A SURVEY OF ECTOPARASITIC ARTHROPODS ON DOMESTIC ANIMALS IN TAK PROVINCE, THAILAND

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Abstract. In July 2008 a survey of ectoparasites on domestic animals was conducted in the Royal Thai Army areas of operation along the Thai-Myanmar Border, Tak Province, Thailand. Eleven different ectoparasites were collected: two species of hard ticks (Ixodidae), three species of fleas (Siphonaptera) and 6 species of sucking or chewing lice (2 species each in the suborders Anoplura, Ischnocera and Amblycera) were collected. Domestic dogs (*Canis lupus familiaris*) (*n*=94) were found infested with 2 species of flea *Ctenocephalides felis orientis* (86.2%) and *Echidnophaga gallinacea* (1.1%), one species of tick, *Rhipicephalus sanguineus* (21.3%), and one louse species, *Heterodoxus spiniger* (7.4%). Domestic cats (*Felis catus*) (*n*=6) were found infested with only flea species, *Ctenocephalides felis felis* (100%) and *E. gallinacea* (33.3%). Cattle (*Bos indicus*) (*n*=11) had *Rhipicephalus (Boophilus) microplus* (72.7%), *Linognathus vituli* (27.3%), and *Solenopotes capillatus* (9.1%) present, while chickens (*Gallus domesticus*) (*n*=10) had infestations with *E. gallinacea* (20%), and 3 lice species, *Lipeurus caponis* (10%), *Goniodes dissimilis* (10%) and *Menopon gallinae* (60%). This is believed to be the first report of *S. capillatus* collected in Thailand.

INTRODUCTION

Arthropod ectoparasites have a major impact on husbandry, productivity and welfare of domestic animals (Colebrook and Wall, 2004). These obligate parasites live, feed and shelter on or just beneath the surface of their host's epidermis, hair or feathers (Marshall, 1981). As a result, skin and other subcutaneous tissues can be directly compromised by irritation, hypersensitivity, dermatoses and alopecia. The presence of salivary and fecal antigens from burrowing ectoparasites (*eg*, *Sarcoptes*) can result in significant hypersensitivity in some animals. Feeding activity of the ectoparasites may result in significant blood loss, secondary infestations, pruritus, excoriation and in some cases premature death. Ectoparasites may also cause indirect harm including behavioral disturbances, such as increased frequency of rubbing or scratching, leading to reduced time in feeding. For cattle, less grazing and general disturbed behavior decreases production of meat or milk (Matthysse, 1946). In some cases, infected animals may resort to self-wounding, particularly when ectoparasites are present in

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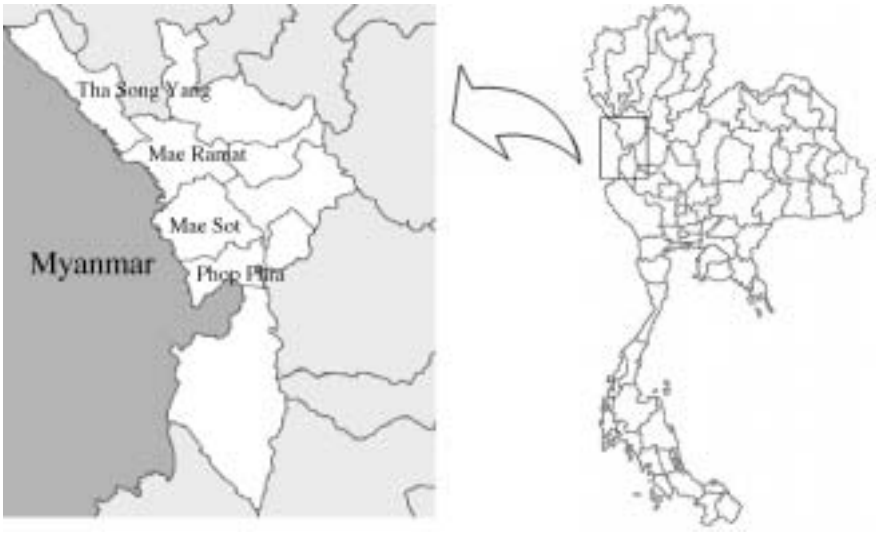

Fig 1–Area of ectoparasite collections, Tak Province, Thailand.

high densities (Berriatua *et al*, 2001). Some ectoparasites may also act as vectors of viruses, rickettsia, bacteria, protozoa, cestodes and nematodes, including vectors of zoonotic diseases in humans (Arends *et al*, 1990; Uilenberg, 1995; Raoult and Roux, 1997; Parola *et al*, 2003, 2005; Rehbein *et al*, 2003; Petney *et al*, 2007).

Various studies have reported ectoparasites on domestic animals in Thailand, including dogs (Sangvaranond, 1990a,b; Sangvaranond *et al*, 2000; Nithikathkul *et al*, 2005), domestic cattle (Sangvaranond, 1988; Sarataphan *et al*, 1998), and chickens (Sangvaranond, 2003). Tanskul *et al* (1983) and Ahantarig *et al* (2008) have published checklists and summarized disease information regarding ticks in Thailand.

The Thai-Myanmar border in Tak Province has experienced an increase in cross border movements and importation of large numbers of livestock from Myanmar into Thailand (Tanya, 2001). The economic impact from changes in animal husbandry and the need for increased parasite surveillance and control have increased the need for a better understanding of the current distribution and prevalence of livestock and domesticated animal ectoparasites. This paper describes a survey of ectoparasites on domestic animals in military operational areas along the Thai-Myanmar border of Tak Province, Thailand.

MATERIALS AND METHODS

This study was conducted in 28 military areas of operation along the Thai-Myanmar border with Tha Song Yang, Mae Ramat, Mae Sot and Phop Phra districts of Tak Province, Thailand in July 2008 (Fig 1). The ectoparasites were collected from 4 species of domestic animals including dogs (*Canis lupus familiaris*), cats (*Felis catus*), chickens (*Gallus domesticus*) and native cattle (*Bos indicus*). All animals were humanly captured and handled during the inspection process. Skin, hair shafts, feathers, ears, and other locations were carefully inspected. Fleas were collected by combing the coats of the animals with flea combs. The presence of

Table 1
Arthropod ectoparasites collected and animals infested.

Host (Number examined)	Ectoparasites	No. animals (%) with ectoparasites	No. collected ectoparasites (%)	Mean per host	Location[a]
Domestic dog	*R. sanguineus*	20 (21.3)	80 (10.2)	0.9	N, B, Bo, P
(*n*=94)	*C. felis orientis*	81 (86.2)	664 (84.6)	7.0	N, Bo
	E. gallinacea	1 (1.1)	4 (0.5)	0.04	Bo
	H. spiniger	7 (7.4)	37 (4.7)	0.4	Bo
Domestic cat	*C. felis felis*	6 (100)	26 (92.9)	4.3	Bo, N
(*n*=6)	*E. gallinacea*	2 (33.3)	2 (7.1)	0.3	Bo
Domestic cattle	*R. microplus*	8 (72.7)	84 (67.7)	7.6	Bo, B
(*n*=11)	*L. vituli*	3 (27.3)	16 (12.9)	1.5	Bo, N, S
	S. capillatus	1 (9.1)	24 (19.4)	2.8	N, Bo, S, T
Domestic chicken	*E. gallinacea*	2 (20)	21 (22.8)	2.1	H, C, W, E
(*n*=10)	*L. caponis*	1 (10)	25 (27.2)	2.5	Wi, T
	G. dissimilis	1 (10)	1 (1.1)	0.1	Wi
	M. gallinae	6 (60)	45 (48.9)	4.5	Bo, Wi

[a]Ectoparasite location on host: H, head; N, neck; B, back; Bo, body; E, eye; C, comb; W, wattles; Wi, wing; T, tail; P, paws; S, shoulder.

ticks and lice were detected either by visual examination or by brushing the coat and collected them using forceps. The ectoparasites found were preserved in 70% ethyl alcohol in a sample tube.

Lice and flea samples were placed directly in Hoyer's medium (Krantz, 1981) while tick samples were examined directly under a stereoscope. The specimens were identified to species according to published methods and taxonomic keys (Furman and Catts 1982; Varma, 1993; Price and Graham, 1997). Species names for the Ixodid ticks followed the revisions by Horak *et al* (2002). Host animals were not sampled for other mites, particularly the species in the suborder Gamasida, *eg, Ornithonyssus, Dermanyssus, Sarcoptes, Otodectes, Notoedres, Demodex,* and *Cheyletiella* species.

RESULTS

Sampling was conducted in four districts of Tak Province, Thailand. Tha Song Yang at 10 sites (dogs only), Mae Ramat at 4 sites (dogs and chickens), and Mae Sot (dogs, cats and chickens), and Phop Phra at 9 sites (dogs, cats, chickens and cattle).

The total number of collected ectoparasites from domestic dogs, domestic cats, cattle and chickens were 785, 28, 124 and 92, respectively. The mean number of ectoparasites (by species and host) are presented in Table 1 along with primary sites of infestation. There was no evidence of past or present cutaneous myiasis (*eg, Chrysomya bezziana*) in any animal examined.

Ectoparasites from four species of domestic animals were identified. Two species of hard ticks (Ixodidae), three species of fleas (Siphonaptera) and 6 species of sucking or chewing lice (2 species each in the suborders Anoplura, Ischnocera and Amblycera) were collected. Domestic dogs (*Canis lupus familiaris*) (*n*=94) were found infested with 2 species of flea, *Ctenocephalides felis orientis* (86.2%) and *Echidnophaga gallinacea* (1.1%), one species of tick, *Rhipicephalus sanguineus* (21.3%), and one louse species, *Heterodoxus*

Table 2
Review of various arthropod-borne pathogens and/or economic importance of ectoparasites collected.

Ectoparasite	Host	Economic/disease vector importance
C. felis felis	*Felis catus*	Cats: alopecia, military dermatitis, *Dypylidium caninum*
	Canis l. familiaris	Dogs: canine dermatoses, *Dipetalonema Reconditium, Dipylidium caninum*
	Homo sapiens	Humans: dermatitis, *Rickettsia felis, Bartonella henselae, Dipylidium caninum*(uncommon), *Hymenolepis nana*
C. felis orientis	*Felis catus*	Cats: alopecia, military dermatitis, *Dypylidium caninum*
	Canis l. familiaris	Dogs: canine dermatoses, *Dipylidium caninum*
	Homo sapiens	Humans: dermatitis, *Dipylidium caninum*
R. sanguineus	*Canis l. familiaris*	Dogs: *Babesia canis, Babesia gibsoni Ehrlichia canis, Hapatozoon canis, Anaplasma platys, Mycoplasma Haemocanis, Dipetalonema dracunculoides, Cercopithifilaria grassi*
	Homo sapiens	Humans: *Rickettsia conorii, Rickettsia rickettsii, Coxiella burnetii*
R. microplus	*Bos indicus*	Cattles: *Babesia bigemina , Babesia bovis, Anaplasma marginale, Theileria mutans*
	Homo sapiens	Humans: babesiosis
E. gallinacea	*Gallus domesticus*	Poultry: Dermatitis, anemia, ocular ulceration, emaciation
H. spiniger	*Canis l. familiaris amiliaris*	Dogs: *Dipylidium caninum, Dipetalonema reconditum*
	Homo sapiens	Humans: *Dipylidium caninum* (uncommon)
L. vituli	*Bos indicus*	Cattle: skin irritation, restlessness
S. capillatus	*Bos indicus*	Cattle: skin irritation, restlessness decrease milk production
L. caponis	*Gallus domesticus*	Poultry: skin irritation, loss of egg production
G. dissimilis	*Gallus domesticus*	Poultry: skin irritation, loss of egg production
M. gallinae	*Gallus domesticus*	Poultry: skin irritation, loss of egg production

spiniger (Amblycera: Boopiidae) (7.4%). Domestic cats (*Felis catus*) (*n*=6) were found infested with only flea species, *Ctenocephalides felis felis* (100%) and *E. gallinacea* (33.3%). Cattle (*Bos indicus*) (*n*=11) had *Rhipicephalus (Boophilus) microplus* (72.7%), *Linognathus vituli* (Anoplura: Linognathidae) (27.3%), and *Solenopotes capillatus* (Anoplura: Linognathidae) (9.1%) present. Chickens (*Gallus domesticus*) (*n*=10) had infestations with *E. gallinacea* (20%), and 3 lice species, *Lipeurus caponis* (Ischnocera: Philopteridae)

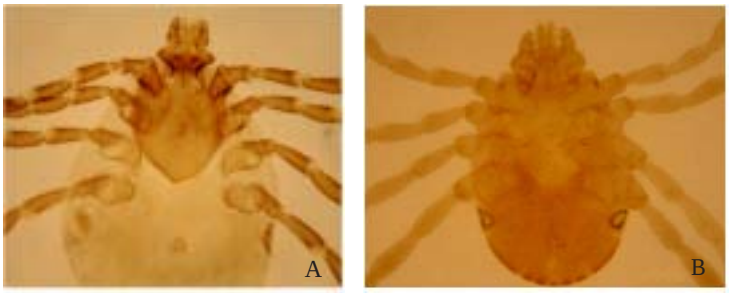

Fig 2–Ticks collected on domestic animals (A) *Rhipicephalus sanguineus*, (B) *Rhipicephalus microplus*. Photos at 20 x magnification.

Fig 3–Flea species collected from domestic animals (A) *Ctenocephalides felis felis*, (B) *Ctenocephalides felis orientis*, (C) *Echidnophaga gallinacea*. All photos at 50 x magnification.

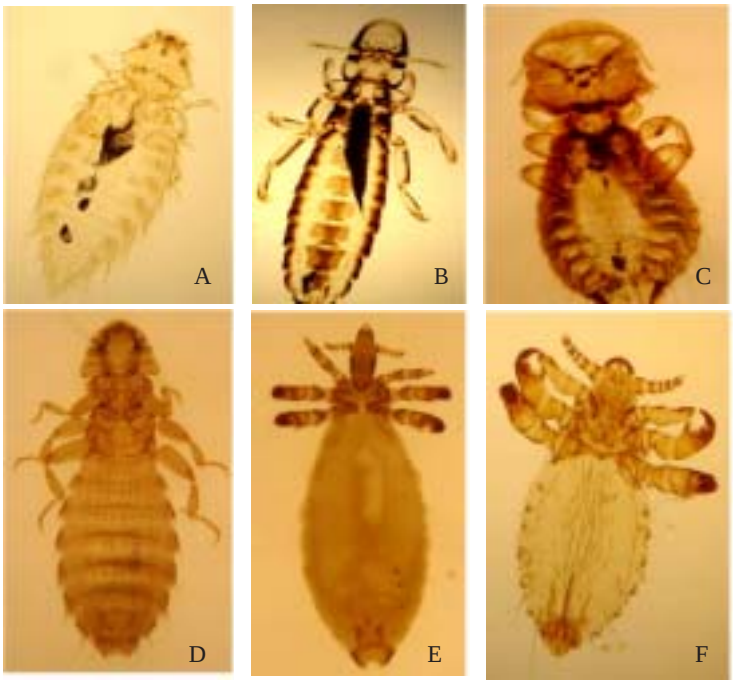

Fig 4–Lice species collected from domestic animals (A) *Menopon gallinae*, (B) *Lipeurus caponis*, (C) *Goniodes dissimilis*, (D) *Heterodoxus spiniger*, (E) *Linognathus vituli*, (F) *Solenopotes capillatus*. All photo at 50 x magnification.

(10%), *Goniodes dissimilis* (Ischnocera: Philopteridae) (10%) and *Menopon gallinae* (Amblycera: Menoponidae) (60%) (Table 2). *Echidnophaga gallinacea* was the only arthropod found on more than one host species (both carnivores and birds), while others encountered appeared to be more host-specific. This is believed to be the first report of *S. capillatus* collected in Thailand.

DISCUSSION

Identification of ectoparasites was relatively straightforward. *Ctenocephalides felis orientis*, one of 4 described subspecies of *C. felis*, is found from India to Australia, and can be differentiated from *C. felis felis*. The anterior portion of the head of *C. felis orientis* is strongly rounded, the male manubrium is widened apically and the female has a row of minute bristles above the antennal fossa. For *C. felis felis*, the anterior portion of the head is much less rounded, the manubrium of the male is only slightly widened apically and the female does not have any rows of minute bristles above the antennal fossa (Hopkin, 1961).

The majority of ectoparasites collected along the Thai-Myanmar Border are those commonly found in Thailand. Eleven species of arthropod parasites were collected from 4 different host species representing carnivores (dogs and cats), a galliform bird (chickens) and an artiodacylid (cattle). No attempts were made to collect acarines (other than metastigmatid ticks) from skin, fur or feathers. *Rhipicephalus sanguineus* and *Heterodoxus spiniger* are predominantly found on domestic dogs, a finding supported by Sangvaranond (1990a) in a survey of ectoparasites (lice and ticks) on domesticated dogs and cats from 19 provinces in Thailand and in a survey by Beaucournu *et al* (2001) in Lao PDR. Of the two flea species, *C. felis orientis* was found only on domestic dogs and *Ctenocephalides felis felis* was confined to cats; both were found in high prevalence similar to the findings by Sangvaranond (1990b). Sangvaranond (1990b) surveyed fleas from dogs and cats from 15 Thai provinces finding a greater diversity of species on hosts: *C. felis orientis*, *C. felis felis* and *C. canis* on dogs and both *C. felis felis* and *C. felis orientis* on cats. Beaucournu *et al* (2001) found *C. felis felis* and *C. felis orientis* on dogs in neighboring Lao PDR. *Ctenocephalides canis* is rarely found on domestic dogs in Thailand (Sangvaranond *et al*, 2000). *Echidnophaga gallinacea* (sticktight flea) was the only ectoparasite found on more than one species of host. This flea is primarily a pest of domestic poultry, but may also parasitize cats, dogs, rabbits and humans (Wall and Shearer, 1997).

Sarataphan *et al* (1998) surveyed ticks in cattle and buffaloes in 25 provinces of Thailand and found the cattle tick, *Rhipicephalis microplus*, was the dominant tick with an extensive distribution. Likewise, a high percentage of cattle were parasitized by this tick species in our survey. *Rhipicephalis sangunieus*, like its namesake (brown dog tick) was found only on dogs.

We report for the first time the presence of *Solenopotes capillatus* (little blue cattle louse) in Thailand. This species is commonly found on cattle in Europe, Australia and in many areas of the eastern and southeastern United States (Matthysse, 1946; Price and Graham, 1997). Sangvaranond (1988) examined lice from domestic cattle and buffaloes located in 18 provinces in central, eastern, northeastern and southern Thailand and identified only three species of sucking lice: *Haematopinus eurysternus*, *Haematopinus quadripertusus* and *Linognathus vituli*, only one of which was found in this study (*L. vituli*, the long-nosed cattle louse). However, we acknowledge that our findings may not represent the full diversity and species dis-

tribution profile of domestic cattle due to the limited number of animals (11) examined.

Menopon gallinae (chicken shaft louse) was the dominant chewing louse on domestic chickens, followed by *Liperus carponis* (chicken wing louse). The flea, *E. gallinacea* and *Goniodes dissimilis* (chicken louse) were also collected from chickens. Sangvaranond (2003) reported that *M. gallinae* is a dominant species in many provinces of Thailand, followed by *L. carponis*. *E. gallinacea* is a common flea of chickens in northeastern Thailand. However, other species of ectoparasites on domesticated chickens were not found in this study compared to Sangvaranond (2003); differences that may likely be attributed to the relatively same sample size and limited geographical range of our study.

The zoonotic potential for disease transmission and infestation (*eg*, dermatitis) by some ectoparasite species are of human public health interest (Marshall, 1981) (Table 2). The cat flea is a known vector of *Rickettsia felis* (Parola *et al*, 2005) and is associated with cat scratch disease caused by *Bartonella henselae*. The common dog tick, *Rhipicephalus sanguineus* is reported to be a vector for *Rickettsia conorii*, an agent of spotted fever rickettsioses in humans (Raoult *et al*, 1997). Other ticks in the area capable of harboring *Ehrlichia* spp, *Anaplasma* spp, and *Rickettsia* spp make it important that these arthropods be controlled (Parola *et al*, 2003).

To prevent economic damage caused by ectoparasitic infestation and transmission of pathogens to domestic animals and humans, veterinarians should advise animal owners to pay closer attention to animal health and welfare and be aware of zoonotic diseases associated with some ectoparasites. A better understanding of the diversity and distribution of ectoparasites on domestic animals in Thailand can help direct efforts to control these parasites.

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