, had the highest percentage, density and prevalence of tick species. *Ct. canis* was the most prominent of flea species on domestic dogs in Pattaya, in agreement with Thailand literature on ectoparasites (Nithikathkul *et al*, 2002, 2005). The worldwide distribution of ticks and fleas, their role as vectors for a variety of pathogens, their involvement in flea allergy dermatitis, and their general public health impact demonstrate the need for effective ectoparasite control. Further investigations are needed for a better understanding of ectoparasite infestations (species, percentages, densities and prevalences of ectoparasites), the geographical patterns of occurrence and distribution, and seasonal climatic factors that influence development in other animals such as cats, rodents, stray dogs, pigs, and cattle.

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