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Seasonal abundance of horse flies (Diptera: Tabanidae) and stable fly (Diptera:Muscidae) collected by Nzi trap within Taw Area, Myanmar

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Abstract

Blood sucking flies are vectors of medical and veterinary importance. Within Nay Pyi Taw area, a longitudinal study was conducted to collect blood sucking fly samples between January and December, 2011. A total of 2,717 fly samples including 1,506 samples of blood sucking flies and 1,211 samples of non blood sucking flies were collected throughout a year. Collected blood sucking flies were *Stomoxys* spp. (76%), *Tabanus* spp. (23.4%), *Haematopota* spp. (0.3%) and *Chrysops* spp. (0.3%). The number of blood sucking flies peaked in October in winter (dry) season. Among the collected flies, *Stomoxys* spp. was found with the highest population in rainy and winter seasons. However, in the summer season, the number of *Tabanus* spp. was found the highest population. *Haematopota* and *Chrysops* spp. were observed only in rainy and winter season. No significant relationship was observed between the number of blood sucking flies and meteorological data such as monthly temperature and monthly rainfall during the study period. This is the first report on seasonal abundance of Tabanidae and *Stomoxys* flies in Myanmar.

Keywords: seasonal abundance, Tabanidae, *Stomoxys*, Nay Pyi Taw, Nzi trap

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Introduction

Blood sucking insects are important for medical and veterinary science because they can act as the vectors of many of the most debilitating diseases of humans and domesticated animals. In addition, they are of considerable direct cost to the agricultural industry through losses in milk and meat yields, and through damage to hides, wool and transmission of many pathogens to humans and animals (*Loa loa*, *Francisella tularensis* to humans, anthrax, infectious equine anemia, bovine virus, diarrhoea virus and surra to animals). Moreover, blood sucking flies can act as mechanical vectors of diseases associated with viruses causing equine infectious anemia, bovine leukosis, vesicular stomatitis, hog cholera etc, bacteria of anthrax, tularemia, and trypanosomes causing surra. (Wall and Shearer, 2001; Gillott, 2005).

The Tabanidae is one of the largest families of Diptera, containing estimated 8,000 species divided into 30 genera, only three of which: *Tabanus* (horse flies), *Haematopota* and *Chrysops* (deer flies) are of major veterinary importance in temperate habitats (Wall and Shearer, 2001). Moreover, the bloodsuckers belong to only the above three genera, whose evolution has closely followed that of the hoofed mammals (Gillott, 2005). In temperate areas, adult tabanids are primarily nuisance pests of humans (Mullens, 2002).

The Muscidae is the second largest of the calypterate families, with about 4,000 species. The family contains a number of subfamilies and genera of veterinary importance, notably the genera *Hydrotaea*, *Musca*, *Stomoxys* and

Haematobia. Species of the later two genera are blood-feeders and together form the subfamily *Stomoxyinae* (Wall and Shearer, 2001). Muscid flies are annoying livestock especially during the summer or rainy season in Germany (Kaufmann, 1996).

Numerous studies have investigated the effects of meteorological factors on seasonal abundance of tabanids in Japan (Inaoka, 1971), Croatia (McElligott and Galloway, 1991; Krčmar, 2005), Nigeria (Ahmed et al., 2005; Oku et al., 2011), Thailand (Muenworn et al., 2010; Changbunjong et al., 2012; Phasuk et al., 2013), and Australia (Hennekeler et al., 2011). In the USA, approximately 50% of the estimated annual loss in cattle production from all categories of livestock pests can be attributed to biting flies (Wall and Shearer, 2001). In Sudan, the economic impact of tabanids is particularly important where tabanids emerge in extremely high numbers during the rainy season (Mohamed-Ahmed et al., 2007).

In Myanmar, livestock production is important not only as an agricultural production but also as integrated farming. Thus it is necessary to keep these animals healthy and produce good products. In Myanmar, relatively little is known about distribution and effects of meteorological factors on seasonal incidence of blood sucking flies and it has not been investigated yet. It is essential to investigate the seasonal incidence of blood sucking flies in cattle production in order to effectively control diseases due to flies and hence for improvement of livestock production. Therefore, the objective of this study was to investigate the seasonal incidence and the effects of meteorological factors on the abundance of blood sucking flies in Nay Pyi Taw area, Myanmar.

Materials and methods

Study sites, sample collection and preparation of Nzi trap

A longitudinal study was employed to collect flies sample between January and December, 2011. This study was carried out in three different locations (A, B and C) in Nay Pyi Taw area (between latitude 19˚ 45'N and longitude 96˚ 6'E). This area has an elevation of 115m above sea level, has annual rainfall about 115mm and annual temperature about 21.2 - 32.5˚C. Location A was situated near by a small holder cattle farm, Yezin village, location B was Model Livestock zone, Shwe Myo and location C was nearby a small holder cattle farm, Ywadaw village (Fig. 1).

In each study location, fly samples were collected by using Nzi trap deployed for three consecutive days and performed twice a month across the year. All flies samples were labeled separately by location and date. Those samples were carried to the laboratory of Pharmacology and Parasitology Department, University of Veterinary Science, Yezin, Nay Pyi Taw and killed by ethyl acetate. Their number was counted, recorded and preserved in bottle using 70% ethanol. Then the bottles were labeled with the site of collection, date of collection, trap number etc. Identification of genera was based on morphology of flies as described by Walker (1994), Kaufmann (1996), Wall and Shearer (2001), Mullens (2002) and Capinera (2008) .

Fig. 1. Location of study area; Yezin (A), Shwe Myo (B), Ywadaw (C) and Nzi trap.

Nzi trap was used for fly trapping (Fig. 1). It is a triangular shape with dimensions of 90 cm to a side. The portion under the netting cone is all black. The body is closed by a blue top front shelf, providing a 90×45 cm bottom front entrance. The front entrance is flanked by two blue 'wings', each is 45 cm wide (Mihok, 2002). Meteorological data of monthly rainfall and monthly temperature for the study period was collected from Yezin, Nay Pyi Taw meteorological station.

Statistical analysis

All data were entered and stored in a computerized database using Microsoft Excel and the Statistical Package for Social Science (SPSS) version 16.0. Seasonal and monthly abundance of blood sucking flies were tested by ANOVA 'F' test. Relationship between meteorological data of monthly temperature and monthly rainfall and number of blood sucking flies were examined by using Simple Linear Regression analysis. All the analyses were performed at significance level of 0.05.

Results and Discussion

Among the total of 2,717 fly samples collected throughout the year, 1,506 flies were observed as blood sucking flies which were *Stomoxys, Tabanus, Haematopota* and *Chrysops* spp. (Fig. 2).

The remainings were *Musca domestica*, non blood sucking fly. According to ANOVA 'F' test, the trapped number of *Stomoxys* spp. was found to be the highest among blood sucking fly species ($p<0.05$) followed by *Tabanus*, *Haematopota* and *Chrysops* spp. However, the later three species were not significantly different ($p>0.05$) in number among the trapped flies although *Haematopota* spp. and *Chrysops* spp. were found as the lowest number. Number and percentage of blood sucking flies are described in Table 1 and Fig. 3A.

The highest number of blood sucking flies was observed in October among the months. When the numbers of blood sucking flies were compared among the three seasons; winter (dry) (October-January), summer (hot) (February-May) and rainy (June-September) no significant difference ($p>0.05$) was observed. However, fly number was numerically highest in winter (701) followed by rainy (657) and summer (148) (Fig. 3B).

According to the Simple Linear Regression analysis, there was no significant relationship ($p>0.05$) between monthly temperature and monthly rainfall and number of blood sucking flies throughout the year (Fig. 4A and 4B).

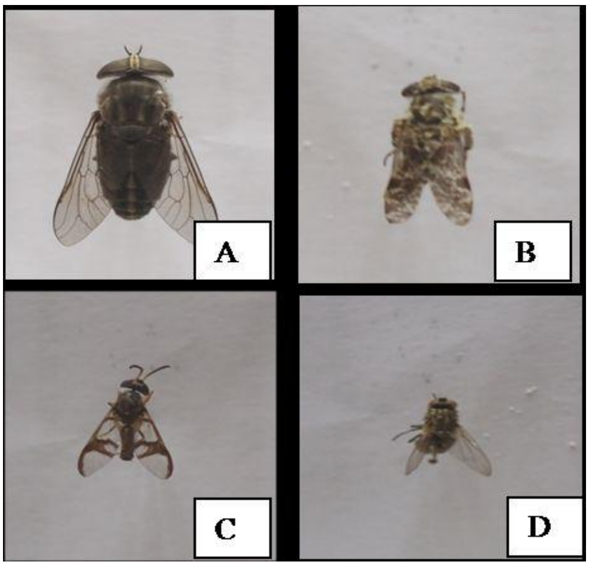
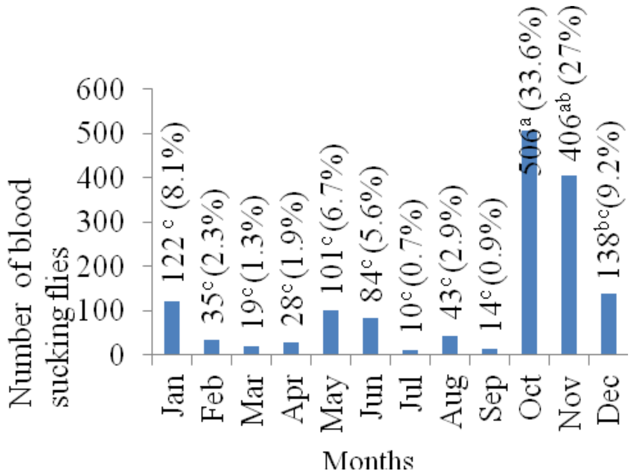
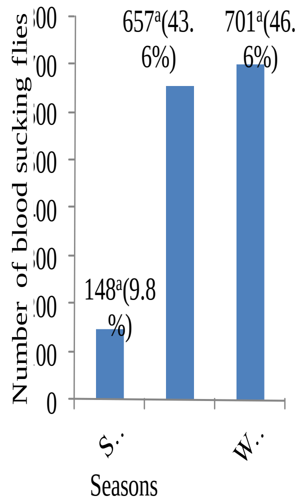


Fig. 2. Collected fly samples, *Tabanus* spp. (A),*Haematopota* spp. (B), *Chrysops* spp. (C) and *Stomoxys* spp. (D).

No.	Species	Number of flies	Percentage (%)
1	*Stomoxys*	1,144^{a}	76.0
2	*Tabanus*	352^{b}	23.4
3	*Haematopota*	5^{b}	0.3
4	*Chrysops*	5^{b}	0.3



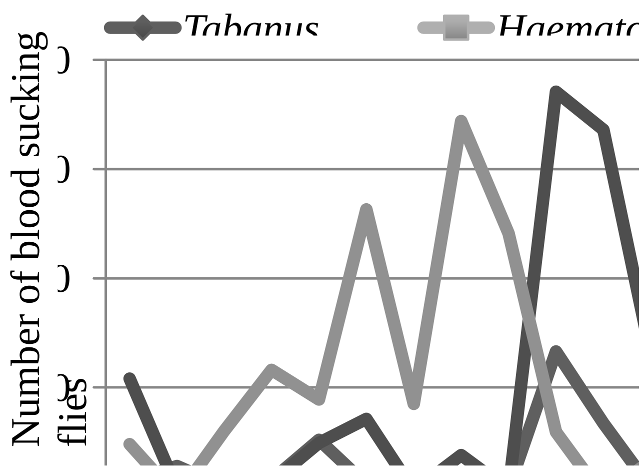
a



b

$^{a, b}$ = indication of significantly different mean values at $p<0.05$

Fig. 3 Blood sucking flies captured in each month (A) and captured in each season (B) between January and December, 2011.



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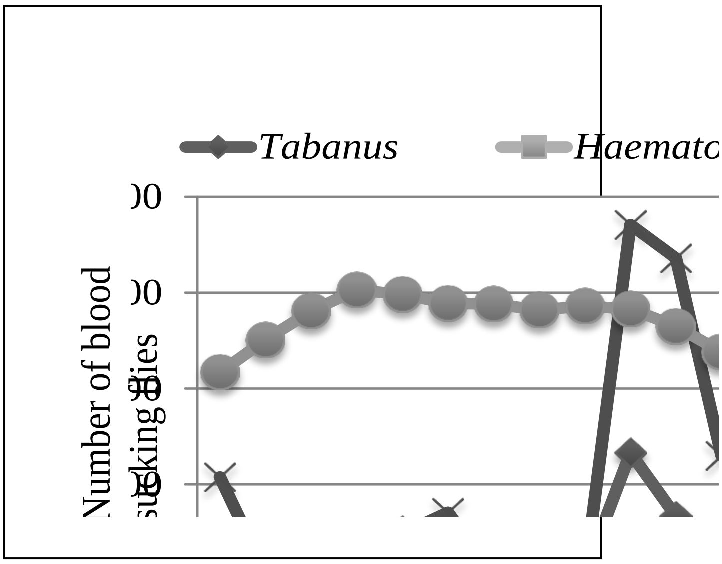

b

Fig. 4. Seasonal distribution of blood sucking flies in relation to Temperature (A) and Rainfall (B).

In this study, Nzi trap with attractant (dry ice) was used to collect blood sucking flies. Four species of blood sucking flies could be trapped over a year. Among those species, *Stomoxys* spp. was observed as the highest number (76%) in the study area. Thus, the result of this study was similar with the findings of Ahmed *et al.* (2005) who reported that *Stomoxys* was the most abundant occurring flies with large numbers throughout the year in Nigeria.

Therefore, it could be suggested that most abundance of *Stomoxys* spp. in the present study might relate its pattern of life cycle. Life cycle of *Stomoxys* usually complete within short period and takes 3-7 weeks which may vary according to different temperature while tabanids take 3 months to 2-3 years to complete their life cycle. Thus, the number of *Stomoxys* appeared highest among the observed fly species in this study.

The highest number of *Stomoxys* spp. was collected in winter season although not statistically different among the three seasons. *Stomoxys* numbers collected in the rainy season was not much different with that of winter season and the lowest number was observed in summer season. The similar findings were noted by Gilles et al. (2008) in tropical Reunion Island and Torr and Mangwiro (2000) in Zimbabwe. Masmeatathip et al. (2006) also stated that the peak density of *Stomoxys* spp. found in a wet season was associated with rainfall in Thailand. However, in the present study, no relationship between the monthly rainfall and flies number was observed. Similar results were reported by Muenworn et al. (2010) that although *Stomoxys* spp. was more abundant during the rainy season, it was not associated with the total rainfall.

Common sites of *Stomoxys* are straw, manure piles and moist decaying feed or silage. In this present study, it could be generally assumed that rainfall might support the favourable conditions of breeding places of *Stomoxys*. Moreover, flies number in rainy season was not much different with winter in the present study. Thus, it could also be suggested that relatively abundance of *Stomoxys* spp. in rainy season might be due to high humidity during the rainy season (Cruz-Vazquez et al., 2004; Changbunjong et al., 2012; Phasuk et al., 2013).

The total number of *Stomoxys* was observed highest in winter (21.7˚C - 26.5˚C) season followed by rainy (28.2˚C - 28.9˚C) and summer seasons (28.1˚C - 30.3˚C). Gerry et al. (2007) reported that *Stomoxys* spp. was most active at the temperature of (20˚C - 27˚C), and usually look for food and for location to lay their eggs once they warm up. In the present study, although there was no correlation between monthly temperature and number of *Stomoxys*, winter season appeared to be the most suitable temperature for breeding of *Stomoxys* flies and thus observed highest number of these flies in winter. Lysyk (1998) also pointed that at the temperature above 30˚C, flies especially *Stomoxys* have very poor survival rate. In the summer season of the present study, *Stomoxys* flies were observed as lowest population in comparison with rainy and winter seasons. So, it could be suggested that the abundance of *Stomoxys* flies might partially relate to monthly temperature and rainfall although no statistical relationship was noted.

Among the trapped blood sucking flies in this study, *Tabanus* spp. was found as the second highest abundant species. Thus, the number of *Tabanus* flies was lower than that of *Stomoxys* which takes only 3-7 weeks for its life cycle. Moreover, it was noted that *Tabanus* flies were most abundant in summer season among the four fly species. This result was similar with the study of Chvala et al. (1972) who stated that tabanids were more abundant during the summer season having monthly temperature of 27˚C in Croatia, because *Tabanus* flies were active in sunlight. In this study, although monthly temperature was observed no correlation with *Tabanus* spp. according to Simple Linear Regression analysis, the monthly temperature in summer season was highest among the three seasons.

When considered as individual fly species, the trapped number of *Tabanus* flies was comparatively higher in rainy season than other seasons. These results correspond with those of Service (2001) and Mohamed-Ahmed et al. (2007), who stated that in the tropics, fly populations often reach a peak towards the beginning of the rainy seasons, decreasing in population in the dry seasons, but often not completely disappearing.

In this study area, the monthly temperature in rainy season was not much different with that of summer season. Moreover, monthly rainfall was the highest in rainy season among the three seasons. Although there was not possible to detect any correlation between climatic factor and the population, the climatic factor might favour increased breeding and survival rate of *Tabanus* flies in rainy season. Moreover, *Tabanus* spp. was found highest in October and lowest in August. It could be considered that monthly temperature and monthly rainfall in October might favour the breeding conditions of *Tabanus* spp. In August, monthly rainfall was highest. Although rainfall is one of the factor for increasing population of flies, the possible reason for relatively lower number in August might be due to high rainfall that immature stages of *Stomoxys* (eggs and larvae) are highly sensitive to the following environmental conditions such as humidity and rainfall to survive and successfully develop to pupae and adults (Skoda et al., 1991; Cruz-Vazquez et al., 2004).

As reported by Mikuska et al. (2008), *Haematopota* and *Chrysops* were observed as lowest number in comparison with *Tabanus* flies. Therefore, it could be considered that some diseases mechanically transmitted by *Chrysops* such as loasis and tularemia which have not been reported yet in Myanmar might be due to low presence of these two flies.

Conclusions

The impact of flies can lead to zoonoses as well as economic losses for farmers. Thus, further study such as survey and molecular identification of pathogens carried by the flies should be performed in all parts of Myanmar. In addition, proper strategies should be designed and implemented to minimise their effect on livestock production. In conclusion, this study provides information about seasonal abundance of blood sucking flies which might be very useful for their control and further investigations in Myanmar.

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References

Ahmed AB, Okiwelu SN and Samdi SM (2005). Species diversity, abundance and seasonal occurrence of some biting flies in Southern Kaduna, Nigeria. Afr. J. Biomed. Res. 8:113-118.

Capinera JL (2008). Horse Flies and Deer Flies (Diptera: Tabanidae). In: Encyclopedia of Entomology, 2nd ed. Springer science, United States of America. pp. 1856-1859.

Changbunjong T, Weluwanarak T, Ratanakorn P, Maneeon P et al. (2012). Distribution and abundance of Stomoxyini flies (Diptera: Muscidae) in Thailand. Southeast Asian J. Trop. Med. Public Health 43:1400-1410.

Chavala M, Lyneborg L and Moucha J (1972). The horse flies of Europe's (Diptera: Tabanidae). Entomological Society of Copenhagen, Copenhagen, pp. 499.

Cruz-Vazquez C, Mendoza IV, Parra MR, Garca-Vazquez Z (2004). Influence of temperature, humidity and rainfall on field population trend of *Stomoxys calcitrans* (Diptera: Muscidae) in a semiarid climate in Mexico. Parasitologia Latinoamericana 59: 99-103.

Gerry AC, Peterson NG and Mullens BA (2007). Predicting and controlling stable flies on California dairies. ANR Publication 8258. University of California Agriculture and Natural Resources Communication Services, Oakland.

Gilles J, David JF, Duvallet G and Tillard E (2008). Potential impacts of climate change on stable flies, investigated along an altitudinal gradient. Med. Vet. Entomol. 22: 74-81.

Gillott C (2005). The panorpoid orders. In: Entomology 3rd ed. Springer. Netherland. pp. 239-286.

Hennekeler KV, Jones RE, Skerratt LF, Muzari MO et al. (2011). Meteorological effects on the daily activity patterns of tabanid biting flies in northern Queensland, Australia. Med. Vet. Entomol. 25: 17-24.

Inaoka T (1971). Daily and seasonal fluctuations of blood sucking activity of Horse-flies in Sapporo, Hokkaido. Journal of Faculty of Science. Hokkaido University Series VI Zoology. 18: 155-172.

Kaufmann J (1996). Tabanidae and Muscidae. In: Parasitic Infections of Domestic Animals. Birkhauser Verlag, Germany. pp. 132-134.

Krčmar S (2005) Seasonal abundance of horse flies (Diptera: Tabanidae) from two locations in eastern Croatia. J. Vector Ecol. 30: 316-321.

Lysyk TJ (1998). Relationship between temperature and life history parameters of *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 35: 107-119.

Masmeatathip R, Gilles J, Ketavan C and Duballet G (2006): First survey of seasonal abundance and daily activity of *Stomoxys* spp. (Diptera: Muscidae) in Kamphaengsaen Campus, Nakornpathom Province, Thailand. Parasite. 13: 245-250.

McElligott PEK and Galloway TD (1991). Seasonal distribution and parity of host-seeking horse flies (Diptera: Tabanidae) from a pasture near seven sisters, Manitoba. Can. Entomol. 123: 361-370.

Mihok S (2002). The development of a multipurpose trap (the Nzi) for tsetse and other biting flies. B. Entomol. Res. 92: 385-403.

Mikuska A, Krčmar S and Mikuska J (2008). Horse flies (Tabanidae) of Bosnia and Herzegovina. J. Vector Ecol. 33: 365-369.

Mohamed-Ahmed MM, Abdulla MA, Mohamed YO, El Rayah IE et al. (2007). Trapability of periurban populations of horse flies (Diptera: Tabanidae) in Khartoum State, Sudan. J. Sci. Technol. 8: 46-63.

Muenworn V, Duvallet G, Thainchum K, Tuntakom S et al. (2010). Geographic distribution of Stomoxynae flies (Diptera: Muscidae) and diurnal activity of *Stomoxys calcitrans* in Thailand. J. Med. Entomol. 47: 791-797.

Mullens BA (2002). Horse flies and Deer flies (Tabanidae). In: Medical and Veterinary Entomology, Eds. GR Mullen and LA Durden Elsevier, United States of America. pp. 263-277.

Oku EE, Ukeh DA and Dada NE (2011): Prevalence and seasonal distribution of daytime biting Diptera in Rhoko Forest in Akamkpa, Cross River State, Nigeria. Int. J. Zool. Res. 7: 279-285.

Phasuk J, Prabaripai A and Chareonviriyaphap T (2013). Seasonality and daily flight activity of stable flies (Diptera: Muscidae) on dairy farms in Saraburi Province, Thailand. Parasite 20: 17.

Service MW (2001) Horse flies (Tabanidae). In: Encyclopedia of Arthropod transmitted infections of man and domesticated animals. CAB International. UK. pp. 224-225.

Skoda SR, Thomas GD, Campbell JB (1991). Developmental sites and relative abundance of immature stages of the stable fly (Diptera:Muscidae) in beef cattle feedlot pens in eastern Nebraska. J. Econ. Entomol. 84:191-197.

Torr SJ and Mangwiro TNC (2000). Interactions between cattle and biting flies effects on the feeding rates of tsetse. Med. Vet. Entomol. 14: 400-409.

Walker A (1994). Flies-Diptera. In: Arthropods of humans and domestic animals. 1st ed. (Eds. R.P. Lane and R.W. Crosskey). St Edmundsbury Press. Great Britain. pp. 53-129.

Wall R and Shearer D (2001). Adult flies (Diptera). In: Veterinary Ectoparasites: Biology, Pathology and Control. 2nd ed. Iowa State University Press. Blackwell science Ltd. pp. 83-112.

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