# *Trypanosomes found in Wild* Glossina morsitans *and Wild Game in the "Fly-Belt" of the Upper Shiré Valley.*

By Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.; Major A. E. Hamerton, D.S.O., and Captain D. P. Watson, R.A.M.C.; and Lady Bruce, R.R.C. (Scientific Commission of the Royal Society, Nyasaland, 1912-14.)

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## Introduction.

In June, 1913, one of the members of the Commission went to the Liwonde district to identify and isolate the various species of trypanosomes infecting the "fly" and wild game in the "fly-belt" which extends along the Upper Shiré River valley from Lake Pamalombe to the Murchison cataracts. This "fly-area" is, roughly speaking, 100 miles south of Kasu and the "Proclaimed Area." It is separated from the extensive "fly-area" of the plains on the west shore of Lake Nyasa, of which the "Proclaimed Area" forms a part, by a range of hills and high plateaux where the "fly" is absent, although there is nothing to prevent trypanosome-infected wild animals wandering from one "fly-belt" into the other.

The valley of the Upper Shiré is thickly populated, and the "fly-area" is crossed by two of the most frequented roads in Nyasaland, the grand trunk road running from Zomba to the north and the main road from Liwonde to Fort Johnston. Although thickly populated, human trypanosome disease, though probably existing, has not yet been discovered in this district.* The natives, however, can keep no cattle, and their goats and dogs are constantly destroyed by trypanosome diseases, so that they have to continually import these animals from the highlands.

Game is very abundant in this district, particularly in the dry season, when herds of eland, koodoo, waterbuck, and impala concentrate in the vicinity of the river. In the wet season elephant and buffalo wandering about the country frequently remain for many weeks in the impenetrable thickets and swampy "dambos" along the river banks. A characteristic feature of the flora of this district is the extensive forests of "sanya" trees, open forests of medium-sized trees, devoid of undergrowth, but carpeted with short wiry grass. Large herds of impala are always to be found in these forests, and tsetse flies are everywhere, being particularly numerous

* Since this was written cases of trypanosome disease in man have been found.

along the dusty tracks made by the antelope and around the pools where they drink.

Nandumba's village (14° 40′ S. lat., 35° 10′ E. long.), on the banks of the Shiré River, was selected as the locality for the camp in which to carry out experiments of feeding flies on healthy dogs and goats, monkeys being unobtainable. The experiments were carried out between the dates of June 19 and July 25, 1913.

## Methods Employed.

The method employed in the feeding experiments was the same as described in a previous paper in the 'Proceedings,'* except that monkeys were unobtainable, and the flies were fed only twice on each animal.

All infected animals were subsequently taken to Kasu, the usual precautions being taken to prevent re-infection on the way, and the trypanosomes found in them were compared with the species and strains of trypanosomes obtained from human beings, various animals, and the flies in the Proclaimed Sleeping Sickness Area. Special attention and study were devoted to the comparison of the strain of the trypanosome causing disease in man in Nyasaland—*Trypanosoma brucei vel rhodesiense*—from Nandumba's, with strains obtained from human beings, various animals, and the tsetse flies in the Proclaimed Area.

The following Table gives in the first column the date the tsetse flies were first fed on the experimental animals, the second column the number of flies fed, and the signs plus and minus show the result of feeding the flies on the dog and goat.

Table I.—Infectivity of Wild *Glossina morsitans* in the Liwonde District.

| Date. | No. of flies fed. | Dog. | | | | Goat. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *T. brucei vel rhodesiense.* | *T. pecorum.* | *T. simiæ.* | *T. capræ.* | *T. brucei vel rhodesiense.* | *T. pecorum.* | *T. simiæ.* | *T. capræ.* |
| 1913. | | | | | | | | | |
| June 19 | 73 | + | — | — | — | — | + | + | + |
| „ 26 | 150 | + | + | — | — | — | + | — | + |
| July 2 | 100 | + | — | — | — | — | + | — | + |
| „ 4 | 450 | + | — | — | — | — | + | — | + |
| „ 8 | 650 | + | + | — | — | — | — | — | + |
| „ 15 | 650 | + | — | — | — | — | + | — | — |
| „ 22 | 500 | — | + | — | — | — | + | — | — |

* 'Roy. Soc. Soc.,' B, vol. 86, pp. 422 and 423 (1913).

It will be seen that the "fly" in the Upper Shiré district carries the same four species of trypanosomes as those found at Kasu in flies from the Proclaimed Sleeping Sickness Area: *T. brucei vel rhodesiense*, *T. pecorum*, *T. simiæ*, and *T. capræ*.

Here, in a series of seven experiments, all the animals on which the flies were fed developed trypanosome disease. In six experiments the flies infected the dogs with *T. brucei vel rhodesiense;* in the second and fifth there was a double infection with *T. pecorum;* and in the seventh an infection with *T. pecorum* alone. None of the goats were infected with *T. brucei*. Six goats were infected with *T. pecorum*, one with *T. simiæ*, and five with *T. capræ*. It will be noticed that the smallest batch of flies used, a batch of 73, infected the dog with *T. brucei*, and the goat with *T. pecorum*, *T. simiæ*, and *T. capræ*.

## Examination of the Blood of Wild Animals in the Liwonde District.

Whenever wild animals were killed their blood was examined for trypanosomes, which were identified by the microscope in stained films of the blood. The following Table gives the results:—

Table II.

| Animal. | Species of trypanosomes found. | | | | |
|---|---|---|---|---|---|
| | *T. brucei vel rhodesiense.* | *T. pecorum.* | *T. simiæ.* | *T. capræ.* | *T. ingens.* |
| Zebra | − | − | − | − | − |
| Impala | − | − | − | − | − |
| ,, | − | − | − | − | − |
| ,, | − | − | − | + | − |
| ,, | − | − | − | − | − |
| ,, | − | + | − | − | − |
| ,, | − | + | − | − | − |
| ,, | − | − | − | − | − |
| Koodoo | − | − | − | − | − |
| ,, | − | − | − | + | − |
| Waterbuck | − | − | − | − | − |
| ,, | − | + | − | − | − |
| ,, | − | + | − | − | − |
| ,, | + | − | − | − | + |
| ,, | − | − | − | − | − |
| ,, | − | − | − | + | − |

This Table, even in so small a series of animals examined, indicates that *T. pecorum* occurs frequently in the wild game, such as the impala and

waterbuck. *T. brucei vel rhodesiense* was found in only one animal out of the sixteen, *T. simiæ* in none, and *T. capræ* in three.

### Conclusions.

1. The trypanosomes found in the wild *G. morsitans* and wild game of the Upper Shiré "fly-area" are identical with those found 100 miles farther north in the Proclaimed Area.

2. The trypanosome causing disease in man in Nyasaland—*T. brucei vel rhodesiense*—is frequently met with, so that it is probable cases of this form of sleeping sickness will be found among the natives of this district.

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## *The Food of* Glossina morsitans.

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Five hundred flies, freshly caught in the Proclaimed Area, were killed by chloroform and the gut of each was roughly dissected out, smeared on a slide, fixed by osmic vapour and alcohol, and subsequently stained by Giemsa. The flies were all caught in the bush, away from the paths, the fly-boys proceeding in single file and catching the flies with gauze nets as they circled round, or settled on the boys or the grass.

The proportion of male flies to females caught was roughly two to one. But only 30 females were used in the present experiment, the majority being sent to the breeding-station at Chunzi.

Of the 500 flies examined, 288, or 57·6 per cent., were found to contain mammalian blood in a recognisable state. No measurements were made of corpuscles, which in most cases were much altered by the digestive processes, but the small type of cell appeared to predominate, such as occurs in the hartebeeste, waterbuck, and other antelope.

In only three cases were nucleated red corpuscles found, and in two of these there was only a small proportion of nucleated blood mixed with a large amount of mammalian. In the third case the blood was all nucleated. Thus, of those flies which contained recognisable blood, only 1·0 per cent.