

Zeitschrift:	Acta Tropica
Herausgeber:	Schweizerisches Tropeninstitut (Basel)
Band:	25 (1968)
Heft:	1
Artikel:	Miscellaneum : On the trypanosome-infection rate of "Glossina morsitans" in the Ulanga District (Tanzania)
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DOI:	https://doi.org/10.5169/seals-311529

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Miscellaneum

On the Trypanosome-Infection Rate of *Glossina morsitans* in the Ulanga District (Tanzania)

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To further the knowledge of the epidemiological situation regarding trypanosomiasis in the Ulanga District (Tanzania), a survey was carried out in 1967 on the infection rate of freshly caught wild *Glossina morsitans*. For comparison, tsetse flies were examined a) in an area around Ifakara, where a lot of game and great numbers of tsetse flies are to be found, but no human trypanosomiasis has occurred so far and b) in the endemic region around Kilosa kwa Mpepo, where each year between 20 to 70 cases of sleeping sickness are reported and where we had found a rather high incidence of trypanosomes in wild mammals, namely 34.3% from the middle of October to the middle of December 1966 (GEIGY et al., 1967).

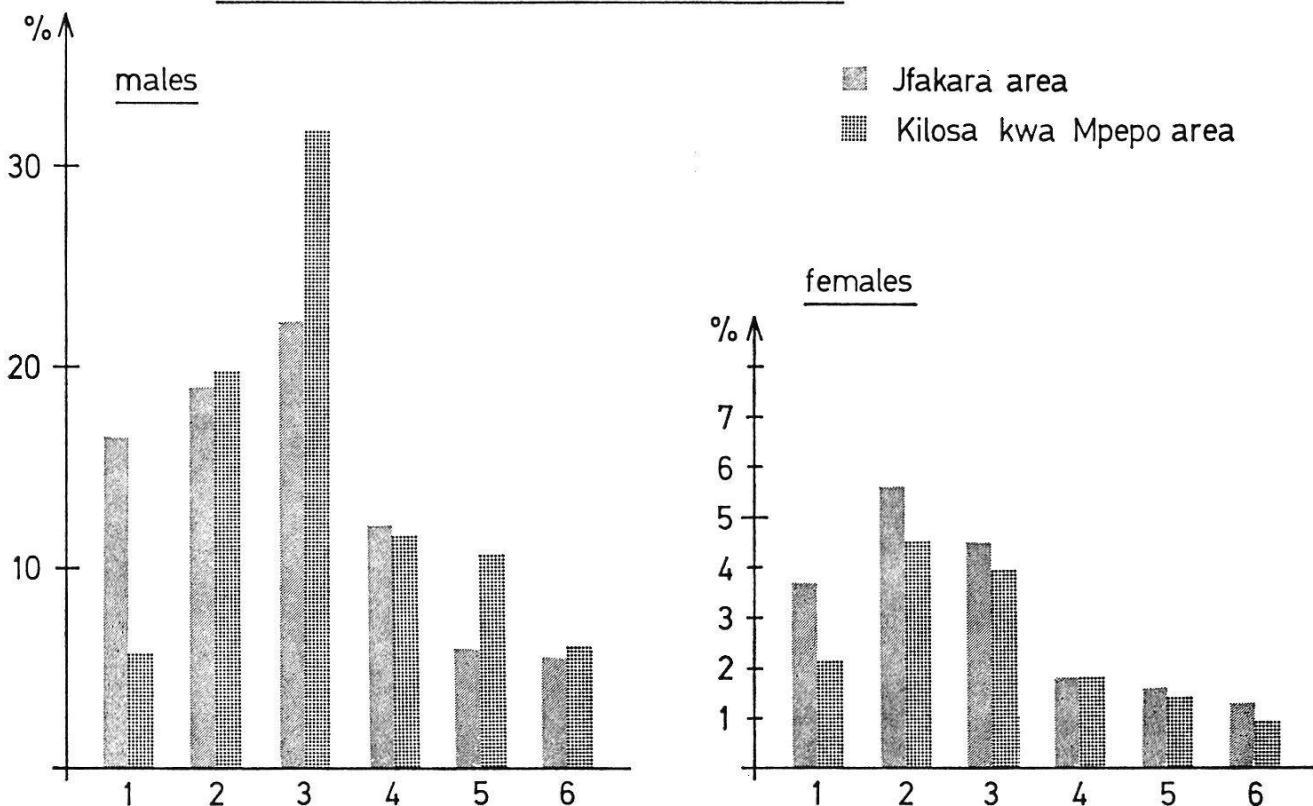
The Ifakara area was studied between the middle of August and the end of September, the Kilosa kwa Mpepo area in September and October 1967. A planned simultaneous survey of trypanosome infection in wild animals in the area around Ifakara had to be abandoned because of the weather conditions: after prolonged rains the grass proved to be too high for hunting during the time at our disposal.

Material and methods

The tsetse survey of the Ifakara region was carried out from the Rural Aid Centre, whereas we installed a field laboratory for the work around Kilosa kwa Mpepo at Ngoheranga Mission, 18 miles north of Kilosa kwa Mpepo, as last year.

Males and females of *G. morsitans* only, the species predominant in both areas, were examined. To begin with, we tried to compare the age and sex ratio from catches off a bait cow and such caught on a Landrover, slowly driving over a track of about 2 miles through wooded savannah (Brachystegia woodland — miombo). As we were able to catch many more individuals in a much shorter time by the Landrover method and the ratio of males and females as well as of the age groups were similar with both methods, we gave up using bait animals very soon. Specially so, as the cow we used got soon infected with *Trypanosoma congolense* as well as *Theileria parva* and had to be slaughtered. As the number of male flies exceeded that of females considerably, we applied JACKSON's (1947) wing fray method, using the wear of the hind margin of the wings, for age grading into 6 groups. For females, we started with SAUNDERS' (1962) ovarian method, but had to give it up as too time consuming. After consultation with SAUNDERS (personal communication) and after comparing our own results with both methods on a number of individuals, we decided, that the use of the wing fray method for females too would be sufficient for our purposes. Although, one still has to consider the fact, that as the male tsetse are more active than the females, one must suppose that females in the same wing fray categories are older than the corresponding males (JACKSON, 1947). Males as well as females were dissected for assessing the infection rate within 10 to 36 hours after being

Graph.1: Distribution of male and female *G. morsitans*
caught on Landrover (age groups 1-6)



caught. The flies were kept in a cool box (10 to 15°C) up to the time of dissection. Labrum, hypopharynx, salivary glands and gut were examined separately. In all cases, where the gut as well as the hypopharynx were showing trypanosomes, the entire proboscis was injected i.p. into a white mouse. The same was done with infected salivary glands. After JORDAN (1964) and HARLEY (1966) infections involving the salivary glands are of the *brucei*-type, those confined to the proboscis of the *vivax*- and those involving gut as well as proboscis supposed to be of the *congolense*-type. Infections found in the gut only, may be either *brucei*- or *congolense*-type. The determination of *vivax*- and mature *brucei*-type are clear cut. But as regards the species involved in gut-proboscis infections, these may be either *congolense*-type or a mixture of either *brucei* or *congolense* with *vivax*. Furthermore, in an area, where most of the trypanosome carrying wild animals show mixed infections, one must expect a high percentage of mixed infections in the tsetse fly as well. We therefore preferred to classify our results according to the localisation of the trypanosomes in the fly. Where metacyclic forms were present in such infections, the follow up of the infections in mice may clear the situation.

Results

Most of the flies were caught between 8.30 and 10.00 in the morning, single catches varying between 16 and 189 individuals. In the Ifakara region, a total of 1375 flies were caught over a period of 6 weeks from August 17th to September 27th. Of these, 1094 were dissected for gut, salivary glands and proboscis, i.e. wherever the gut was found infected, salivary glands and proboscis were

TABLE 1 *Ifakara area*Infections classified according to localisation in male *G. morsitans*The category "gut and salivary glands" has been left out, as no sure *brucei*-infections were found in the Ifakara area

Age category	Mean age	No. dissected G+P+S	Remains of blood meal *	Gut only **	(Vivax-type)		No. positive proboscis	Total of infections ***
					Gut and proboscis	No. dissected for proboscis		
1	9 d.	41	2.4% (1)	2.4% (1)	—	63	1.6% (1)	1.6% (1)
2	15 d.	189	2.6% (5)	2.1% (4)	1.1% (2)	170	3% (5)	4.1% (7)
3	25 d.	270	1.1% (3)	6.3% (17)	3.3% (9)	233	6.9% (16)	10.2% (25)
4	33 d.	165	1.2% (2)	2.4% (4)	6.7% (11)	119	9.2% (11)	15.9% (22)
5	34 d.	102	—	2% (2)	7.9% (8)	60	11.7% (7)	19.5% (15)
6	48 d. or older	100	4% (4)	4% (4)	9% (9)	56	12.5% (7)	21.5% (16)
Total		867	1.7% (15)	3.7% (32)	4.5% (39)	701	6.7% (47)	11.2% (86)

* In some cases, a few bloodforms were found in the partly digested remains of the last blood meal in the midgut. These cannot be considered as proper "gut infections" but are mentioned to show, that at the time the survey was made, trypansome carrying animals must have been quite frequent.

** Here at least some typical midgut forms were observed; their character remains undeterminate: they may develop later on into mature *congolense* or *brucei*-type infections.

*** Without gut infections.

TABLE 2 *Kilosa kwa Mpepo area*Infections classified according to localisation in male *G. morsitans*

Age category	Mean age	No. dissected G+P+S	Remains of blood meal *	Gut only **	Gut and proboscis	Gut and salivary glands (brucei-type)	Proboscis only (vivax-type)	Total infected ***
1	9 d.	55	—	1.8% (1)	—	—	—	—
2	15 d.	196	3.1% (6)	2% (4)	1% (2)	—	1.5% (3)	2.5% (5)
3	25 d.	317	1.9% (6)	4.1% (13)	2.5% (8)	—	5% (16)	7.5% (24)
4	33 d.	122	2.4% (3)	4.1% (5)	5.8% (7)	—	7.4% (9)	13.2% (16)
5	44 d.	106	1.9% (2)	3.8% (4)	3.7% (4)	0.95% (1)	8.4% (9)	13.1% (14)
6	48 d. or older	58	—	5.2% (3)	20.7% (12)	—	17.3% (10)	38% (22)
Total		854	2% (17)	3.5% (30)	3.9% (33)	0.12% (1)	5.5% (47)	9.5% (81)

* In some cases, a few bloodforms were found in the partly digested remains of the last blood meal in the midgut. These cannot be considered as proper "gut infections" but are mentioned to show, that at the time the survey was made, trypanosome carrying animals must have been quite frequent.

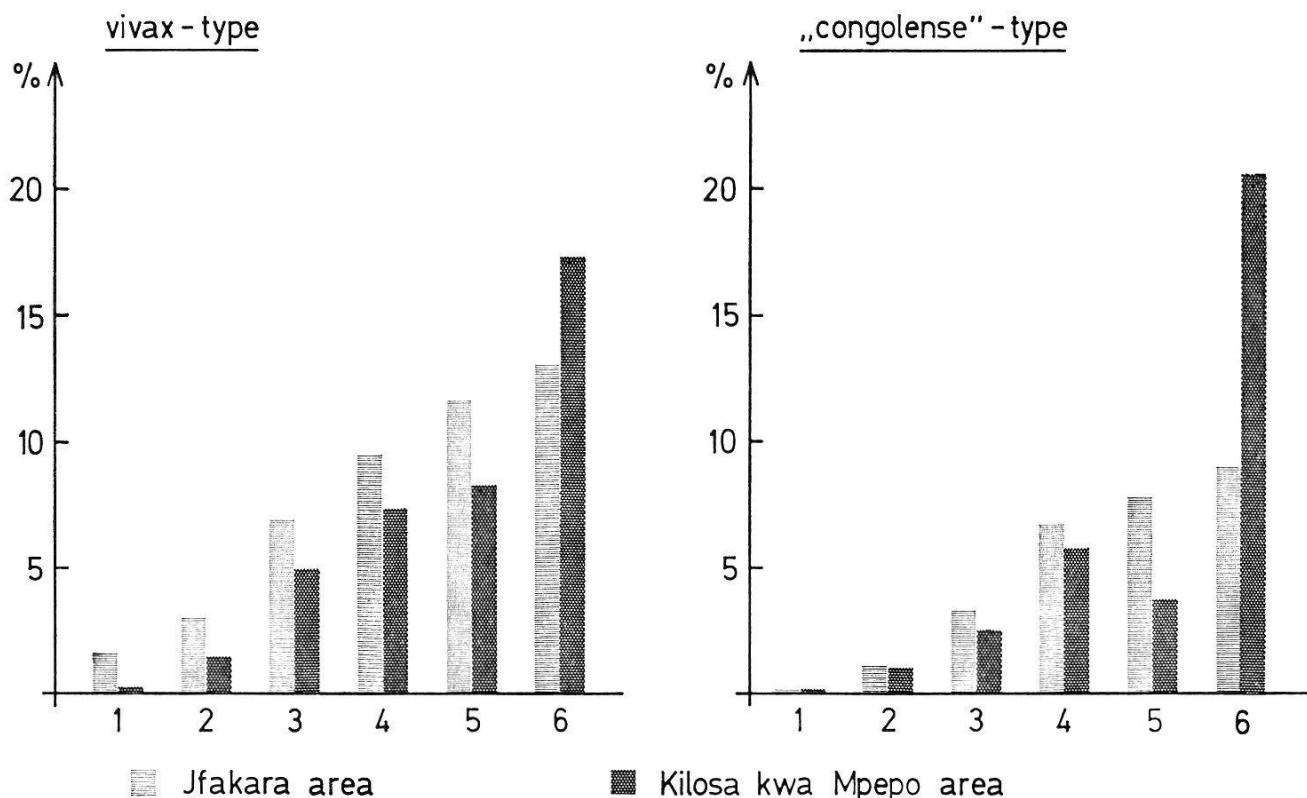
** Here at least some typical midgut forms were observed; their character remains undeterminate: they may develop later on into mature *congolense* or *brucei*-type infections.

*** Without gut infections.

examined too. 853 of the total number were examined for *vivax*-type infections (proboscis). The overall infection rate was 10.8% (without gut infections).

In the Kilosa kwa Mpepo region 994 flies were caught and dissected completely over a period of about 4 weeks from September until October 19th, showing an overall infection rate of 8.9%. As found by others authors, the greatest number were *vivax*-infections, followed by *congolense* and only one sure case of *brucei* (Kilosa kwa Mpepo area). As the percentage of trypanosome infections increases with the age of the flies (HARLEY, 1966), all results are classified according to age groups 1 to 6 (JACKSON, 1947). Graph 1 shows the relative distribution of the males and females caught in the two areas (on Landrover). The number of females proved to be very low in both areas, 16.5% around Ifakara and 14% only in the Kilosa kwa Mpepo region. Classified results of the different types of infection are therefore only given for male tsetse flies (table 1 Ifakara, table 2 Kilosa kwa Mpepo, combined results graph 2).

Graph. 2: Distribution of *vivax*- and „*congolense*“-type infections in male *G. morsitans* (age groups 1 - 6)



Discussion

There appears no significant difference in the incidence of trypanosomes in the transmitting tsetse flies examined in two different areas of the Ulanga District, one area, where only animal trypanosomiasis is known and another, which, in addition, is an endemic sleeping sickness area. In the latter, only one out of 994 tsetse flies harboured *brucei*-group trypanosomes, although along the track used for fly-catching *Phacochoerus aethiopicus*, *Kobus ellipsiprymnus*, *Redunca arundinum*, *Hippotragus niger* and *Alcelaphus lichtensteini* could be observed, all proved to be reservoirs for *brucei*-group trypanosomes. Some

of the above mentioned animals show even a very high incidence (GEIGY et al., 1967). On the other hand, only mature *brucei*-infections can be definitely determined and these are to be found usually in age categories 4, 5 and 6, which represent a small number of the flies in our catches, namely 14%, 11.6% and 6.6% respectively. The evaluation of the tsetsefly infections is complicated even more by the fact, that most of the reservoir animals examined last year showed mixed infections. The tract we used in the Kilosa kwa Mpepo region is also frequently used by man, going hunting, collecting firewood or wild honey. Getting information about the localities, where people are bitten by infected tsetse flies proves to be very difficult. The population is thinly scattered over the area and usually only the dispensaries at which the diagnosis was made is known. A serological survey of the whole population of the entire area may help to clarify the situation.

Acknowledgements

We are indebted again to the Central Veterinary Laboratory (Dar es Salaam) for supplying us with the necessary white rats and mice as well as to the Swiss Capuchin Mission for their kind hospitality.

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