Original Research Article

Species Composition and Diurnal Activity Rhythm of Tabanids (Diptera: Tabanidae) at the Ivindo National Park and its Environs

ABSTRACT

An entomological prospection to show the species composition and diurnal activity of tabanids was carried out using 15 Vavoua traps, during the rainy season (25th Sept-5th Oct to 21st Oct-9th Nov 2018), in the secondary forest [Ivindo National Park (INP)] and Village-Town sites in and around the biosphere reserve Ipassa-IRET Makokou in Gabon. In total, 839 tabanids were caught with 747 recorded at INP and regrouped under 11 species of the genus *Tabanus* [*T. taeniola* (57.76%), *T. ricardae* (26.32%), *T. par* (5.54%), *T. ruficrus* (3.74%), *T. socius* (3.74%), *T. marmorosus* (0.28%), *T. obscurehirtus* (0.14%), *T. disjunctus* (0.00024%)]. However, two species of the genus *Chrysops* [*C. dimidiatus* (70.83%) and *C. silaceus* (29.17%)] and one species of the genus *Haematopota* [*H. pluvialis* (100%)] were only identified at INP. While in the Village-Town sites, 92 tabanids were caught and regrouped under five species of the genus *Tabanus* [*T. ruficrus* (14.13%), *T. taeniola* (9.78%), *T. ricardae* (73.91%), *T. par* (1.09%), and *T. marmorosus* (1.09%)]. Tabanids were more abundant in the forest (7.12 t/t/d) as compared to the Village-Town (0.77 t/t/d) with a statistically significant difference ($P<0.05$). At INP, tabanids showed a unimodal activity pattern with peak attained between 12h-14H and in the anthropized milieu (14h-16h) and dominated by females.

Keywords: Hematophagous flies; park, reserve; Vavoua traps; biotope; rainy season; Gabon.

1. INTRODUCTION

1.1 Background

Tabanids represent a large group of dipterous insects with 4400 species regrouped under 144 genera [1]. Tabanids are a neglected subject of research but are vectors of pathogens of medical and veterinary importance [1,2]. Tabanids are known mechanical vectors of animal *Trypanosoma* spp., like *T. vivax*, *T. theileri* etc. [3] as well as biological vectors (*C. silacea* and *C. dimidiata*) of *Loa loa* filariasis [4,5,6].

In Gabon, there is no longitudinal study on tabanids, but the few existing reports on this group are cross sectional studies carried out in some protected areas and their environs [7, 8, 9, 110, 11].

The biting activity pattern of tabanids have been established for forest and savanna groups [5, 12]. The activity patterns vary with conditions of micro-environment across seasons with activity peaks ranging from unimodal, bimodal, trimodal etc [1, 5]. However, no information exists on the activity rhythm of tabanids with respect to sex at the Ivindo National Park (INP) and its environs. The present entomological prospection aims at determining the abundance and diurnal activity profile with respect to sex of tabanids at the Ivindo National Park and its surrounding.

2. MATERIALS AND METHODS

2.1 Study area

The study was carried out in Makokou, located in the Ogooué-Ivindo province in North-East Gabon. Trapping was carried out at the Institute of Research for Tropical Ecology (IRET) of Ipassa (0°.51'N; 12° 79'E) and its environs (0°.52'N; 12° 82'E) (Figure 1), elevated at an altitude of 500m [13].The climate is of the equatorial and humid type with alternating rainy and dry seasons. The mean annual rainfall is 1 600 to 1 800 mm while the mean annual temperatures are close to 24°C. The annual and daily themal amplitudes are weak [7] and the main water body in the area is river Ivindo. The entomological prospection was carried out during the rainy season (25th Sept-5th Oct to 21st Oct-9th Nov 2018). The forest fauna of Gabon is rich and diversified and the Makokou region holds a significant share with one of the highest listed fauna in Gabon. It consists of 128 species of mammals, 424 species of birds, 65 species of reptiles, 47 species of amphibians among others [7].

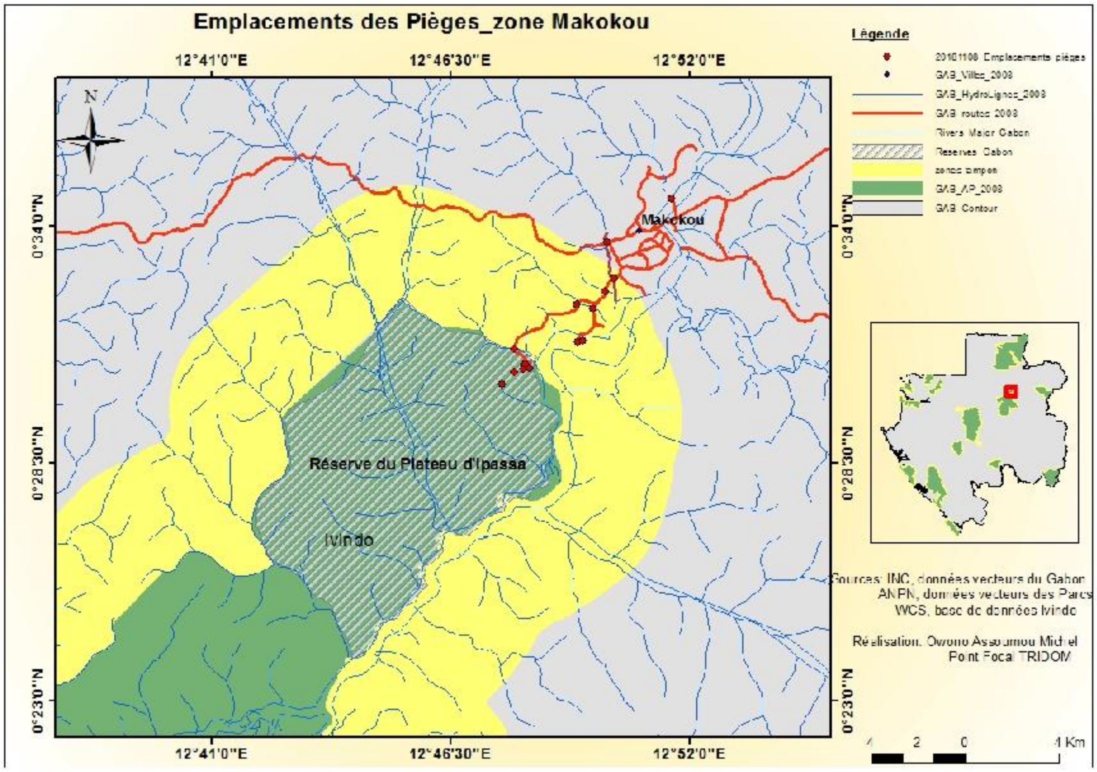

Figure 1. Map of the study site showing the position of traps (red circles)

2.2 Capture of tabanids

Trapping was carried out using 15 Vavoua traps [14]. Vavoua traps have been reported to be efficient in the collection of tabanids [15]. Traps were set along a transect of about 17 km, following the anthropogenic gradient from the secondary forest in the INP (non-anthropized environment), to the Village and Makokou town (highly anthropized environment). Trapping duration was three months (25th Sept-5th Oct to 21st Oct-9th Nov 2018). The 15 traps were divided into the two study areas, at a ratio of 7-8 traps per milieu. Trapping effort was: 15 traps × 30 days = 450 traps days. The traps were activated in the morning at 8 am and emptied at 6 pm. All trap cages were tagged with the trap number and date and returned to the laboratory. They were then placed in a freezer for 15 minutes to kill the insect prior identification. Identification was carried out using the dissecting microscope (LABOMED®, France) of the field station laboratory of IRET-Ipassa in Makokou.

2.3 Daily activity Rhythm

The diurnal activity pattern of tabanids in the study area was carried out using three traps in each of the prospection sites for three days consecutively during prospection days. The follow-up diurnal time ranges for this trial was 8-10H, 10-12H, 12-14H, 14-16H and 16-18H. Trap-tags consisted of date, location and time interval.

2.4 Fly identification

The identification of tabanids was carried out using the identification key of Oldroyd [16].

The abundance was defined by the Trap Apparent Density (ADT) known as the number of tabanids caught per trap and day:

$$ADT = \frac{\text{Number of tabanids flie captured}}{\text{Number of traps} \times \text{Number of trapping days}}$$

2.5 Data analysis

The statistical analysis was carried out using SPSS version 20. The one-way ANOVA on ranks was used to compare the ADT in the two prospection biotopes. The level significance was set at $P<0.05$.

3. RESULTS

3.1 The species composition of tabanids with respected to prospection site

In total, 839 tabanids were caught with 747 collected at the INP which consisted of 11 species regrouped under three genera notably *Tabanus*, *Chrysops* and *Haematopota*. At the INP, *Tabanus taeniola* was the most frequent species while *Tabanus obscurehirtus* and *H. pluvialis* were very rare (Table 1). At the Village-Town trap-sites, only 92 tabanids were caught and five species identified and all belonged to the genus *Tabanus* (Table 1). In the Village-Town trap-sites, *T. ricardae* was the most frequent while *T. par* and *T. marmorosus* were very rare (Table 1).

Table 1. The species composition of tabanids

Biotope	Genus	Species	Number	%
		Tabanus taeniola	417	57.76
		Tabanus ricardae	190	26.32

INP	*Tabanus* (N=8)	*Tabanus par*	40	5.54
		Tabanus ruficrus	27	3.74
		Tabanus socius	27	3.74
		Tabanus marmorosus	2	0.28
		Tabanus obscurehirtus	1	0.14
		Tabanus disjunctus	18	0.00024
	Total *Tabanus*		722	100
	Chrysops (N=2)	*C. dimidiatus*	17	70.83
		C. silaceus	7	29.17
	Total *Chrysops*		24	100
	Haematopota (N=1)	*H. pluvialis*	1	100
	Total *Haematopota*		1	100
Village-Town	*Tabanus* (N=5)	*Tabanus ruficrus*	13	14.13
		Tabanus taeniola	9	9.78
		Tabanus ricardae	68	73.91
		Tabanus par	1	1.09
		Tabanus marmorosus	1	1.09
	Total *Tabanus*		92	100

3.2 Abundance of tabanids with respect to prospection sites

At the INP, *Tabanus taeniola* was the most abundant species of the genus *Tabanus* with ADT of 3.99. In *Chrysops*, *Chrysops dimidiata* (ADT = 0.16) was the most frequent species in the present collections. However, in the genus *Haematopota*, only one species was identified with a low apparent density (ADT= 0.01) (Figure 2A).

In the Village-Town sites, *Tabanus ricardae* was the most abundant species of the genus *Tabanus* with ADT of 0.57 (Figure 2B). The other species notably *Tabanus rifucrus* and *Tabanus taeniola* were rarely captured. *Tabanus par* and *Tabanus marmoratus* were rarely caught (Figure 2B). Generally, the ADT of tabanids was higher in the forest (ADT=7.12) as compared to the Village-Town (ADT=0.77) sites with a statistically significant difference (P<0.05).

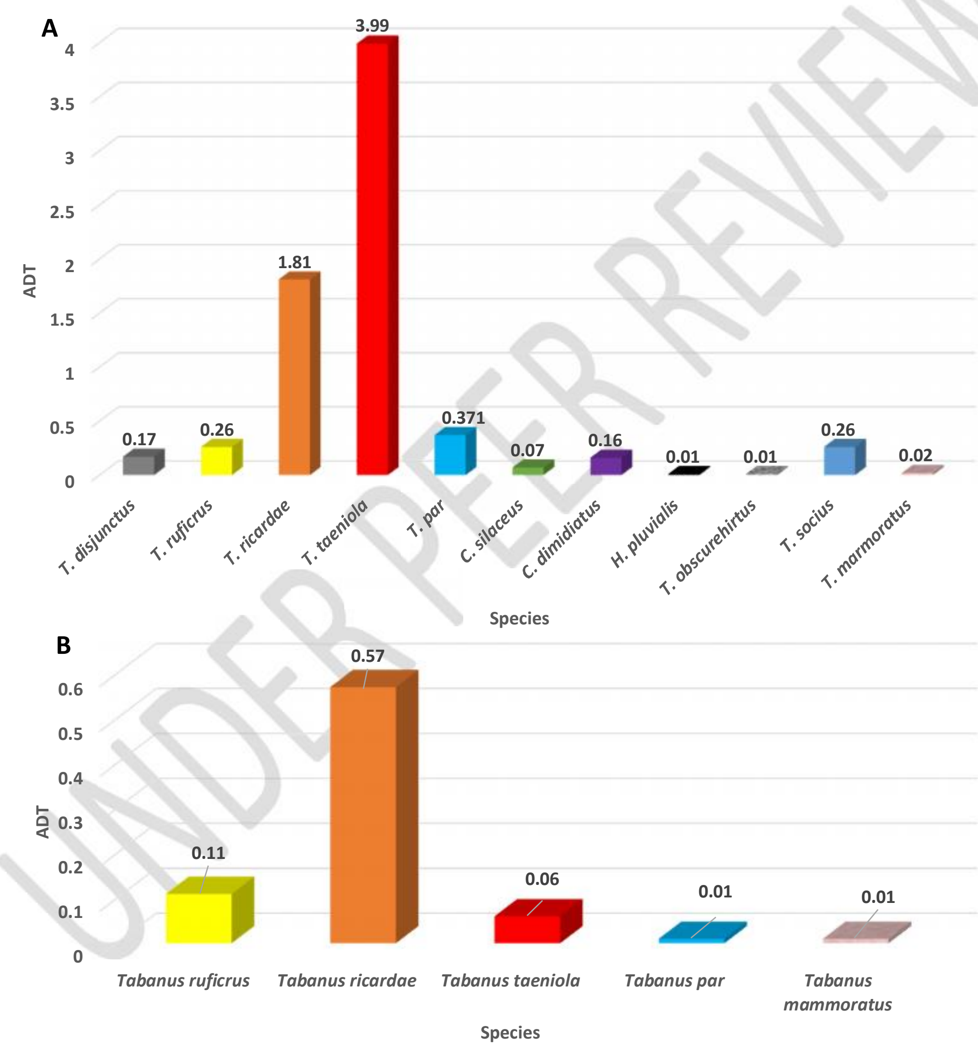

Figure 2. The ADT of tabanids in INP (A) and Village-Town (B)

3.3 Daily activity rhythm of tabanids with respect to prospection sites

At the INP, all the species of tabanids caught showed the same peaks of abundance between 12 and 14H (Figure 3A). In the Village-Town sites, *Tabanus taeniola*, *Tabanus socius* and *Tabanus ruficrus* showed a unimodal daily activity with peak noticed between 14 to 16H (Figure 3B). However, *Tabanus ricardae* was captured with the same abundance between 8 and 10H (Figure 3B).

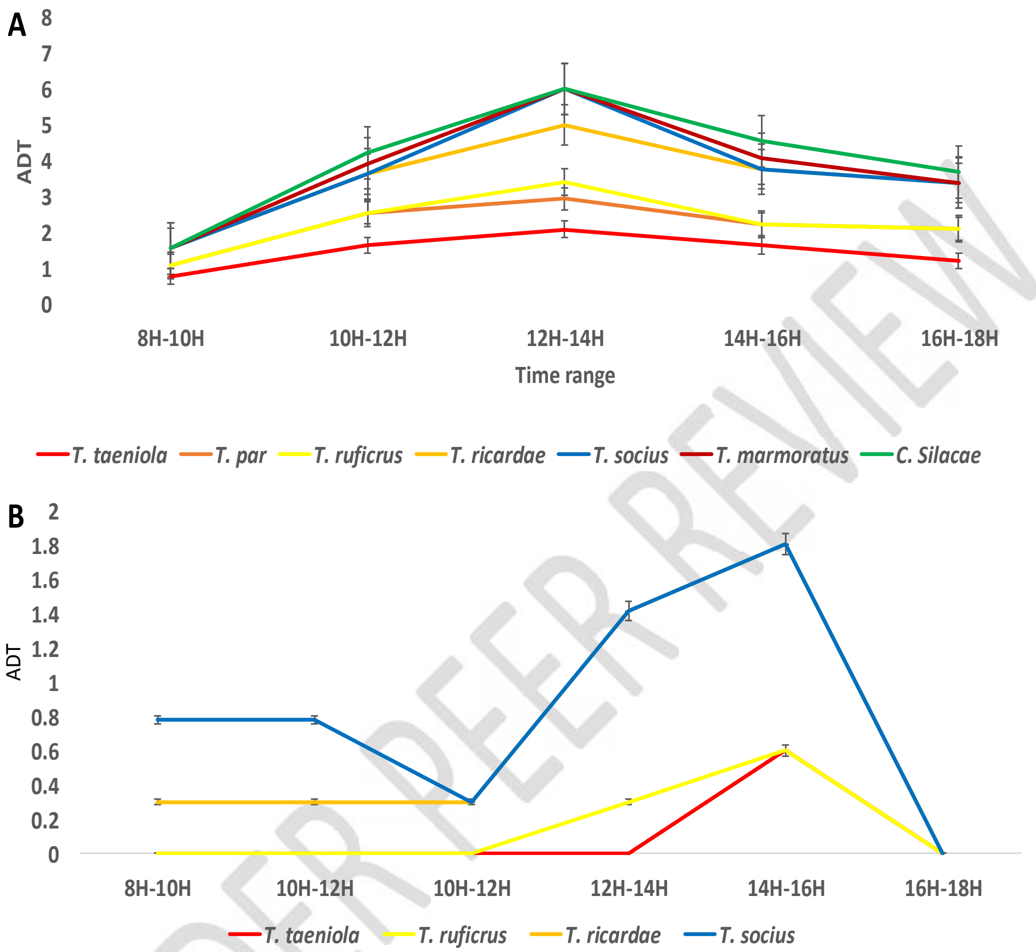

Figure 3. Diurnal activity of tabanids with respect to site A(INP) and B (Village-Town)

4. DISCUSSION

The apparent density (1.86) per trap and day of tabanids was higher than that reported by Mavoungou et al., [7]. This difference could be related to the discrepancies in the trapping efforts. In total, 18 species of tabanids were identified and represented 22.5% of known species of Central Africa [17]**.** This low species richness in the present study could be related to the type of trap used. Because Mihok [18]; Acapovi [19] rather revealed the Nzi trap was an efficient trapping system for tabanids. The Vavoua trap was used in this study for budgetary reasons i.e. it is cheap even though not efficient as compared to Nzi which is very expensive.

The tabanid species composition and ADT was higher at the INP trapping points as compared to the man-made areas. This difference in tabanid species composition and number has been reported for these type-localities [7]. The high ADT of tabanids at the INP could be linked to the favourable environmental factors such as ambient temperature, relative humidity, rainfall and high host density [1] prevailing in the site that fostered the high development and survival of this group. It was interesting to find out that during the prospection period, *C. silacae* and *C. dimidiata* were only caught by traps set in the secondary forest of the INP and never caught by traps pitched at the Village-Town sites. The presence of the two species of Chrysops which are main vectors of *Loa loa* filariasis [5] indicates the risk of the transmission of the parasite to the human population frequenting the INP as well as the adjacent villages.

The peak of activity of tabanids followed a unimodal pattern and occurred at different diurnal time ranges in the INP (12-14H) and Village-Town (14-16H). This result is like that obtained by Acapovi [20] who showed a unimodal activity peak for tabanids in the mentioned periods. The high tabanid abundance during at time points of the day could be related to the prevailing meteorological factors (ambient temperature, wind speed and relative humidity) during such periods that favoured their activity in the prospected sites. The mentioned weather variables have been shown to be the main modulators of the activity of tabanids [1] and such conditions are optimal between 14 to 16H [20].

5. CONCLUSION

The genus *Tabanus* was highly represented at the INP trapping sites with 8 species (with *Tabanus taeniola* as the most abundant species) and less represented in anthropized medium with 4 species (with *T. ricardae* as the most abundant species). Three species notably *Chrysops dimidiata*, *Chrysops silacae* and *Haematopota pluvialis* were only identified in the secondary forest of the INP. The peak activity of tabanids in the Village-Town sites occurred between 14-16H while that at the INP occurred between 12-14H.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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