

NOTE ON SOME DIPTERA (TABANIDAE, GLOSSINIDAE, MUSCIDAE AND RELATED FAMILIES) AT THE PEAK OF DRY SEASON IN TORO GAME RESERVE, UGANDA

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Abstract. The authors studied the occurrence of haematophagous and non-haematophagous flies in three different collecting sites in the Toro Game Reserve in western Uganda, at the dry season peak (January, February), using canopy trap and baited traps. Collected were 6 species of Tabanidae, 1 species of Glossinidae, 24 species of Muscidae, 3 species of Calliphoridae, 4 species of Sarcophagidae and 3 species of other families.

In recent years the studies on biting flies in Uganda have received great attention. Following the studies carried out by the staff members of the East African Virus Research Institute in Entebbe, on the biting habits, biting and nocturnal activity and swarming, by means of high observatory tower in the Mpanga Forest and later in the Zika Forest (Haddow et al. 1950, Corbet et al. 1962, Lancaster and Haddow 1967 etc.), important research of the seasonal abundance and diurnal as well as nocturnal activities of biting flies in the Busogo region (Southon 1963, Harley 1965 a, b) and in the vicinity of Lake Edward (Kangwagye 1973 a, b) was undertaken. A relatively less attention was paid to the research of synovine, coprophagous and other groups of flies which do not suck blood on the host, but from the epidemiological and epizootiological aspect are of no less importance.

At the beginning of 1978 the Czechoslovak Expedition Africa-Wildlife '78 conducted a complex natural-scientific research in the Toro Game Reserve, Toro District in the western Uganda. The present paper is based on the materials of haematophagous and non-haematophagous flies collected during the expedition.

MATERIAL AND METHODS

Experimental area. The Toro Game Reserve covers an area of 548.5 km² in western Uganda near the border with Zaire, on the southern shore of Lake Albert, at the altitude about 700-800 m, in coordinates 0°55'N and 30°20'E. The whole reserve is situated at the bottom of the western branch of a rift valley and is overgrown with low and tall grass savannas, with dominant grasses of the genus *Hyparrhenia*, *Hyperthelia*, *Themeda*, *Heteropogon*, *Cymbopogon*, *Chloris*, *Sporobolus* etc. The trees here are represented by *Acacia sieberiana*, *Crateva adansonii*, *Balanites aegyptiaca*, *Tamarindus indicus* and locally by the palm *Borassus aethiopum*. The reserve is drained by the rivers Wasa and Mugidi, with gallery forest in their flood-plains. The reserve is populated by large numbers of the Uganda kob (*Kobus kob thomasi*) numbering about 2500 head, and low numbers of Defassa waterbuck (*Kobus elipsiprymnus harnieri*), Bohor reedbuck (*Redunca redunca*), Cape buffalo (*Syn-cerus caffer*) and elephant (*Loxodonta africana*). Also present are the lion (*Panthera leo*), leopard (*Panthera pardus*) and hyena (*Crocuta crocuta*). During the dry season the majority of animals (except the Uganda kob) retreat to the vicinity of the rivers Wasa and Mugidi. No cattle is kept or pastured near or in the wide surroundings of the collecting sites. On the other hand, the close vicinity of the

Semliki Safari Lodge, where the collecting sites 1 and 2 were situated, is under constant anthropic influence and offer enough food to some synanthropic or partly synanthropic flies.

Detailed characteristics of the experimental area are given in the papers of Verner (1978), and Otto and Jeník (1980).

Climate. The climate of the reserve is characterized by mean annual temperatures 21—27 °C, mean annual precipitation 700—1300 mm and mean potential evaporation 900—1500 mm. The precipitation during the year comprises two rain periods separated by two dry seasons.

Mean diurnal values of temperature and relative humidity at the time of collecting in the sites 1 and 2, measured 2 m above the ground, are given in Fig. 1. The characteristic curves of diurnal temperature and relative humidity measured under same circumstances 7—8 February 1978 are given in Fig. 2. A more detailed evaluation of climate in the experimental area at the time of collecting is presented in the paper of Otto and Jeník (1980).

Methods. A tent trap of the type "Canopy" without bait (Catts 1970, Adkins et al. 1972) was used for collecting horseflies and tsetse flies, checking their numbers either after all-day exposure or at regular intervals, in order to trace their flying activity during the day. Also some flies of the families Muscidae and Sarcophagidae were collected in this trap. Current baited traps were also used for collecting muscid flies, with human faeces, intestines of an antelope and fruit as baits. However, the baits were effective only for a short time due to desiccation in the hot sun. Collecting was carried out in January and February 1978, i. e. at the peak of dry season.

During collecting the basic values of climate (temperature, humidity, direction and force of wind, amount of solar radiation) were studied in the two different collecting sites at 7.00, 14.00 and 21.00 hours and these were taken as basis for the calculation of mean diurnal values. The measurements were taken at special measuring sites which corresponded with collecting sites 1 and 2.

The collecting site 1 was situated on the flat bottom of the steep valley of the Wasa river near the Semliki Safari Lodge in the very centre of the reserve, at the altitude of 764 m, constituting tall grass savanna in the stream terrace not far away from a gallery forest skirting the other bank of the river. Due to the vicinity of the Semliki Safari Lodge the site was under a strong anthropic influence.

The collecting site 2 was a dried-up waterhole on a plateau with low grass savanna, about 1 km ESE from the collecting site 1, at the altitude of 786 m. Anthropic influence here was not so strong as in the collecting site 1.

The collecting site 3 was a dried-up waterhole with hydrophilic vegetation (*Panicum maximum*, *Echinochloa pyramidalis* and *Mimosa pigra*) in the tall grassland with *Borassus* palms, near the road to Ntoroko, about 7 km ENE from the collecting site 1, at the altitude approximately 720 m. Anthropic influence here was minimal.

RESULTS AND DISCUSSION

Tabanidae: In eight all-day collections in three different collecting sites the canopy trap yielded 265 females of horseflies belonging to six species (Table 1). The two dominant species, *Tabanus taeniola* and *T. par* are lowland species, *T. taeniola* predominating in the open landscape near open streams, *T. par* mainly occurs in the forest floor, similarly as *T. thoracinus*. *T. congolensis* is a forest species (Haddow et al. 1950, Haddow 1964, Oldroyd 1954). Likewise, *Ancala fasciata* is a widespread species in the vicinity of large water reservoirs and similarly as *T. taeniola* it is capable of feeding of hippopotamuses, elephants and buffaloes (Oldroyd 1954). Only *Atylotus agrestis* is a species associated with dry savanna. This characterization is reflected in the composition of the material collected in the particular collecting sites. In the site 1 the dominant species was *Tabanus par*, in the site 2, still near a stream, but in the open landscape, *T. taeniola* prevailed. In the site 3, relatively farthest from an open stream, the occurrence of horseflies was very low, with a mild predominance of *Atylotus agrestis*. The numbers of horseflies collected in all-day catches in sites 1 and 2 did not differ from one another very much. However, repeated all-day catches in the site 1 resulted in gradual decrease of the yield (27 January — 84 specimens, 30 January — 31 specimens, 31 January — 27 specimens, 6 February — 19 specimens), caused by the shortage of active horsefly females, or by the smaller attractiveness of the canopy trap positioned in the same place for several days on end, rather than by the influence of climatic changes (Figs. 1 and 2).

Table 1. A survey of horseflies (Tabanidae) collected in canopy trap on eight collecting days between 27 January and 6 February 1978 in three different collecting sites in the Toro Game Reserve, Uganda

	Site 1 5 collecting days		Site 2 2 collecting days		Site 3 1 collecting day		Total	
	n	%	n	%	n	%	n	%
<i>Tabanus par</i> Walker	122	65.6	22	32.4	3	27.3	147	55.5
<i>Tabanus taeniola</i> Palisot de Beauvois	44	23.7	38	55.8	3	27.3	85	32.1
<i>Tabanus thoracinus</i> Palisot de Beauvois	6	3.2	1	1.5	—	—	7	2.6
<i>Tabanus cf. congoiensis</i> Ricardo	1	0.5	—	—	—	—	1	0.4
<i>Atylotus agrestis</i> (Wiedemann)	12	6.5	6	8.8	5	45.4	23	8.6
<i>Ancala fasciata</i> Fabricius	1	0.5	1	1.5	—	—	2	0.8
Total	186	100	68	100	11	100	265	100

During his studies in Tanzania Wiesenhütter (1975) ascertained a maximal occurrence of horseflies, with predominant species *Tabanus taeniola* and *T. fraternus* Macq., at the beginning and during the period of rains i. e. in March and in May. It may be therefore supposed that during our studies at the end of the dry season (January, February) the occurrence of horseflies, primarily of *T. taeniola*, was relatively at a low level. Similar results from Uganda had been already reported by Harley (1965 b).

The highest number of horseflies was collected between 10.00 and 13.00 hours (51 %), a lesser number between 13.00 and 15.00 hours (31.2 %), the two dominant species *Tabanus par* and *T. taeniola* being more frequent in the morning hours, but on some days (e. g. January 30 or February 6) *T. par* was more abundant in the afternoon (cf. Harley 1965 a, b, Kangwagye 1973 a).

Glossinidae: Only 9 specimens (6 ♀♀ and 3 ♂♂) of *Glossina pallidipes* Austen were caught in the canopy trap during four collecting days in the site 1 near the Wasa river. Between 7.30 and 13.00 hours 5 ♀♀ and 2 ♂♂ alighted on the trap, between 15.00 and 18.30 hours only 1 ♀ and 1 ♂ (cf. Smith and Rennison 1961, Harley 1965 a, Kangwagye 1973 a, Smith 1973).

Muscidae and related families: Other Diptera were collected in the baited trap by means of human faeces (2 samples of 29 and 30 January resp.) and intestines of an antelope (1 sample of 2 February) in the site 1, and in the canopy trap (15 samples of the period 27 January to 7 February) in all three sites. The catches in the baited trap using fruit as bait were negative. The samples from the canopy trap are relatively poor in quantity and do not show marked differences depending on the biotope and period of collecting and in Table 2 therefore the sum total of specimens collected is given. This table shows the marked differences in the food ecology of particular species.

1. Group of haematophagous parasitic species, the so-called biting flies (subfam. Stomoxyinae): Throughout the Ethiopian region *Stomoxys nigra* is in various ecosystems probably the most abundant species of the subfamily, attacking different vertebrates including man. *S. boueti* and *S. taeniata* are more rare, the former species having been seen feeding on a buffalo, the latter on cattle, buffalo and bullock (Zumpt 1973, Kangwagye 1973 b). *Haematobia minuta* is widespread species in Africa, associated

with cattle, bullock and buffalo (Kangwagye 1973 a, b); a larva was developed from the elephant faeces (Zumpt 1973). All species found in the Toro Game Reserve are most likely to be associated with buffalo, and in moist places and in the vicinity of streams where the buffalo herds are concentrated, their larvae also live in the accumulated faeces, unless they are phytosaprophagous as related by Kunz and Monty

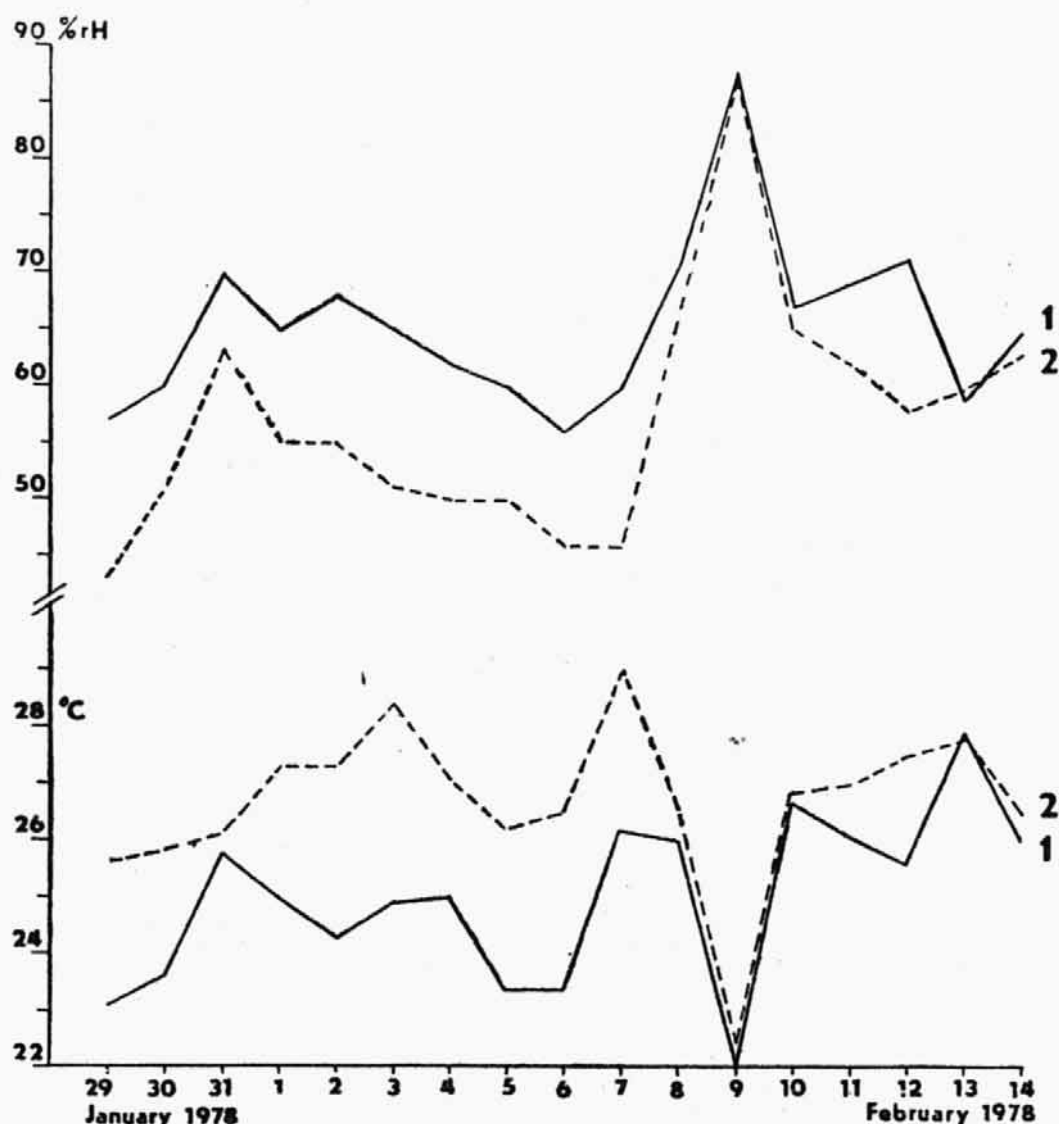


Fig. 1. Fluctuation of mean diurnal temperature and relative humidity 2 m above the ground in collecting sites 1 and 2 in the Toro Game Reserve between 29 January and 15 February 1978.

(1976) with reference to *S. nigra*. The dominant mammal in the reserve, the Uganda kob, is undoubtedly attacked by the species *S. nigra* and other biting muscid flies. Zumpt (1973) only once mentions antelopes as possible hosts of biting flies, namely of the species *S. pallida* Roubaud, well known in the Uganda territory.

2. Group of secretophagous flies*): Only species of the genus *Musca* from this ecological group are represented in our material. In all species found by us secretophagia is connected with facultative haematophagia or obligatory non-parasitic haemato-

*) On the basis of particular published data and knowledge about collecting higher Diptera in traps of the type Manitoba and Skufin in Central European conditions (Gregor and Minář 1980) we may suppose that all secretophagous species of the family Muscidae are attracted by optical silhouette traps.

phagia (e. g. in *M. crassirostris*), or with a wide saprophagia (as well as synanthropy), e. g. in *M. sorbens*. From the aspect of a possible transmission of different agents important may be *M. lusoria* and *M. xanthomeles*, as evidenced by the attractiveness of various substrates to these species (see Table 2).

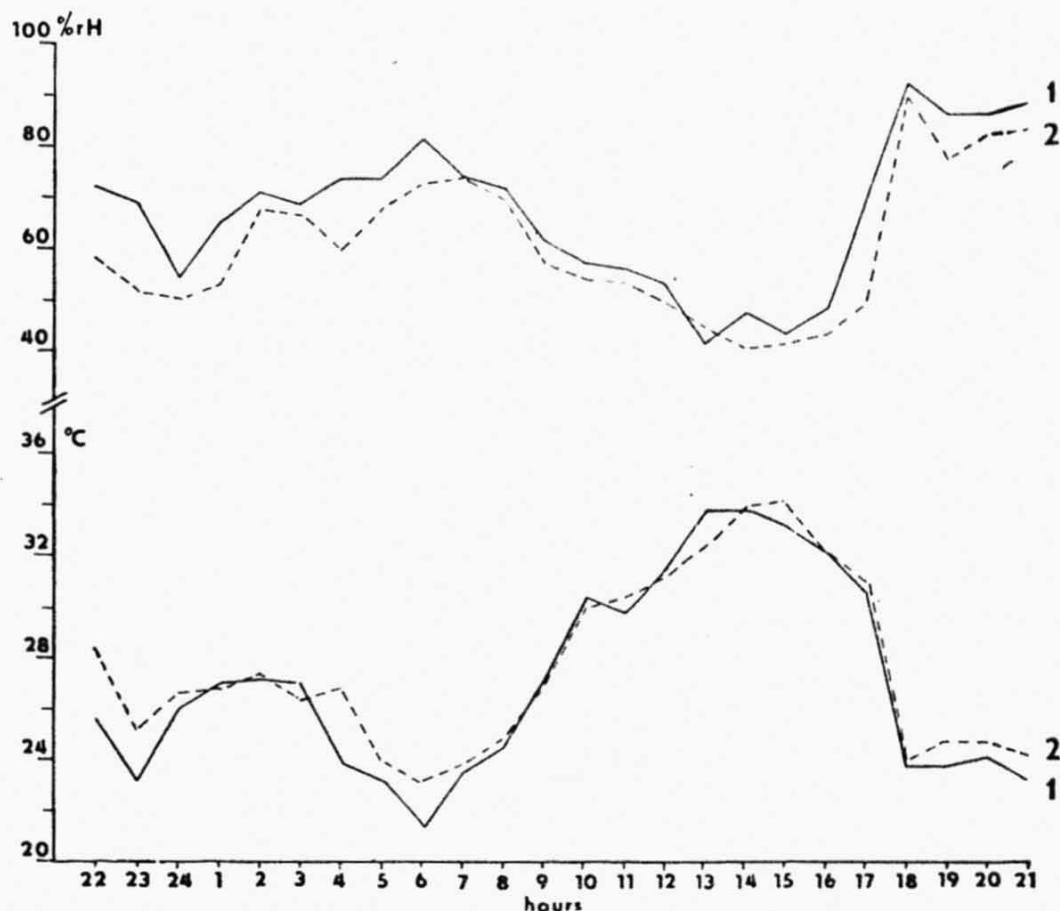


Fig. 2. Diurnal curves of temperature and relative humidity 2 m above the ground in collecting sites 1 and 2 in the Toro Game Reserve between 7 and 8 February 1978.

3. Group of other forms: In samples collected on human faeces markedly are represented systematic groups in which coprophagia prevails in imagoes: subfamily Muscinae (*Pyrellia*, *Orthellia*, *Morellia*), family Sarcophagidae (*Sarcophaga*), family Ulidiidae (*Physiphora*) and Sepsidae (*Platytoxopoda*). The great abundance of *Musca domestica calleva* on faeces is remarkable due to the fact that the nominate subspecies *M. domestica domestica* visits this medium only exceptionally. The family Calliphoridae (*Hemipyrellia*, *Chrysomya*) signalling the presence of animal refuse and cadavers, is slightly represented. *Chrysomya marginalis* also visits excrements and also feeds on exudates from sores and wounds of cattle (Greenberg 1971). *Atherigona varia soccata* seems to be saprophilic.

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Table 2. A survey of all higher Diptera collected in canopy trap (a), trap baited with human faeces (b) and with intestines (c). Column (a) gives the sum total of specimens from 15 samples collected between 27 January and 7 February 1978, the number of positive samples is indicated in brackets

Family and subfamily	Species	a		b		c		
		♀	♂	♀	♂	♀	♂	
MUSCIDAE	Stomoxyiinae	<i>Stomoxys nigra</i> Macquart	3	1	(3)			
		<i>Stomoxys boueti</i> Roubaud		1	(1)			
		<i>Stomoxys taeniata</i> Bigot ¹⁾	2		(2)			
		<i>Haematobosca latifrons</i> (Malloch)	4	8	(5)			
		<i>Haematobia minuta</i> (Bezzi)		1	(1)			
		Stomoxyiinae gen. sp.	1		(1)			
	Muscinae	<i>Musca domestica calleva</i> Walker	1		(1)	20	5	2
		<i>Musca xanthomelas</i> Wiedemann	24	26	(10)	13	11	3
		<i>Musca lusoria</i> Wiedemann	12	3	(9)	1	4	3
		<i>Musca gabonensis</i> Macquart	1	1	(2)			4
		<i>Musca ventrosa</i> Wiedemann	1		(1)			
		<i>Musca munroi</i> Patton ²⁾	1		(1)			
		<i>Musca tempestatum</i> (Bezzi)	10	8	(6)			
		<i>Musca conducens</i> Walker	2		(2)	1		
		<i>Musca sorbens</i> Wiedemann	1		(1)	5	1	
<i>Musca osiris</i> Wiedemann					2	1	3	
<i>Musca crassirostris</i> Stein			1	(1)				
<i>Orthellia scatophaga</i> Malloch						1		
<i>Morellia</i> cf. <i>nilotica</i> (Loew)					1			
<i>Pyrellia scintillans</i> Bigot ²⁾				4	1	1		
<i>Pyrellia spinthera</i> Bigot ²⁾				4	1			
Phaoniinae	<i>Hennigmyia setinervis</i> Stein ²⁾						1	
Limnophorinae	<i>Lispe mapaiensis</i> Paterson ²⁾	1		(1)				
Coenosiinae	<i>Atherigona varia soccata</i> Rondani	1		(1)	4			
CALLIPHORIDAE	<i>Hemipyrellia fernandica</i> Macquart ³⁾					1		
	<i>Chrysomya albiceps</i> (Wiedemann)				3	1		
	<i>Chrysomya marginalis</i> (Wiedemann)				6	2		
SARCOPHAGIDAE	<i>Sarcophaga hirtipes</i> Wiedemann ³⁾					2		
	<i>Sarcophaga</i> sp.		2	(2)	4			
	<i>Senotainia</i> sp. ³⁾	4	1	(2)				
	<i>Heteronychia</i> sp. ³⁾	3	2	(3)				
ULIDIIDAE	<i>Physiphora smaragdina</i> (Loew)				3	6		
	Ulidiidae gen. sp.					1		
SEPSIDAE	<i>Platytoxopoda</i> sp. ⁴⁾				3		1	

¹⁾ f. *brunnipes* Grünberg, ²⁾ det. A. C. Pont, ³⁾ det. F. Zumpt, ⁴⁾ det. J. Zuska

ПРИМЕЧАНИЕ ПО НЕКОТОРЫМ ДВУКРЫЛЫМ (ТАБАНИДАЕ,
GLOSSINIDAE, MUSCIDAE И РОДСТВЕННЫЕ СЕМЕЙСТВА) В ПИК
СУХОГО СЕЗОНА В ЗАПОВЕДНИКЕ ТОРО, УГАНДА

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Резюме. Авторы изучали наличие кровососущих и некровососущих мух в трех разных местах отлова в заповеднике Торо в западной Уганде, в пик сухого сезона (январь, февраль) с помощью ловушки тент и ловушек с приманками. Всего было отловлено 6 видов семейства Tabanidae, один вид сем. Glossinidae, 24 вида сем. Muscidae, 3 вида сем. Calliphoridae, 4 вида сем. Sarcophagidae и 3 вида, относящиеся к другим семействам.

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