THE DISTRIBUTION OF TSETSE-FLIES IN THE PROVINCE OF MOZAMBIQUE, EAST AFRICA.

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(MAP).

The presence of trypanosomiasis in cattle in the Province of Mozambique has made the question of tsetse-flies one of considerable interest and importance. During the past two-and-a-half years the writer has lost no opportunity of gathering information as to the whereabouts of tsetse-belts. It has been very difficult, because of the inaccessibility of most parts of the Province. The northern districts of Nyasa and Mozambique, for example, are practically impenetrable except for a few miles along the coast; no roads exist, and the natives, while not actively hostile, do not favour the intrusion of the white man. The northern part of the Zambesia district and the Tete district are likewise seldom visited by white men. It was not possible to organise a system of collecting reports of fly-belts from officials because of the small number of officials in these out-of-the-way regions. The writer has, however, been enabled to visit practically all accessible parts of the Province, and by questioning officials and natives and those who have been through the more inaccessible regions, has gathered considerable data. Specimens of fly have been secured from many of the places recorded. Although the few notes given are by no means complete, it seems best, however, to place them on record now.

Beginning at the north, I have two well-authenticated reports of tsetse from the Nyasa district. Toward the end of the dry season of 1908, during August and September, Major Hamilton, the game warden of the Eastern Transvaal, and the British Consul at Lourenço Marques, made a journey across this district, on foot. The road followed was from the seaport Ibo, southward to Port Amelia, thence westward along the Pulu river. Continuing westward about midway between the sea coast and Lake Nyasa, they passed through a strip of country between the Msalu and Lujenda rivers. The route then bent slightly south-west along the latter river, finally striking westward to Lake Nyasa near Fort Maguire.

A small quantity of fly was found along the Pulu river west of Port Amelia. It was along both sides of the river, and in very dense bush. But what was most surprising was the absence of game. Major Hamilton, who is a well-known hunter, informed me that he saw only one or two tracks of small game, no big game, and scarcely any feathered game. Between the Msalu and Lujenda rivers was a stretch of about 90 miles with thick bush and very little water. A large quantity of fly was found throughout the whole extent of this country. Here

again very little game was found. One water-buck was shot near the Msalu river, but after this not more than four or five tracks of game were seen, and only once was buffalo spoor found. A few elephants, however, were present in this region. After crossing the Lujenda river, game, including buffalo, became very plentiful, but no tsetse was to be found.

This statement must, of course, be taken with many allowances, for Major Hamilton, while a most careful and accurate observer, only followed a well-beaten native road across the country. At the same time, being such a careful observer and such a keen hunter, it seems probable that if game had been present he would have found it. It being the dry season, one would expect to find the game near the rivers. This, however, did not seem to be true. At the same time one would hardly expect to find tsetse in a region so dry as that between the Msalu and Lujenda rivers. All the game seems to have disappeared from the region east of the Lujenda river, and is apparently unable to migrate from the region to the west of it, as the river is very wide and deep, of a nature which game would not readily cross. Information which has been given me by Dr. Amaral Leal, of Lourenço Marques, would seem to throw some light on the conditions obtaining in one of these areas. Dr. Leal was stationed at Ibo some seven or eight years ago, and assures me that at that time the country immediately west of Ibo and Port Amelia was full of game. This fact would seem to indicate that in this area the fly has apparently survived the disappearance of game, and is able to exist without it. Although these observations cannot be taken as in any way proving that tsetse-fly is not dependent on the presence of game for its existence, it would seem to indicate that such might be the case. I believe that similar conditions have also been proved to exist in North Western Rhodesia, where, when game disappeared, the tsetse continued, often centering about the neighbouring kraals. A specimen of fly from each of the regions mentioned was brought back to me by Major Hamilton. Both are plainly *Glossina morsitans*.

Flies have been received from Port Amelia with the statement that they were collected from near that place; the exact locality was not, however, given. Austen, in his "Monograph of the Tsetse Flies," has a fly-belt marked on his map as existing along the Rovuma river, which separates this Province from German East Africa. As to whether this still exists I am unable to say, although I have had a report to that effect which is probably authentic.*

From the Mozambique district we have two records, one of a belt at Mapula near the south central part of the district, the second near the coast at a point north-west from the town of Mozambique.

The Zambesia district has some considerable fly-belts in the north-eastern area, and one report has been received recording the existence of fly in the north-western portion. There is fly in the parts of the Nyasaland Protectorate adjoining this district, and it is reasonable to suppose that it will also be found on the Portuguese side of the border. A specimen of *G. pallidipes* has been sent to me from Lekungo. Dr. Sant'Anna, of the Hospital service, has recently

* [The existence of *G. morsitans* along the Rovuma has recently been fully confirmed by Mr. H. T. Barrett (see p. 43), and the fly-belts observed by him have therefore been added to Mr. Howard's map.—ED]

been through that portion of the district known as Maganja da Costa, and informs me that in nearly all parts of this region *G. morsitans* is to be found. I have examined his specimens, and find that he has both *G. morsitans* and *G. pallidipes* from Maganja. He also reports *G. brevipalpis** from one locality in Maganja. Austen has belts located near Chinde, at the mouth of the Zambesi river, and also at the mouth of the Shiré river. These no longer exist. The coastal region is also quite free from fly. Cattle trypanosomiasis was present in herds at Mopea on the Zambesi in 1908-9, and also on the southern banks of the Zambesi to the westward, toward the Tete district, but a careful search in the adjoining regions failed to disclose any fly. The natives were quite ignorant of it. All the facts went to indicate that the disease had been introduced in cattle brought from Nyasaland and had then been spread through the herds by local biting flies such as *Stomoxys* or TABANIDÆ.

The Tete district, while not having as many fly-belts as one would be led to expect, has several well-known fly-areas in the central and northern parts. The western portion seems to be fairly free from fly. Drivers who have brought cattle across this portion, in the vicinity of Zumbo, from North Eastern Rhodesia into Southern Rhodesia, report that there is no fly until they arrive at the escarpment in Southern Rhodesia, some distance south of the Tete boundary, where the land suddenly rises to a higher level. Here in the kloofs fly is to be found.

Dr. Sant'Anna has also recently visited the Tete district, and kindly gave us his notes on the fly-belts which he found. A belt of *G. morsitans* exists on the road leading to the north from Tete to Villa Coutinho, near and north of the course of the Inyamandzi river, an affluent of the Revugwe river. A second belt was found near the Lingove river, another affluent of the Revugwe river. A third occurs about six hours south of Inyamandzi, while a fourth occurs two hours west of a place known as Muchina, in the same general region.

The district belonging to the Companhia de Moçambique has several fly-belts. In the northern part there is apparently a considerable amount of fly. While the south bank of the Zambesi river is itself quite clean, tsetse probably occurs at several places some distance inland. Trypanosomiasis has occurred among cattle along the river in the vicinity of Sena, but no fly is present at least within a considerable distance of the river, where the cattle graze. At Lacerdonia there is fly one hour's distance south from the river. About half-way between the Zambesi and Beira, toward the coast, is a place known as Chirugoma, in the vicinity of which are fly-belts of both *G. morsitans* and *G. brevipalpis*.

Twenty to twenty-five miles from Beira, near the railway line, is a belt of *morsitans*; another belt occurs about thirty miles south of Sofala; a third is known to occur near the Rhodesian boundary in the vicinity of Melsetter;

* [In his manuscript the author refers to this species under the name of *G. fusca*; but it is now recognised that the large East African *Glossina*, to which this name was formerly applied, is specifically distinct from the purely western *G. fusca*, and it has been described as *G. brevipalpis*, Newstead. In the British Museum there are specimens of this species taken at Bamboo Creek, on the Beira Railway, by Mr. L. E. W. Bevan, of Salisbury, Rhodesia; this record has been added to the author's map.—ED.]

while a fourth occurs near the Government farm at Chimoio. The southern and south-western parts of this district, as well as the northern part of Gazaland, are very little known and practically unentered by white men.

The southern part of the Province, including the Inyambane and Lourenço Marques districts, was at one time noted for the presence of tsetse. After the rinderpest passed over South Africa, however, the fly began to disappear, and we have been unable to locate a single tsetse-belt in this portion. In the southern corner of the Lourenço Marques district, toward the boundaries of Zululand and Swaziland, there is said to be tsetse. The reports are, however, all vague and indefinite, so that there is some doubt as to their reliability.

Lourenço Marques, 17th December, 1910.