Seasonal Abundance of Tabanidae (Diptera) on Dairy Farms in Saraburi Province, Thailand

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Abstract

Tabanids were collected using Malaise traps from five different dairy farms in Amphur Muaklek of Saraburi Province from June 2008 to October 2009. A total of 215 adult female tabanids belonging to 2 genera and 10 species (*Haematopota glenni*, *H. javana*, *H. pachycera*, *H. singularis*, *H. varifrons*, *Tabanus dorsilinea*, *T. konis*, *T. rubidus*, *T. systenus*, and *T. striatus*) were caught. The most abundant species in this study were *H. pachycera* (35.8%) followed by *H. varifrons* (29.3%) and *T. rubidus* (17.7%). The numbers caught increased with the beginning of the rainy season in March, remained high until September, and declined in the dry season (October to February). Both total numbers caught and species richness peaked in April. No tabanids were caught from November 2008 to January 2009. Rainfall fluctuations may be the main climatic factor correlated with population changes of the most abundant species. Tabanid numbers fluctuate in a similar way between wet and dry seasons as in previous studies in Thailand and South America, and show similar large variation between sites in species present and their relative dominance. The risk of tabanid-borne disease is likely to be higher in the wet season.

Keywords: tabanid, dairy cattle, seasonal abundance, Saraburi Province, Thailand

Introduction

Tabanids (Diptera: Tabanidae) are among the most important blood-sucking pests of humans, cattle and other warm-blooded animals. Females are haematophagous and able to inflict severe bites that cause blood loss and may result in reduced weight gain and milk production. They are intermittent feeders so that blood pathogens may be transmitted from one animal to another by flies that are disturbed while feeding. They play an important role as mechanical and biological vectors of various diseases in parts of the world. Bacteria, rickettsiae, viruses and protozoa can be mechanically transmitted by tabanids, causing such diseases as anthrax, tularemia, anaplasmosis, equine infectious anemia, and trypanosomiasis (Bicout, et al., 2006; Carn, 1996; Enwezor and Sackey, 2005; Franke et al., 1994, Hornok et al., 2008; Krinsky, 1976; Martins et al., 2008). Some species may serve as intermediate hosts of filarial worms (Couvillion et al., 1986; Spratt, 1974)

In Thailand, tabanids are known as vectors of *Trypanosoma evansi,* which causes trypanosomiasis or surra infection in dairy cattle (Kashiwazaki et al., 1998; Pholpark et al., 1999). Clinical signs of this disease including fever, anorexia, weight loss or emaciation, lethargy, abortions, nervous symptoms, and death in some cases, have been observed in cattle, buffaloes and elephants (Chobjit et al., 2006; Hin-on et al., 2005; Kashiwazaki et al., 1998; Rodtian et al., 2005;). Moreover, surra causes

economic losses from reduced weight gain and milk yield, reproductive losses and the cost of treatment. Tabanids are suspected to be the most important mechanical vectors of *T. evansi* in Thailand. For this reason, we need more information about their ecology, including the seasonal patterns in abundance of Tabanid species on Thai dairy farms.

Materials and Methods

This study was conducted on five dairy farms in Amphur Muaklek, Saraburi Province (Figure 1), which has the highest number of dairy farms in the province. This area is located in the central highlands of Thailand, an area of high plains and plateaus about 140 km Northeast of Bangkok. There are three seasons in the year: hot (March to May), rainy (June to October) and dry (November to February). The total annual rainfall in 2008 and 2009 at the Muaklek District Office about 10-20 km from the study sites was 1290 and 1382 mm, respectively (Thai Meteorological Department, unpublished data). Temperature and relative humidity informations are not available.

The flies were caught using Malaise traps from June 2008 to October 2009. The traps used were about 175 cm. high at the front peak, 109 cm. high at the back, about 175 cm. long and 109 cm. wide. The traps were installed about a meter from the cattle pen. Each month, one Malaise trap was set up at each of the five farms and left for one week. 80% ethanol was used as killing agent. After each trapping period, the collected insects were transported to the Parasitology Laboratory, Faculty of Veterinary Medicine, Kasetsart University where they were separated, pinned, counted. Tabanids were identified using the taxonomic keys by Burton (1978) and Stone and Philip (1974), and specimens identified by J.J.S. Burton. Voucher specimens are deposited in the Department of Parasitology, Faculty of Veterinary Medicine, Kasetsart University.

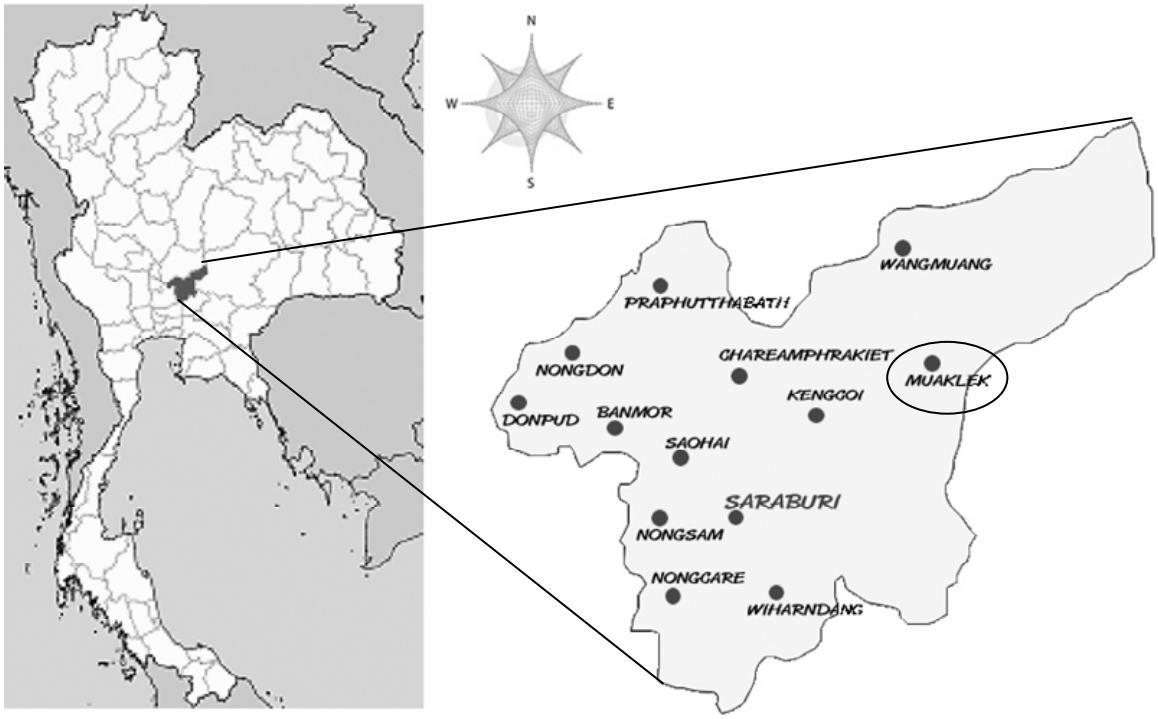

Figure 1 Location of Amphur Muaklek (study area) in Saraburi Province, Thailand.

Results

A total of 215 adult female tabanids comprising 10 species belonging to 2 genera were caught using the Malaise traps (Table 1). The genus *Haematopota* Meigen was represented by 5 species and 151 individuals and was collected on four farms. *Tabanus* Linnaeus was represented by 5 species and 64 individuals and was found on all farms. The most abundant species in this study were *Haematopota pachycera* Bigot (35.8%) followed by *Haematopota varifrons* Stone & Philip (29.3%) and *Tabanus rubidus* Wiedemann (17.7%). Two species, *Haematopota javana* Wiedemann and *Tabanus dorsilinea* Wiedemann were represented only by single specimens. The total tabanid population increased in number correlated with the beginning of rainfall in February and declined in the dry season (Figure 2). In 2009, a population peak occurred in April (80 individuals), which was also the month with the highest number of species (7 species). Tabanids were most common during the rainy season, and gradually decreased in number toward October 2009 (Figure 2). No tabanids were caught from November 2008 through January 2009. During this period the only month with any rain was November.

Of the most abundant species, *H. pachycera* was found on four farms and was most abundant in August 2009 (Figure 3). *H. varifrons* was found on three farms but was only collected in April, and 94% of individuals were collected on Farm 5. *T. rubidus* was found on four of the five farms and peaked in July 2009. A maximum of seven species was found on a single farm (Farm 5) out of the total of 10 species collected. All tabanid species of this study are presented in Figures 4 and 5.

Discussion

The abundance of tabanid populations is influenced by meteorological conditions, especially temperature, relative humidity and the beginning of the rainy season (e.g. Ito et al., 1999; Barros, 2001; Parra et al., 2008). In general, tabanid populations are highest when the temperature is high and during the rainy season. However, there may be a seasonal succession of the more abundant species, with different species peaking at different times of the year (Barros, 2001). In Thailand, in the province of Pathum Thani, adjoining Saraburi, Ito et al. (1999) found an increase in the number of adult flies at the beginning of the rainy season, high numbers during the rainy season from April to September, and a

Table 1 Species and relative abundance (RA) and distribution of tabanids in five collecting farms in Amphur Muaklek, Saraburi Province, Thailand from June 2008 to October 2009.

Species	Farm					Total	RA (%)
	1	2	3	4	5		
Haematopota pachycera Bigot	54	5	0	7	11	77	35.8
Haematopota glenni Philip	0	0	0	0	6	6	2.8
Haematopota javana Wiedemann	1	0	0	0	0	1	0.5
Haematopota varifrons Stone & Philip	1	3	0	0	59	63	29.3
Haematopota singularis Ricardo	0	1	0	1	2	4	1.9
Tabanus dorsilinea Wiedemann	0	0	0	1	0	1	0.5
Tabanus rubidus Wiedemann	11	0	4	10	13	38	17.7
Tabanus systenus Burton	0	2	6	0	7	15	7.0
Tabanus striatus Fabricius	0	2	1	3	1	7	3.3
Tabanus konis Philip	0	2	1	0	0	3	1.4
Total	67	15	12	22	99	215	100.0
No. of species collected	4	6	4	5	7		

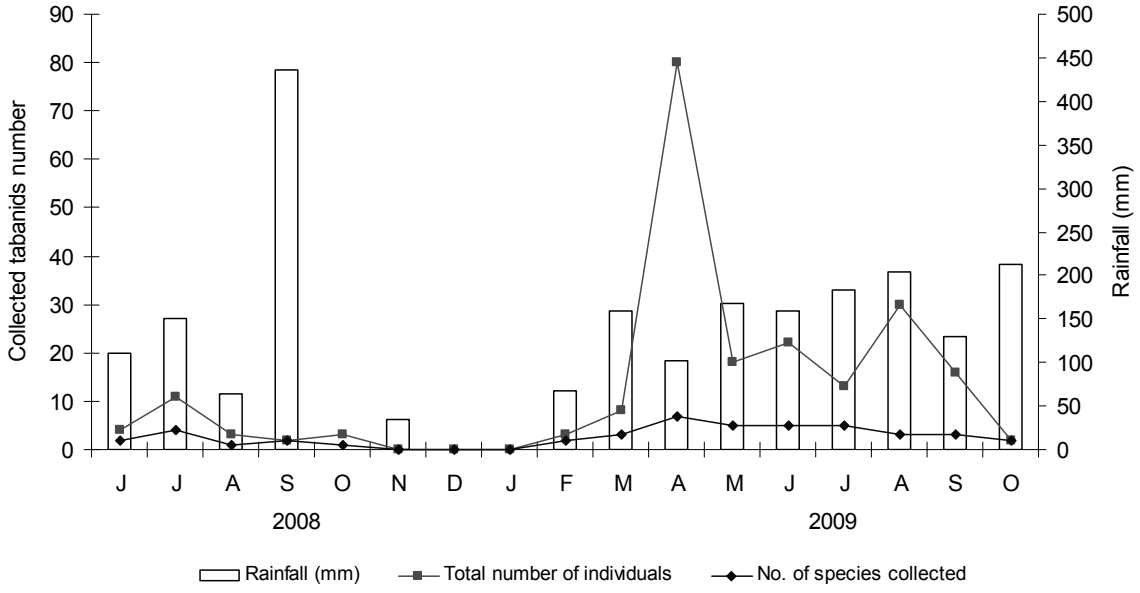

Figure 2 Monthly rainfall and seasonal abundance of Tabanidae from dairy farms in Amphur Muaklek, Saraburi Province, Thailand from June 2008 to October 2009.

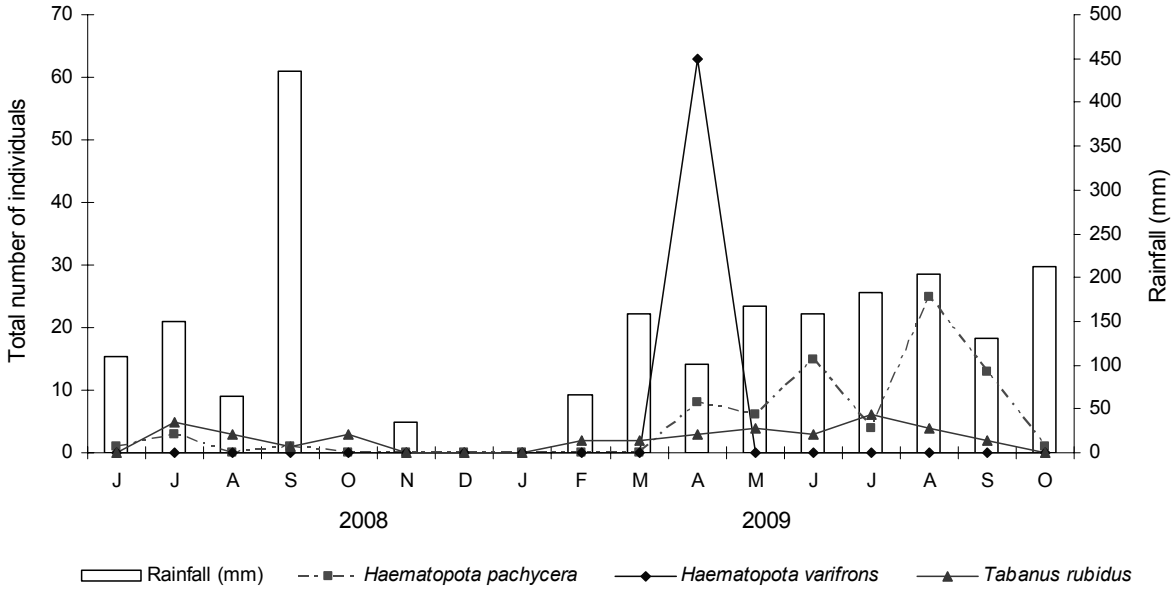

Figure 3 Monthly rainfall and seasonal abundance of H. pachycera, H. varifrons and T.rubidus from dairy farms in Amphur Muaklek, Saraburi Province, Thailand from June 2008 to October 2009.

decline in the dry season. The present study showed a fly population peak occurred suddenly in April after the beginning of the rains in March. However, this peak was primarily the result of the capture of large numbers of one species, *H. varifrons*, on one farm, Farm 5. The situation of this farm close to a mountain differs from the other farms. It is possible that *H. varifrons* has different ecological requirements from other species collected, but we have no information on this. Tabanid populations remained relatively high from April through September 2009, and similar numbers of species were collected in each month (Figure 2). The absence of tabanids from November 2008 through

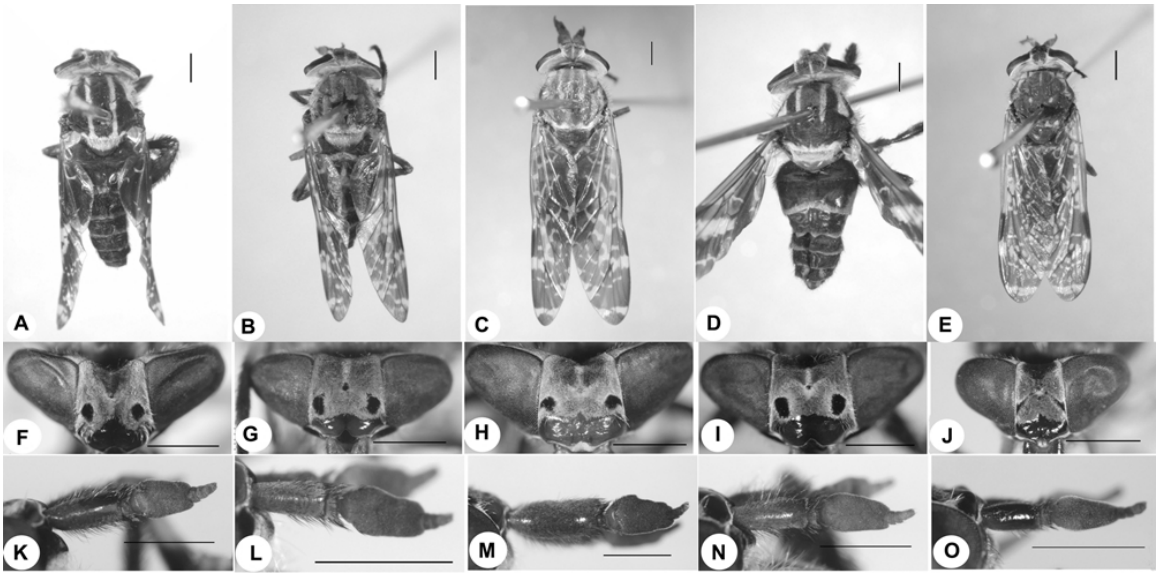

Figure 4 Females of the genus *Haematopota* Meigen from dairy farms in Amphur Muaklek, Saraburi Province, Thailand, *H. glenni* (A, F and K), *H. javana* (B, G and L), *H. pachycera* (C, H and M), *H. singularis* (D, I and N) and *H. varifrons* (E, J and O); body, head and antenna, respectively. Scale bar, 1 mm.

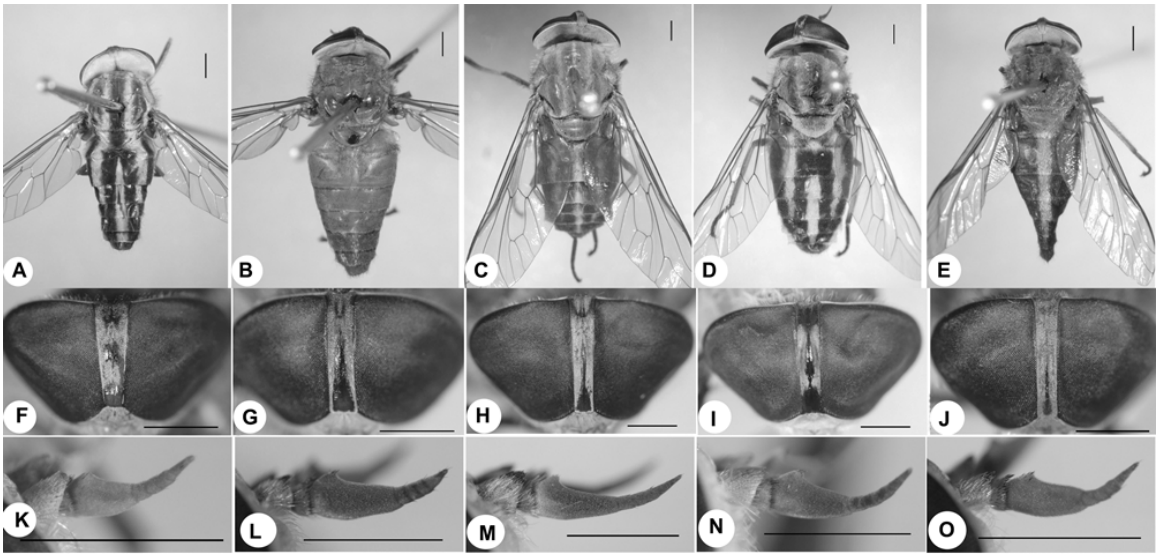

Figure 5 Females of the genus *Tabanus* Linnaeus from dairy farms in Amphur Muaklek, Saraburi Province, Thailand, *T. dorsilinea* (A, F and K), *T. konis* (B, G and L), *T. rubidus* (C, H and M), *T. striatus* (D, I and N) and *T. systenus* (E, J and O); body, head and antenna, respectively. Scale bar, 1 mm.

January 2009 is probably related to the drier conditions and lower temperatures during the winter months (Barros, 2001; Ito et al., 1999), but further studies are needed.

The high abundance of tabanid species during the rainy season (April through September), increases their potential importance as mechanical vectors of *Trypanosoma evansi* infection. Kashiwazaki et al. (1998) found high infection rates of cattle by *T. evansi* during the wet season in Loei Province in Northeast Thailand. The resultant reduced milk production and abortion (especially late abortion) of dairy cattle can be economically important to farmers, such as those in the present study, with small numbers of cattle (Kashiwazaki et al., 1998; Pholpark et al., 1999). We suggest that the reduction of tabanid populations to a low level during the rainy season would decrease the risk of trypanosome infection in cattle in Thailand. However, this will require measures that are

targeted at a wide range of tabanid species. Because they are mechanical vectors of *T. evansi*, the importance of particular species of tabanid as vectors is likely to be related to their relative abundance at a particular site and time of year. The results of the present study indicate that there is high variation in tabanid species present and in numbers of individual species in space and time.

In Muaklek district where the present study was carried out, five species of *Tabanus* had previously been recorded (*T. birmanicus* (Bigot), *T. brunnipennis* Ricardo, *T. konis* Philip, *T. praematurus* Austen, *T. striatus* F.) (Burton, 1978; Tumrasvin, 1989). Only two of these species (*T. konis* and *T. striatus*) were found in the present study, and only in small numbers (Table 1). Instead, *T. rubidus* Wiedemann was much more abundant. Table 1 also clearly shows that there is considerable variation between farms within Muaklek district in the species present and the relative abundance of these species. There are usually one or two species dominating the catch at a particular farm, but the species involved tend to differ between farms. The differences in farm practice among the farms are not obviously related to the observed variation. Other studies (e.g. Ito et al. (1999) in Thailand, and Barros (2001), and Parra et al. (2008) in Brazil and Colombia respectively) have given similar results. It appears that tabanid numbers fluctuate in a similar way between wet and dry seasons in both Thailand and tropical South America. The large variation among sites in tabanid species present and their relative dominance is also observed in both continents. Far more needs to be discovered about the ecology of particular tabanid species and the reasons for the observed variation in space and time.

Acknowledgments

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