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Contributors

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PORTIONS OF REPORT

On Work of Katanga Medical Commission, 1906, 1907, 1908,

WITH MAP,

BY

SHEFFIELD NEAVE.

MAY, 1908.

— GLOSSINA PALPALIS —

— GLOSSINA MORSITANS —

PORTIONS OF REPORT

On Work of Katanga Medical Commission, 1906, 1907, 1908,

WITH MAP.

BY SHEFFIELD NEAVE,

MAY, 1908.

News had arrived in London in March, 1906, that cases of Sleeping Sickness had been detected among porters arriving from Bukhama.

In May I received the following instructions from the Tanganyika Concessions, Limited, on behalf of themselves, the Union Miniere and Benguella Railway Company, in respect of the mining area in Katanga, viz.:—To ascertain the distribution of the various species of Tsetse and other biting flies, to study the distribution of sleeping sickness should it be found to exist, and to investigate the blood of the population in any infected area, to make research generally in respect of the disease in the Concession and its neighbourhood, and to report and advise as to what measures should be taken in respect thereto. It was originally intended that I should enter the country by the route of the railway from Benguella and inspect this country also, but owing to the delay thereby incurred it was afterwards arranged that I should go by the more direct route.

Immediately afterwards I began to collect equipment, which in these cases always is a very long and tedious process. It must be recollected that I had to provide for Pathological, Medical and Surgical work, and to foresee what might be required under a great variety of circumstances. It was thus necessary to have a large number of articles that might not be used, but these have not been wasted as they all will be of use to the permanent Medical Staff. I had to get a number of articles modified for use on the veldt as opposed to those suitable for work in well constructed laboratories. Makers of scientific apparatus are very independent and slow to make anything at all novel or at all out of the usual routine, so that this collection of apparatus takes a long time, more especially as everything had to be inspected in the finished state before packing. This work entails many visits to many different places and many disappointments if one is to avoid on arrival finding articles quite different to those ordered, and consequently useless.

In view of future work of this sort I would recommend that such things as tin boxes and packages that are to contain apparatus and travel through the country should be examined by an expert. In my case the tin cases, although a good price was paid to a firm of repute, were abominably

made, the seams merely tacked together with solder at intervals and the tin plate itself being much too thin. As the whole was painted with a very thick layer it was impossible for anyone but an expert to detect the deficiencies. The result of course was the damage by water of the contents to an amount many times the value of the boxes, and much valuable time and temper lost in attempted repairs throughout my journey. Again, the packing of large quantities of articles in unlabelled parcels leads to a terrible loss of time. My time therefore until my start on 23rd November was much occupied.

Before starting I also paid a visit with Mr. GEORGE GREY to Brussels to obtain all the information available. We were kindly received by Mons. Droogmans, who did his best for us, and we were subsequently honoured by an invitation from the King. I was accorded every facility for investigation in Katanga, but obtained very little information as to the position of the disease or the location of the fly, as it appears little or nothing was known about it in the area allotted to me for investigation.

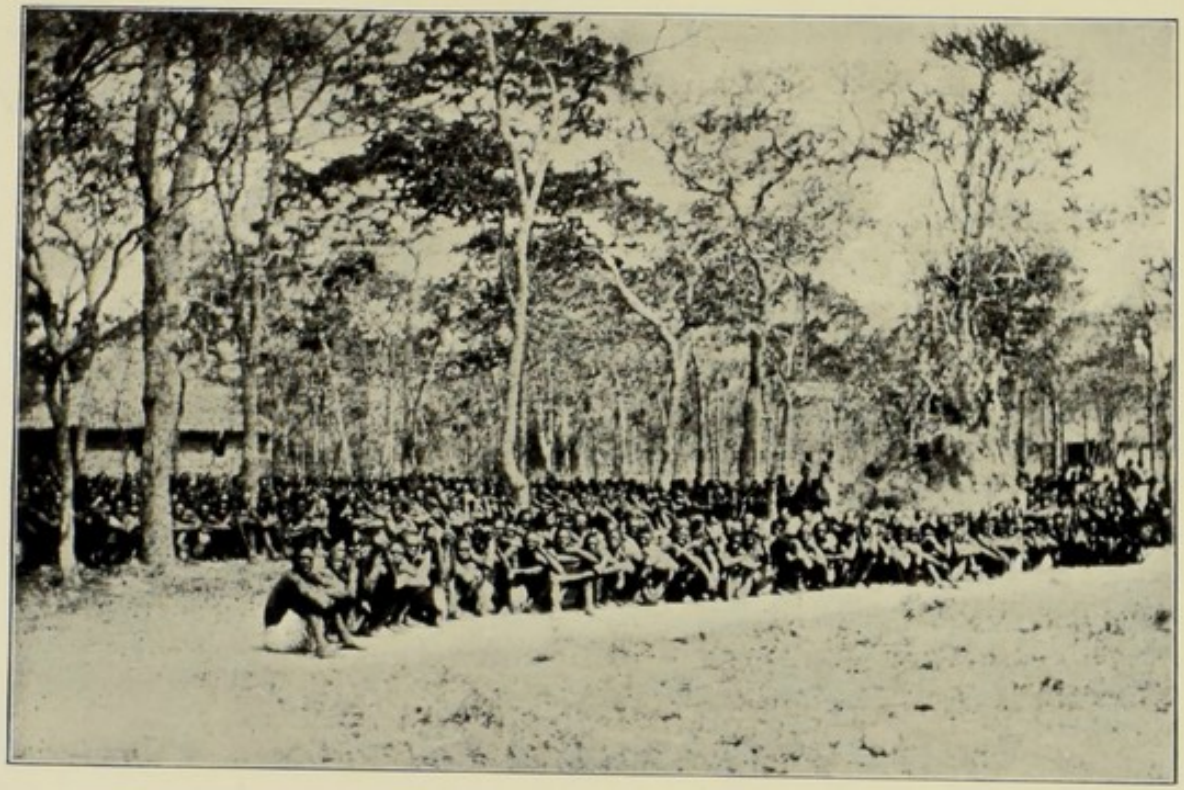
At length myself and my son, Mr. S. A. NEAVE, B.Sc. Ox., F.E.S., M.A., started on 23rd November, and arrived at Lobito Bay on 13th December, 1906. We proceeded the next day up the railway as far as construction had proceeded. We were very kindly received by all the Railway officials and engineers, and were shown the railway and bridges, all of which were quite equal to any other African railway. I came to the conclusion that, while there is Palpalis and sleeping sickness on the Katumbella River close to the commencement of the Railway, yet after it turns from the coast-line towards the interior there is but very little chance of meeting either the one or the other as the country is very dry, and it is only when a river is encountered next in the interior that there can possibly be anything of the sort.

We arrived at the Cape on 19th December, 1906, and at Broken Hill on 29th, whence we trekked to Kambove. We arrived at Kambove on 3rd February. I at once set about learning all that was known on the spot on the subject of my mission. This was very little indeed, viz. :—

(1) At Kambove I received a statement that some flies that had been shown to be Palpalis might have come from the Dikulwe and Lufira Rivers.

(2) Several points on the Lualaba northwards from Busanga had been shown to have this fly.

(3) Also on the S. Kaluli River and Luwesho River, tributaries of the Lualaba.



A TASK FOR THE DOCTOR.

Natives waiting for Medical Examination in respect of Sleeping Sickness.

(4) Dr. MASSEY had made an examination of the Lualaba from Malonda's village, about fifty miles N. of Mazanguli, to L. Kavele and had found Glossina Palpalis and the villages and post of Bukhama heavily infected.

(5) The fly had been found at the Nafunda Falls on the Luapula River, also at Kasenga.

(6) Also at the Government post of Kayoyo on the Mkuleshi River.

(7) The Missionaries at Khoni Hill thought they had found it on the Lufira there, but this had not been confirmed.

(8) At Brussels I had been given a map showing the known areas of Glossina Palpalis marked in red, none of which were indicated in the Concession, the nearest places being marked on Lake Mweru. In view of certain statements made later, I here point out that the Rivers Lualaba, Lufira, and Luapula were not thus marked in any way on this map. I was also told that a doubtful case of Trypanosomiasis had occurred at Kasenga.

The very day of my arrival at Kambove coincided with the first cases of sleeping sickness found there, and there were soon a good many listed.

On the 14th February a map based on these was issued, marking areas as infected for which I disclaim any responsibility.

Among the first natives to be found infected were Lakavutia and Kitambela of Sonta's, one of Mfungwa's villages, and Mwasabombwe of Musabira on the Lualezi River, who all had contracted the disease far away from their villages.

These men were loosely stated to be from the "Sampwe District," a phrase that does not tally with the facts. Really Musabira is more than 20 miles, and Sonta much more from Sampwe's village, which however, was on the above evidence marked on the map as infected. I considered it was unwise to come to a definite conclusion until these places had been visited, and that a map stating definitely that they were infected could only be an attempt to anticipate what might be the case after the fashion of modern journalism, and of course might cause unnecessary panic.

In all I spent a month at Kambove examining the natives resident and passing through on their way from and to work. I had also a good deal of attendance to do in a general way on the residents both white and black. More particularly on Dr. MASSEY, who was taken with tick fever. He was bitten in his hut and caught the tick, identifying it as *Ornithodorus moubata* a week before his fever began, and I found the spirilla in his

blood under the microscope. When taken with the clinical symptoms this gave a complete diagnosis.

I found no hospital for any sick among the white men or natives, but this was remedied as to the latter later on—in respect of a native hospital.

Mr. HAYES during this month arrived with a number of natives who had been with him on the Lualaba, and I found a number of them suffering from trypanosomiasis. He himself had no signs of this, but to make quite certain I injected a monkey with 3 c.c. of his blood, without any result.

I also examined several others of the white staff, but found no one infected.

The results of these examinations tended to show that the Lualaba River and the Lufira, from their junction down to the latitude of Bukama together with the intervening tributaries were infected, and that there were a number of infected cases dotted all about the country.

The Lualaba had been visited by Dr. MASSEY so that the remainder of the country was left to myself and my son to investigate.

I had to make a choice between—

(1) Sitting down and trying to add to our knowledge on the subject of the disease, and, by the help of my son, that of the life history of Glossina;

(2) Travelling and mapping the country in respect of the disease and the fly.

Both were equally important, and it was impossible to do both, as there were only two of us.

I eventually decided, taking the whole circumstances into consideration, to take the latter course.

While at Kambove I had a number of interviews with the Acting Manager, Mr. WATSON, on the subject of sleeping sickness and what might be done. He eventually arranged on the 11th February not to recruit labour or have carriers from the North coming further South than a line drawn from Kasenga on the Luapula through the old post of Lufoi close to Mukibo, and the junction of the Buleya River with the Dikulwe River to the junction of the South Kaluli River with the Lualaba, and continued indefinitely West. I was sorry to find, however, in October that this had not been rigorously adhered to.

Kambove to Mazanguli, and back to Kambove.

On March 8th I proceeded to Ruwe, where I found Dr. MASSEY with the third relapse from tick fever; he got better in 24 hours, but in two

- VIOLET NEAVE
AD NAT. PINXIT -

ORNITHODORUS MOUBATA

days was worse again with a fourth relapse, which was longer and not so typical as those previous to it. I remained for six days until he was much better, and he eventually recovered quickly without further relapse. This case shows the necessity for taking full precautions against the white man getting this disease, which is sometimes fatal. In consequence, I recommended a campaign against this tick that can incapacitate for so long a period. In tick fever a white man may well be incapacitated for six weeks.

I found the native compound in a very bad state. The end of the rainy season was approaching and the grass was long. The dwellings was merely rough Msasas, made of branches and thatched with grass, about 7 ft. in diameter, dotted about, six or seven perhaps being crowded together without any latrine or attempt to clean between them. I found this state of things on being asked to go and see some natives who were ill, and although there were some severe cases of pleurisy and pneumonia, there was no hospital to which to remove them. This form of dwelling had been deliberately chosen in consequence of all habitations, sooner or later, being infected with the tick of tick fever (*Ornithodorus moubata*), and the believed necessity of burning them down. Mr. COOKSON however soon put this all right, building a new compound and a new hospital in a very short time. The question of this tick fever is difficult. If the tick only inhabits the floor and the walls, the mud of these might well be mixed with powdered malachite which seems to keep off white ants, and the cracks be looked to every day by a special boy, with a wooden spatula and a lump of mud to fill them up. On the other hand, if they crawl into the roof, or are put there with the thatch, of course they may drop down on the inhabitants. So far I have been unable to ascertain which of these alternatives is really correct. Another view was put forward in favour of good buildings, namely, that as the native is sure to get this fever sooner or later (and it is believed he acquires immunity) it is not worth while to sacrifice his comfort in this way, but it is better to build him a decent hut. Perhaps this last view is the best, more especially as the disease in the native seldom recurs and he recovers in some four days as a rule.

I also examined a large number of natives at work here, but found only one infected with sleeping sickness, mentioned below.

From Ruwe I proceeded to Busanga with Mr. SHARP, who knew all about the place, having worked there for some time on the tin ore. This place is situated on the Lualaba, a short distance below the Nzilo Gorge, and at the junction of the Lufupa. The tin workings had been stopped by

Mr. WATSON on his own initiative, for fear of the white men being infected by sleeping sickness. I found Palpalis in fair quantity on the bank of the river (Mr. SHARP told me that they had been found at the furnace which is about 50 yards from it) and morsitans further inland in the camp and surrounding country. When at Ruwe I found a native who had been working here, Kaniki by name, with trypanosomes in his glands, but failed to find anything further among the few others left here, although they had been here some months with him. I also examined some of the fly, and did not find them infected, but this goes for very little. It is, therefore, very unlikely that any harm had been done here although there had been both Palpalis and trypanosomes side by side. Mr. SHARP says there is some variation from time to time in the amount of the fly as has been observed elsewhere.

I should recommend if work is to be resumed :

1. That the trees and brush be cleared and the grass burnt, being replaced by citronella grass for 1,000 yards on each side of the river by 250 yards both up and down stream from the furnace, and a further 500 yards by 150 yards beyond, and that this space be kept cleared permanently, the citronella grass being cultivated properly. This should be done and the effect on the fly observed before further working is commenced. Originally I thought even more clearance should be made, but I think this enough judging from those clearances I have since seen made and their effects. I have received a reply to a letter I addressed to the Commissioner at Uganda on the subject of citronella grass as follows :—

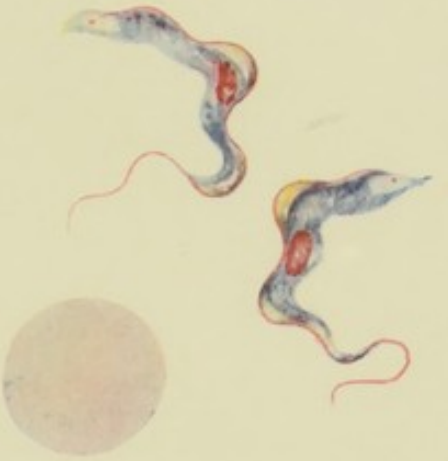
23rd September, 1907.

"I am directed to acknowledge receipt of your letter dated 10th July last requesting information respecting the success of our experiment in planting citronella grass on the shores of Victoria Nyanza, as a means of keeping the foreshore clear of rank vegetation in areas infected by Tsetse fly.

"The fly has disappeared from localities which have been cleared of bush or forest and planted with Citronella grass. Up to the present the fly has not recurred in places where this grass has been planted and kept clear of weeds; the experiment therefore may be looked on as successful.

"The technical name is *Cymbagon Nardus*."

2. That a doctor be in residence whose duty it should be to examine all white men, and incoming or outgoing boys, as well as frequently to examine boys while working there. To make frequent experiments with the fly on monkeys, &c., and to ascertain if any



TRYPANOSOMA GAMBIENSE
AND ERYTHROCYTE

fly were infected and to note whether there was any fly on the cleared areas or in the neighbourhood of the workers.

3. That if the paths through the area of work (which is small) are used by the natives other than the Company's workers, they should be diverted and watched, and that police should arrest all boys found in this area without a special Busanga ticket.

From Busanga I proceeded North, crossing the Mutendella River and finding Mr. ROBINS engaged in prospecting for diamonds. This river has Palpalis on it for a few miles from the Lualaba, but I found none of the workers infected, although working among the fly, which however was sparse.

From here I proceeded parallel to the Lualaba going northwards and crossed at Funda Viabo's (where Palpalis exists) and then eastwards across the South Kaluli (where I again found this fly) to Mazanguli camp. Here I found several cases of Sleeping Sickness coming from the infected region North and North-West of this place, but no evidence of infection of fly in the immediate neighbourhood. The camp is well placed on high ground. Morsitans is present in fair numbers. The place where I crossed the South Kaluli and found Palpalis is, however, only two miles off. This tends to show Morsitans does not convey the disease.

From here I trekked S.E. to Katé's, where I found my son, who had been left to study Glossina.

I had seen sufficient of this part of the country to recognise the importance of determining exactly the location of Palpalis, and I therefore arranged with him to investigate the S. Kaluli and the Lualaba Rivers southwards of where I had been (this had already been done N. of Malonda as already stated).

The result of his investigations showed on the Lualaba that Palpalis existed up to the Nzilo Gorge, but was absent beyond for 30 miles, and that on the S. Kaluli the fly was abundant for a long way up wherever the banks were suitable to its habits.

Kambove to Kaparowe, Koni and Lukafu.

I then returned to Kambove, being anxious to investigate the Lufira, as I had by this time received specimens of Palpalis from the Koni Hill Mission.

After making ready, I left on 15th April, and proceeded to Kaparowe, the crossing of the Lufira formerly used by carriers from North Eastern Rhodesia and the East Coast *via* Chinama on the Luapula, with the object of ascertaining if this was free from fly, so that the road might be altered back to this if Koni, &c., were really infected.

I found no Palpalis at this crossing, but could not stay sufficiently long to make absolutely certain. The observation, however, was afterwards confirmed by my son, who made an exhaustive examination. From here my journey was down the river to Koni, during which the weather was very rainy and cold, and I travelled through much swamp and flood-water; this is not conducive to the activity of Palpalis, but I think that my observations are correct, and that the fly commences between Tsunka's and Lakushi's. I did not find it down to the former place, but it was successfully captured at the latter, and from that point Northwards down the river. The country between the two begins to change to marshy flats and sparse trees on the bank from solid banks and thick tree growth, which would tend to corroborate the observation. It was in fair numbers at the Koni Hill crossing. At the latter place I was hospitably entertained by the Mission, and examined their people, but did not find a case.

From here I proceeded to Lukafu finding Palpalis at the crossing of the Kafira River. At Lukafu I was hospitably entertained and every facility for investigation accorded to me.

The outcome of my examinations here of the natives employed at the Post and the surrounding villages, and of the caravans coming in, was as follows:—

	Palpated.	Examined under Microscope.	Infected with Trypanosomes.	To be kept under observation.
Sunday market at Lukafu, 28.4.'07	211	4	1	omitted
Mwenda's	515	27 (less 3 absent)	9	9
Soldiers' wives at Lukafu ...	193	24	7	8
Mukabwa's	15	1	0	2
Lupemba's	15	2	1	0
Workers, messengers, boys at Lukafu	181	16	3	10
Dikuku's	187	12 (less 2 absent)	6	6
Balubas, Government carriers	74	29	21	omitted
Chamunda's	154	35 (less 1 absent)	22	8
Kikonqaluka's	69	2	0	0
Talashia's	68	12 (less 1 absent)	8	2
Wakinwa's	55	5	4	omitted
Kilima, old soldiers' village ...	16	4	0	1
Gang from Bukama, all from N. of S. Kaluli R.	23	3	1	omitted
	1,776	176 (less 9)	83	46

This collection of villages is situated along the banks of the Lufira, the main village of Mwenda being between 4 and 5 miles from Lukafu and very extensive. Some of the dwellings are right on the river, but the majority are further inland beginning at about 100 yards off, and are much scattered. Capt. GHEUR told me that it contained some 2,600 inhabitants, but others thought much less.

I followed the river in a canoe from Mukabwa's to Lupemba's and found fly all the way except for about 250 yards each side of Mwenda's crossing, which happened to be particularly open and free from trees, and was the spot from which most of the women drew their water.

There are Shambas for a long distance up and down the river, giving the fly an excellent opportunity to infect the cultivators.

The women who draw water, wash and bathe among the fly at Mwenda's were not showing signs of infection (other than those who had travelled), and it is probable that the fly was not yet infected, though of course I may have come on the scene during the period of incubation, the length of which is uncertain. At the same time, owing to the presence of so many infected persons among those who had been to Bukama, the fly would almost certainly become infected.

The villages of Talashia, Chamunda, and Wakinwa, together with Kanzena, were however undoubtedly endemically infected, by which I mean there was an interchange of trypanosomes between the population and the fly, seeing that both sexes and all ages were infected without any record of any journeys into an infected country.

I was unable to account for this difference between these villages and Mwenda's in this respect, but subsequently I learned that Chamunda's was the place where the Baluba carriers used to cross and sleep before they changed to crossing at Musungo wa Panda. Kanzena is just opposite Chamunda's on the river, and the other two are quite close, as the accompanying map will show.

The soldiers found infected were sometimes natives of infected regions in the far North, and had usually in all cases travelled through infected regions in the course of their duty.

Lukafu to Sampwe's.

After leaving Lukafu I proceeded Northwards down the Lufira as far as Lufoi, soon after which the river runs in marshes without defined earth banks as far as the junction of the Dikulwe—something like 35 miles—and consequently does not harbour Palpalis. I met Mr. SHARP here and we

followed the Lufoi River up on to the Kundelunga Plateau and returned to the Lufira by following the Kasanga River, all without finding fly after the lower ten to twelve miles of the Lufoi River. I found one imported case of Sleeping Sickness at Kiaya's on the Kasanga River after examining most of the population on my road from Lukafu and along these rivers. I succeeded in this, owing to the admirable arrangements made for the purpose by Captain GHEUR, whose Lieutenant M. MORIN gave me the best of assistance. In addition to Kiaya's I examined the population of eight other villages.

I arrive at Sampwe Post after crossing the Lufira, which here is effected through a wide swamp, which has to be navigated in canoes. At this place I found one of the boys employed at the post to be infected—an imported case.

Moving on to Sampwe's village on the Dikulwe I found Palpalis on this river at the village, and down to the junction with the Lufira, where it was also found again for the first time since the Lufoi River neighbourhood, the banks here being well defined with some trees. I examined his group of villages, but only found two cases, both women, and both evidently imported, although here, as previously, a number of cases that ought to be under observation were also found. There was however nothing to show that the place was endemically infected as had been stated some months before in the map mentioned above, and circular to prospectors, but it certainly was in danger of becoming so.

Sampwe's to Junction of Lufwa and Lufira.

After leaving Sampwe by crossing the Dikulwe, we proceeded North and again crossed the Lufira close to the junction of these two rivers at Mukabi's, close to which fly was found, and traced some way towards Kiubo Falls. I then proceeded East and struck the Lufwa River some 10 miles above its junction with the Lufira in the swamp. Here however the swamp had ceased, and well defined earth banks had begun with trees on each side. I did not find Palpalis at once, but only some way higher up, though I think it must exist here also in small numbers.

Proceeding up this river I found fly all the way to Kalongo, but none at the junction of the Luampazhi River. I also found Palpalis on the Luishi, but not past Mfungwe's.

I found two cases of trypanosomiasis, and, as usual, cases that should be under observation. The same two cases belonged to a sub-chief of Mfungwe's, and had already been ascertained at Kambove. This shows the district to have Palpalis and some imported cases, but no endemic infection yet.

After this investigation I proceeded North West, making as straight as possible for Kayumba, and with a view to following the Lufira up to the point where I had left it.

Kayumba to Dikulwe River.

I arrived here on 10th June, and we were told by the natives that a Belgian doctor had examined them about two months before, but had not pricked them with a needle (evidently referring to Dr. POLIDORI's visit), and we had some difficulty in inducing them to submit to puncture of the glands, though after a little this was overcome and the later patients became anxious to have it done. Our camp was situated 150 to 200 yards from the river, and yet I caught several specimens of Palpalis in it. This was not what I had expected from previous experience, but was probably explained by the presence of a luxuriant growth of palm trees connecting the camp with the river. I should therefore advise anyone camping here to pitch his camp much further off, notwithstanding want of shade.

The following is a summary of populations examined, and the result for this part of the river from Kayumba to Luashila :—

Village.	Men, women, children. No. Palpated.	Examined by Microscope.	Found Trypanosomes.	Per cent. of Adult Males examined found infected.
Kayumba ...	152	88 (9 absent)	67	64
Moliavita ...	10*	—	—	—
Katomanga ...	26	19	16	62·5
Kankwebachi ...	29	20 (5 absent)	12	63·6
Kisongwele ...	16	11	9	80
Mutekama ...	49	38	32	75
Kashiama ...	28	17	11	60
Kitumbe ...	7	6	4	66·6
Kipopo	12	12	10	100
Katolo	25	18	15	57·1
Kisasa	15	14	12	100
Mukabi ...	9†	—	—	—
Mwanavuto ...	63	14	11	22·2
Kafwe	24	—	—	—
Charowe ...	37	—	—	—
Mpange ...	26	—	—	—
Luashila ...	19	—	—	—

* Population scared by drunken capitao.

† No time to examine by microscope—6 believed to be infected.

The immense preponderance of males infected was noticeable. The fly is very sparse on the banks and the women do not go out in boats so much as the men—the river being their high road and their fishing ground—so that men are much more liable to infection.

This shows a very heavy infection, and one of some standing, as advanced cases were here found: notably at Kisongwele's, where the Chief, who was in a late stage, had been deposed pending his expected death. It also shows that the disease and infection of the fly had spread about as far South on the Lufira as on the Lualaba from their junction.

This district would form a very favourable spot for the study of the fly and the disease. There is a large population at Kayumba's, and the establishment of a hospital within half a mile would, no doubt, in from three to six months induce confidence in the natives, who would, with a man of tact in charge, come in for treatment, when they would not consent to be detained in a lazarette, say, some hundred miles distant from their homes.

Kayumba says he was sent with 100 men from Mazanguli to Ruwe to carry food through Busanga to Ruwe, a few months before our arrival.

Palpalis was found all the way down the Lufira to where I had found it (as above) near Sampwe's village, as well as Fusca at Kiuba Falls, and 15 miles down, but there were no signs of infection of it after Mwanavuti's. This shows the whole of the Lufira to be infested by Palpalis from its junction with the Lualaba to Tsunka's, above Koni, wherever the banks are suitable to its existence. This fly does not appear to be infected above Mwanavuti's until Talashia's and Chamunda's are reached, which have been infected by an entirely different route as mentioned above, viz., by traffic from the Lualaba, notably Bukama, due to Government caravans, as well as by the exchange of the salt of Mwashia's for the oil of the Lualaba and Lufira palm trees, carried on by the natives.

The Dikulwe River to the Ruwe and Kambove Path.

After fruitlessly searching the Kilombwi River for Palpalis, I proceeded to the Dikulwe, cutting it at Kipanga a few miles above Sampwe already visited as above, and travelled up this River nearly to where it crosses the Ruwe and Kambove path.

I found Palpalis—always more or less sparsely—all the way till between Katé and Chara. Just as on the Lufira, this fly ceases at a point where the character of the banks and their clothing of trees &c. do not change, and at about the same latitude. No Palpalis was found for some 20 miles beyond.

The fly became scarcer and scarcer until it ceased altogether.

Cases were found at Milambo, Chandalala, Pwaki, Mundemba, Kalwa, and Katumba's—all imported.

This residence of infected natives among the fly is very dangerous. I duly reported the facts to Captain GHEUR in hope that steps would be taken.

Kambove and Lukafu.

Arrived at Kambove, I met Captain GHEUR who informed me that Dr. POLIDORI had reported that natives were dying fast of Sleeping Sickness at Bukama, and that corpses were floating on the Lualaba, owing to the native no longer being able to bury his dead.

I arranged with him to erect a lazarette at Bunkeya,* and he promised a large location of Mwenda's people there.

I also met Dr. PEARSON on the 10th July, and had a long conference as to the conduct of work, and agreed as to general policy and arrangements.

Leaving on 17th with my son we proceeded to Lukafu where I arranged the details of the erection of a Lazaret at Bunkeya. My son was to go there and superintend the erection of the necessary buildings, awaiting the arrival of Dr. STOEHR. Captain GHEUR was still hopeful of eventually moving the whole of Mwenda's village, and clearing banks there and elsewhere, and in any case was to send all the infected to Bunkeya.

Leaving Lukafu I proceeded to Madonna, with a view to travel the Luapula to Lukonzolwa, where I hoped to confer with Major WANGERMEE. It was at this visit that Palpalis was captured on the Lukafu itself close to the post.

Madonna to Lake Mweru.

On arrival at Madonna on 27th July I searched for Palpalis in a canoe and found it both above and below the buildings and in proximity to them. I was given to understand that these were the first that had been captured there and identified. I had hoped from what had been told me, that none existed above the Nafunta Falls.

This find left the point unsettled as to where the fly ceased on the Luapula, and as it appeared that I should not have time to go further up to settle it, I determined after consideration to trust to obtaining this information from Dr. KINGHORN of the Liverpool School of Tropical Medicine, who I heard was working on the river. Later I obtained it

* The subsequent removal of this to the neighbourhood of Lukafu looks like abandoning the work on the Dikulwe.

from Dr. SPILLANE, who investigated the river higher up for this purpose. It was to the effect that Palpalis stops near Kapepwe's village, considerably further south than on the other rivers investigated.

I proceeded to Kasenga and was there entertained by M. GOURIS, who made things easy for me, and after walking as far as Kalumba's on N.E. Rhodesian side, went on by an iron boat belonging to the Comité Special, for the rest of the journey to Lake Moero.

The result of my investigations on this section showed that Palpalis flourished on the river as far as Kilolo's and a bit beyond, wherever the banks are at all suitable. After this point the river is bounded by marshy land and rushes, so that the fly is absent for that interval. I found one case that appears to have been infected elsewhere, viz: at Mumene's—a little higher up than Kasenga,—and duly informed M. GOURIS.

Lake Moero.

On arrival at Lake Moero I camped on the first land that was available on the west of the mouth of the river, where it enters the lake, viz: at Kisumbo, and found Palpalis. Here there is a higher slope of land with trees behind a narrow swamp between it and the lake, which shows that the fly may flourish although trees are somewhat separated from water. Leaving this I proceeded in the boat to Kilwa Post,* where I waited some two days for Major WANGERMEE, who was expected from Lukafu, and occupied my time in examining the inhabitants of the post and the villages on the shore of the lake to the south. Palpalis was found in fair numbers.

3 cases were found at the post.
2 ,, ,, ,, ,, Kilomba's,

as well as suspicious cases in addition. These appeared to be all imported cases, with the exception of the case mentioned in next paragraph.

Here the difficulty of deciding as to where a native has been infected was well exemplified in one particular case. The native always fears to tell you the truth about his travels, and this is specially so with women. One infected woman insisted that she had never been further than Lukonzolwa, and I was unable to prove otherwise, though it is quite likely to have been so.

From here I accompanied Major WANGERMEE to Lukonzolwa where Palpalis was also found. I remained there some days and examined the inhabitants and those of the surrounding villages. I found twelve imported

*NOTE.—Palpalis had been previously reported from here, as well as at Lukonzolwa and Pweto, in accordance with the map handed to me at Brussels.

cases. I recommended that the Ambatch which grows on the shore of the lake at the foot of the cliff on which their station is built, should be cleared away, and if the fly did not thereby disappear, to further remove all growth up to the summit of the cliff. I afterwards learned that this was done with satisfactory results.

Here also I had a long conference with Major WANGERMEE as to the position of affairs, and as to what had better be done with the staff at our disposal. It had been announced that there were to be four medical men provided from Brussels, three of whom were to arrive in October, the fourth being Dr. ASCENZO, who was in the country. It had been settled that three of these should be placed at posts considerably north of the infected line of contact with the uninfected area. This would have left the mining interest to itself to endeavour to stop the advance of the disease. After much discussion, however, Major WANGERMEE decided to accept the recommendations detailed in the following letter, addressed to him at his request by myself, subject to the approval of Dr. ASCENZO, who eventually gave his assent, as is related below.

"LUKONZOLWA,

"*19th August, 1907.*

"Major WANGERMEE,

"Représentant du Comité Special,

"Lukonzolwa.

"DEAR SIR,

"In accordance with our conversations, I now put in writing the suggestions made by myself, to which you have given so kindly a provisional acquiescence.

"The four doctors of the Comité are to be placed as follows with the following duties, in respect of Trypanosomiasis.

"1. The principal officer of the four to be placed at Lukafu, where he will superintend the removal of villages and the clearing of the banks of the Lufira (where undertaken), and the inspection of the inhabitants from time to time. To visit the posts of the other three medical officers. To locate 'Glossina Palpalis' whenever possible. To examine any batch of labourers recruited at Lukafu. To send any infected cases found to their affiliated Lazaret after injection of Atoxyl. To endeavour to discourage communication between the natives South of Mwanavuti's village and those living there and North of it. This being the most Southern village endemically infected.

"2. One Medical Officer to select a site and superintend the building of a Lazaret at Kilwa, well inland away from the fly. To receive the cases of sleeping sickness found on and in the neighbourhood of the Luapula and Lake Moero, and to treat

the same. To examine all crews of the steamer and barge arriving and leaving Kilwa. To superintend the removal of villages and the clearing of banks of the Luapula. To examine the soldiers and staff of Lukonzolwa periodically as well as the inhabitants of villages on the shores of the Luapula and Lake Mweru between Pweto and Kasenga. To take precautions that the crew of the steamer do not run any chance of infection at Pweto. To locate the fly. To inject Atoxyl before removing infected cases. To discourage the intercommunication of the inhabitants of the most Southern infected village with those South of it.

"3. One Medical Officer to be located at Bunkeya to establish a Lazaret, to take over the cases found on the Dikulwe and Lufira Rivers and South of it generally. To superintend the removal of villages and clearing of banks on the Dikulwe, and as in Nos. 1 and 2, to locate fly, inject Atoxyl, discourage intercommunication, and generally inspect natives.

"4. One Medical Officer to be located at Funda Viabo on the Lualaba or other most suitable spot in the neighbourhood to establish Lazaret—his other duties being, ceteris paribus, the same as those of No. 3.

"Generally removal of villages and clearing of banks to be in discretion of and under direction of Chefs de Poste. The amount of such clearances should be not less than 300 meters on each side of village and on both sides of the river, and 100 metres deep, to be planted with Citronella grass, and kept in good condition. If the village is 100 metres from river, trees may remain in the village itself.

"The personnel of all Ulendos should be examined where possible. All cases being inhabitants of villages south of the southernmost endemically infected village should be rigorously watched against escape from each Lazaret.

"The removal of villages as against the mere clearing of banks must be decided each in its own merits after conference with the Chef de Poste, but it is far more urgent where the river is large enough for boats to pass up and down among the fly. The disease is advancing up the rivers from the North, and the general object of the above is to prevent any further endemic infection of villages further South than is now the case.

"I fear it is impossible at present to attack the questions (1) of importation of food and the moving of Ulendos generally from the infected to the uninfected zone, and *vice versa*; (2) of attempting to treat the disease in infected districts and at the same time of prosecuting research in the matter of treatment and of the life history of the fly and of the organism.

"The medical officers should be instructed to make observations as to whether Glossina Morsitans can convey the disease.

"Yours sincerely,

(Sgd.) "SHEFFIELD NEAVE."

Unfortunately, however, none of the three doctors had arrived when I left the country late in November, and I afterwards learnt that only two were at first sent out. I make this remark, as it is now evident that Major WANGERMEE and his successor will not have been able to carry out my recommendations until the disease will have made some progress Southwards.

Major WANGERMEE also told me that he had stopped all caravans from Bukama almost immediately after the one from there that I found infected at Lukafu had started, and said that all stores would go to the W. Government posts (Kayoyo and Lulua) from Kasenga, which should much assist in preventing further infection down the Lualaba river.

During the whole of the time I was with Major WANGERMEE, he entertained me most hospitably, and did everything he could both to forward my cause and for my own individual comfort, and my sincere thanks are tendered to him therefor.

Leaving Lukonzolwa by land, I travelled to Luanza, where Mr. CRAWFORD, who has been in the country some 18 years, is head of the Garanganza Mission. He told me that his village is on the boundary between the Baluba and Awemba, who are not very friendly, so that there is very little intercourse with the North, and promised to do his best to reduce this to a minimum. (On the other hand I found the path from the North much worn).

He and his wife entertained me very kindly, and were very energetic in their assistance. They are situated in a very nice locality and climate. I showed him how to examine the gland juice, and he was to send for a microscope for the purpose.

As the Government communication is by water, the circumstances are very satisfactory for reducing communication between North infected areas and those South. It is however absolutely necessary that Lukonzolwa and Kilwa should be freed of their present cases, and the fly at these places should not get infected.

At Luanza I found two cases as well as a number of suspicious ones. Palpalis, too, was found on the shore. Both these cases were infected elsewhere. I only had the opportunity to examine a small fraction of total inhabitants, but I think Mr. CRAWFORD will now be able to do a great deal in identifying the disease.

Following the shore of the Lake North by land, I crossed the Luvua River, and arrived at Pweto. Here I found a large number of cases, and came to the conclusion that Palpalis found on the shore was

infected ; in fact, that the place is an endemic centre of infection. There was a Lazaret here with patients in every stage of the disease, but no doctor as yet.

Having had a letter from Dr. SPILLANE, Principal Medical Officer of North Eastern Rhodesia, wishing to see me, I left Pweto by steamer, kindly put at my disposal by the Comité Special, and arrived at Shienje in North Eastern Rhodesia, where I had only a very short time, and only the opportunity of examining a few of the inhabitants. I found a number of suspicious cases, but had no time to examine them microscopically. From here I proceeded by steamer to Kalongwesi.

To sum up as to Lake Mweru. There appears to be Palpalis on the shore wherever it is at all suitable to that fly, but the South part of the East shore is composed of marshes and reeds, and there, therefore, it is probably absent. Dr. SPILLANE later on visited the island of Kilwa and found the fly in great numbers. He also told me that besides the fly I saw at the mouth of the Kalongwesi, it extends up that river among the large population that exists there. He also found some cases at Shienje. Thus the present state of this lake, with an endemic centre at the North end and a number of imported cases in the other parts of its shores, is a great danger to the country.

At Kalongwisi I met Dr. SPILLANE, and conferred with him as to the large number of loads left at Madonna in consequence of the edict that no more North Eastern Rhodesian men were to cross into the Congo. I gave him every information as to the infected localities, and pointed out that there would be no danger of infection if the route by the crossing of the old Chinama Road at Caparowe's were taken, as it would be free of Palpalis and Kambove was quite safe in this way. In the end, after much discussion, he agreed to recommend that these loads be carried by North East Rhodesian natives to Kambove under certain restrictions and arrangements as to food which was of immense importance to the Union Miniere and Tanganyika Companies. I raised also the point of North East Rhodesian natives returning to work in the mines. He was not however prepared to discuss this matter, but said that the Administrator and himself would be ready to deal with it at Christmas after the completion of his then journey of inspection if I would go to Fort Jameson for the purpose at that time.

This being concluded, I started on to go to Bunkeya to attend to the Lazaret that my son and Dr. STOEHR were building. I took with me a number of patients who had no chance of treatment at Lukonzolwa. I chose the route along the Kundelungu Plateau to find a path free from fly,

and in view of ascertaining if Morsitans was present. I found this plateau is a long flat surface over 100 miles long and from 30 to 60 miles wide, and of over 5,000 feet elevation. The climate I found delightful for Europeans but too cold for natives, and it is absolutely uninhabited. It is very well watered, chiefly by pools found in thick patches of wood called Msitus ; in fact, wherever there is such a patch one may be sure of water and a suitable place to camp. Many rivers have their source in this plateau running E. and W. into the Luapula and Lufira respectively, and the sheer precipice by which it is bounded to a great extent, showing it to be composed of horizontal red sandstone, has a large number of fine falls where the rivers pour over the sides, though in some cases channels have been cut by them forming accessible approaches and easy gradients. There is an immense area of rich grazing ground, and some suitable for cultivation if a little draining were done. The latter is not understood by natives.

I found no Palpalis but much Morsitans while approaching the plateau and while ascending the sides, but none on the high ground, and the place would be very suitable for grazing (there is much fat game) and for a sanatorium for white men during convalescence, in such cases as are suitable to a bracing climate.

The native paths all cross the breadth of the plateau from E. to W., and there are none running the length of it from N. to S., the direction I took, and I had to travel by the points of the compass. No doubt a white population will eventually occupy this area, and it will become valuable with the advent of railways. As cattle thrive both at Lukafu and Lukonzolwa, there should be but little difficulty in finding a fly-free route on to the plateau.

Bunkeya, 11th September to 10th November.

After spending a day at Lukafu I arrived at Bunkeya on 11th September and found Dr. STOEHR and my son. Some of the necessary buildings had been erected and a number of natives were under treatment.

Dr. STOEHR had been without atoxyl until quite shortly before my arrival. He had occupied some of his time, however, in making a journey of about 14 days to examine the question of transmission by Morsitans, as I had instructed him by letter, but he had not reached the main points.

My son had chosen a hill for the Lazaret, with the concurrence of Capt. GHEUR, and had been engaged on the superintendence of the buildings. I now instructed him to proceed to the Rivers Lubudi and Lufupa to

endeavour to find if Palpalis stopped on them at some point in the same way as on the Lufira, Dikulwe and Lualaba now already defined.

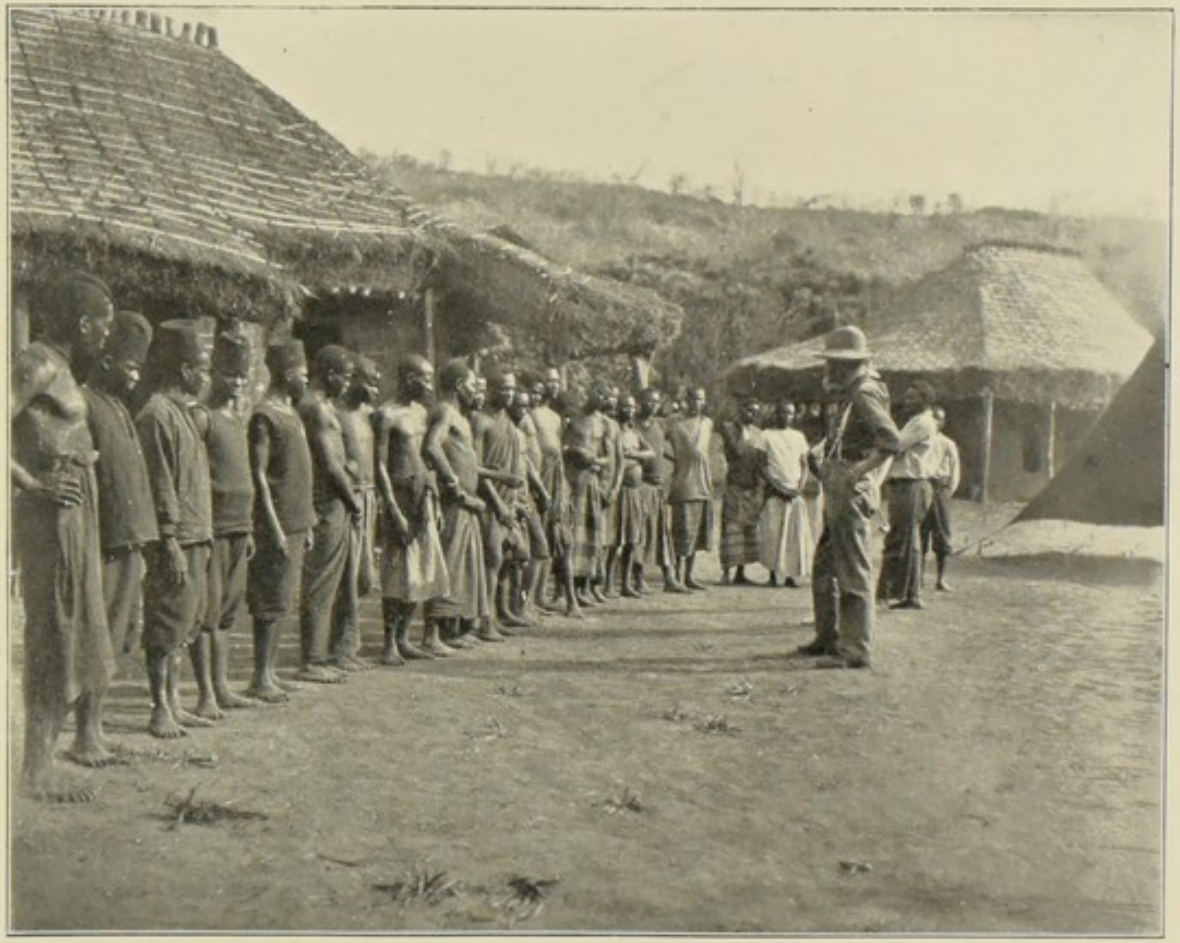
For myself I remained here off and on till 10th November, when I left for good. During this time I obtained some further experience in the treatment of the disease, but unfortunately I had to be much away and my time was much broken. Thus I had to pay a visit to Kambove, 50 miles off, to see Mr. BERTHOLET and pay the monthly visit due by Bunkeya to Kambove, and return ; to pay a visit to Lukafu, also 50 miles off, to treat Capt. GHEUR and to return ; and to make a 200 miles tour of investigation *re* Morsitans.

These expeditions, which occupied 7 days, 10 days, and 10 days respectively, were made while I was endeavouring to study the treatment of the disease ; during my absence Dr. STOEHR remained to carry out the work at Bunkeya.

I regret to say that during this period several caravans from Bukama came through with infected porters on their way to Lukafu, notwithstanding the order given by Capt. GHEUR to the contrary. Notably the caravans of Mr. MEEK the Judge (9 cases) and Dr. ASCENZO (10). This therefore shows that this communication, which has been so prejudicial in the past, cannot be considered to have been closed, and may be presumed to have been still spreading the disease.

During my visit to Lukafu for the purpose of treating Capt. GHEUR'S hand, I had a conference with him and Dr. ASCENZO in accordance with orders from Major WANGERMEE. We were in complete accord as to the advisability of placing the Lazarets at Funda, Viabo's, Bunkeya and Kilwa from a medical point of view. Dr. ASCENZO pointed out there would be administrative difficulties in respect of feeding such posts, but this of course was not in the medical sphere of action, and had been decided on by the Administration. Dr. ASCENZO was to locate and build the Lazarets at Funda Viabo's and Kilwa, and report his views on the above difficulties.

My tour *re* Morsitans was on this wise. Chamunda's on the Lufira close to Mwenda's had undoubtedly been infected as demonstrated above by caravans coming from Balubaland, this being the regular route (Capt. GHEUR informed me) before they crossed as now at Musungo Wa Panda. To reach this point their route lay through a number of villages between the Bianco Plateau and that village. Many of these are infested with Morsitans, and if the latter had been capable of infecting with human trypanosomes, these villages would have been undoubtedly centres of endemic infection more especially Mkaba Kazari and Kalalangombe. In fact a natural scientific



SLEEPING SICKNESS PATIENTS—EARLY STAGE.

experiment had been unintentionally made by the natives on a large scale which is of far greater value than any laboratory experiments of artificial infection. The result of my investigation was most satisfactory, as I found there was no evidence at all of any such endemic infection, and I consider this to be by far the strongest piece of evidence yet adduced as to the power of transmission or the contrary by this fly in nature—an important point much discussed at the time of my leaving England.

The number of patients varied very much, the maximum being about 90, and there was much difficulty at the latter part of the time in retaining them for treatment, as they were mostly in an early stage, and did not feel ill, but were desirous of returning to their homes to cultivate their gardens, this being the time of year most important for the purpose. They were nearly all capable of work, and were employed on the buildings, &c., and received wages, and for a time were quite contented. There were also a number of soldiers who had mostly brought the disease from the N. Congo, and these were employed in building their own quarters where they lived separately from the others.

An attempt was made under Mwenda's brother Titanika to form a settlement of patients from Mwenda's village, but of the 61 cases I had previously found in his group of villages, only 10 were sent to us, though we had a number of others from the same places. This shows that the disease was probably spreading all the time at Mwenda's to an alarming extent.

TREATMENT.

BATCH A.

Atoxyl. Six doses of 5 grs. during 14 days—14 men, followed by $HgCl_2$, 6 doses gr. 1/16, increasing to gr. 1/9 during 12 days. Five days after course, 4 found to have trypanosomes.

These cases did not suffer from this treatment except three, one of whom complained of vomiting and diarrhœa, and the other two of pain in chest, all for 24 hours only. The ten cases who had lost their trypanosomes were after 10 days put on a further course of Atoxyl, 7 doses 3 grs. increasing to 8 grains, 36 grains in all during 12 days, followed by a similar course of $HgCl_2$, but with Trypanroth as well (2 doses of $2\frac{1}{2}$ grs. and 5 of 5 grs.)

The whole of this treatment extended over a period of two months.

Of these 10 cases one became somnolent after the second dose of Atoxyl, and did not have the $HgCl_2$ course, but was treated as below.

The remainder were examined after the second Atoxyl course, together with the remaining four, and all found to have no trypanosomes in gland juice. However, a week after the second Perchloride course, two of the above 10 were found with trypanosomes returned, while of the above four only one still had trypanosomes.

The somnolent case was treated with cyllin injections subcutaneously and into the cerebrospinal canal. The former caused a good deal of local pain; the latter gave no symptoms. He seemed to improve somewhat, but not more than may occur temporarily in such cases even without treatment. Thirty-six days after commencing the somnolence, Trypanosomes had disappeared from gland juice and peripheral blood. Dr. STOEHR however reports his death about 14 days after I left.

I had the cerebrospinal canal injected with Afridol Blue, and Dr. STOEHR reports that the pia and surface of brain at the base were stained as far as the optic thalamus. Meningitis was pronounced. This tends to show that the introduction of medicaments into the spinal canal may, notwithstanding the occlusive tendency of Meningitis, reach the coverings of the brain.

He also reports that the case that had been resistant to Atoxyl eventually lost his trypanosomes under treatment with Afridol Violet and Afridol Blue with some urotropin.

BATCH B.

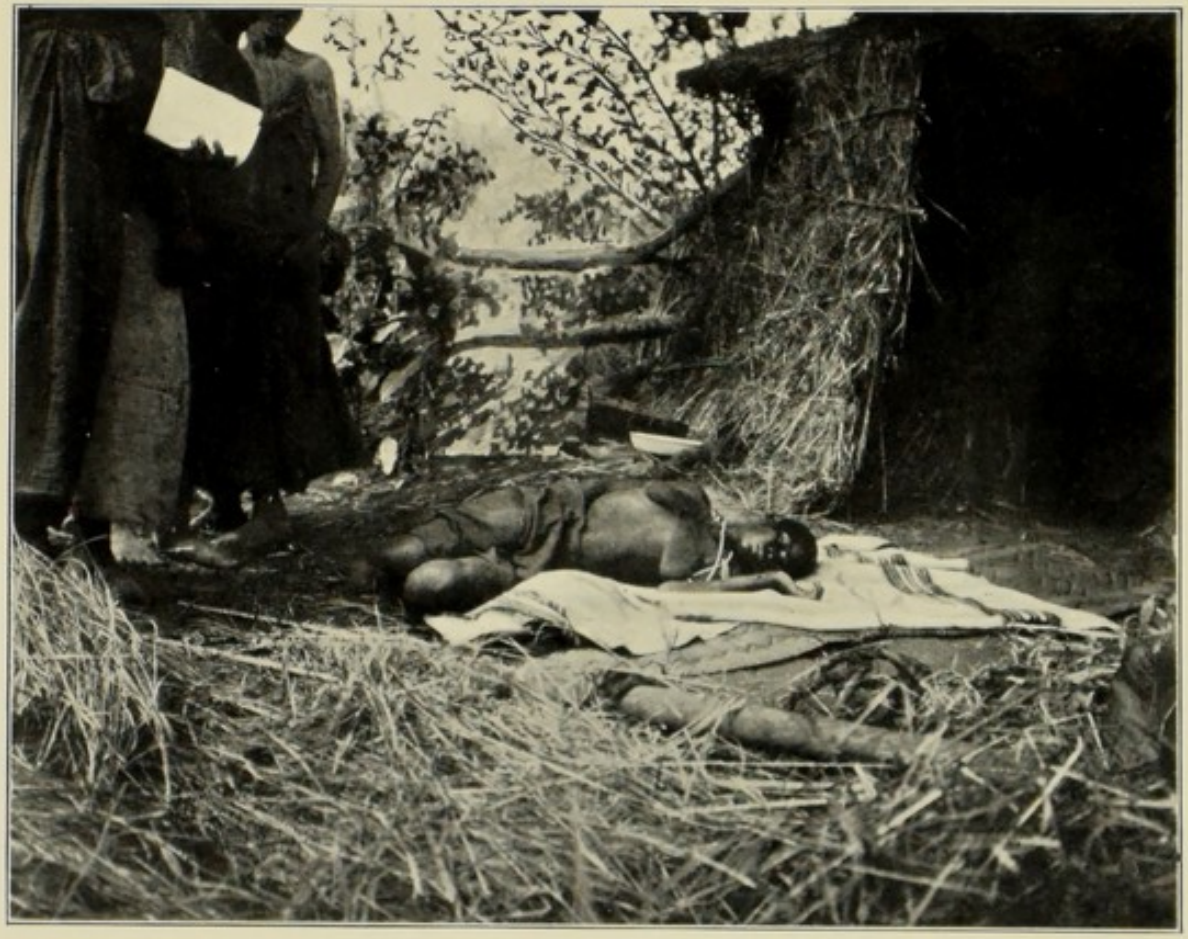
Four cases were treated with Atoxyl, 6 doses 7 grs. each, gradually raised to 15 grs. each, all given in 12 days; 64 grs. in all.

After this course one became blind from Optic Atrophy and died shortly after. He had been having fits and probably died in one, but had had no other sign during life of the meningitis that was found P.M.

The other three suffered from dimness of vision, swimming of objects seen, pain in legs and unsteady gait, which however passed off in from two to three weeks.

The above course was followed by one of cyllin, 5 doses in 14 days, which caused painful lumps. In one case this course was interfered with owing to an attack of dysentery.

After these two courses trypanosomes were found to be absent on microscopic examination.



SLEEPING SICKNESS PATIENT—LAST STAGE.

Of these three one ran away when I left, and the other two were reported to be in good health by Dr. STOEHR on 1st January, 1908.

BATCH C.

A batch of five patients were given the same large doses of Atoxyl as the last (at the same time), at the end of which they suffered from Epigastric pain, tender abdomen, rapid and shallow respiration and weak pulse, the whole pointing to heart failure; from this however they recovered, but were then also found to have some slight difficulty in seeing and walking. After an interval of 14 days they were treated with three doses of gr. 1/20 Osmic acid during eight days subcutaneously. After which, in two cases, the eye symptoms increased with pain. This lasted for about 14 days, when they went to work again, apparently in good health.

The examination for trypanosomes was then negative.

One dose of Atoxyl 9 grs. every week, together with a course of mercury, were given during November and December, and Dr. STOEHR reports them in good health at 1st January, 1908.

BATCH D.

Two patients were given seven doses of S.A.P.A.,* commencing at 1 gr. and rising to 6 grs., 25½ in all, followed by a course of mercury perchloride and trypanroth as in the previous cases, Batch A. This treatment failed to make the organisms disappear.

BATCH E. & F.

Nine cases were treated with seven doses of Atoxyl, beginning with 3 grs. and finishing with 7½, 36 grs. in all, in a period of 14 days, followed by the usual course of $HgCl_2$, as above, together with Trypanroth. Of these, five ran away after treatment before they could be examined; the remaining four were found to be free of Trypanosomes.

BATCH G.

Five cases were treated with six doses of 3 grs. of Atoxyl in a period of seven days, followed by the usual $HgCl_2$ and Trypanroth course. (Two of these had had Atoxyl at Bukama, amount not known), five days after these courses, examination for trypanosomes negative in all five cases.

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* *Sodium Amino Phenyl Arsinate*, sent to me for trial by Messrs. Burroughs and Wellcome.

BATCH H.

Twenty-one cases were treated with seven doses of Atoxyl, beginning at 3 grs. and rising to 7½ grs., 38 grs. in 14 days, and were all except one found to be free of trypanosomes after this course without any bad symptoms in consequence of the treatment—one having run away. This was followed by a course of Silver Nitrate by the mouth in seven cases, and Mercury Cream in thirteen cases till I left, after which Dr. STOEHR reports that they were put on Atoxyl and Mercury, that several ran away, and the remainder were in good health on the 1st of January 1908.

The one case that retained his trypanosomes was put on a course of S.A.P.A. (Sodium Amino Phenyl Arsinate).

BATCH I.

Four cases were given S.A.P.A., (Sodium Amino Phenyl Arsinate), five doses of grs. III, and two doses of grs. V, grs. XXV in fourteen days, and found to be free of trypanosomes. After I left they were treated with Atoxyl and Mercury. Dr. STOEHR reports that they were in good health 1st January, 1908.

Experiments were also made with short courses of Urotropin Sodium Salicylate and Iodoform, but without success. A case also that arrived in a somnolent state succumbed, treatment with Atoxyl and injections of Cyllin into the cerebrospinal canal being of no avail.

To Kambove.

I left Bunkeia on 10th November, and proceeded to Kambove, where I met my son and learnt from him that he had traced the fly to Chianda's village on the Lubudi and Ndomina's village on the Lufupa, but had found it absent further up these rivers. He had, however, been hampered by the hostility of the natives.

Kambove to Fort Jamieson.

I then set off for Fort Jamieson on 17th November to see the Administrator and P.M.O. of North Eastern Rhodesia on the subject of sleeping sickness and the return of their labourers to the mines in Katanga. I arrived there on 16th January, 1908, having done a certain amount of investigation on my way which would tend to show the absence of Palpalis after passing the Luapula and its tributaries. I travelled north of Lake Bangwelo and my son south. His report also confirmed this point. On

CHILD GRAIN CARRIERS.

the other hand, I was informed there is good evidence that the fly and the disease exists on the West and South shores of Tanganyika.

I had several conferences with the Administrator and P.M.O., with the result that the former (who entertained me most kindly) was to write recommending the return of the labourers under certain restrictions. The arguments in favour of this are as follows :—

The route via Madonna and Kaparowe to Kambove passes through a district where there is no endemic disease within miles of it, and it is only at Madonna where it crosses any river where fly exists, and here the banks have been cleared effectively, and the natives on arrival here will be properly supervised.

Thus, provided the route is adhered to, there is no danger of infection being conveyed to the travellers.

The prohibition to natives to cross the Luapula at Madonna—the former recognised route—only leads to the opening up of many small illicit crossings that cannot be supervised.

The suggestion that the Luapula should be closed to natives to cross as a whole, and canoes burnt, is utterly futile unless some thousands of white men be detailed for this duty. In places the river can be forded in the dry weather, and the square miles of swamp which exist in places on each side, afford cover for hundreds of canoes that could never be found by search. Again, the natives on one side have close relationship with those on the other, and often shift their villages from one to the other according to whether they prefer the taxes of North Eastern Rhodesia or the Congo, so that their Cousins and Aunts are often on the opposite side, and it would be impossible to prevent communication without a patrol night and day for every 100 yards, and if these police were natives a bribe of a yard of cloth would effect the object of the man wishing to cross.

So that it is obviously a better policy to have one or two supervised main arteries where the fly has been abolished, than many illicit small ones where the fly exists. For it must be remembered that if work exists on the Congo side, that the North Eastern Rhodesian native wants, he is certain to get across in some way or another, in order to obtain the trade goods that his soul lusteth for.

If the two countries work in accord, a proper pass system can easily be arranged, by which each individual will be able to work only with the consent of both parties to his travelling and working, and be medically examined from time to time on both sides.

It appears to me that the proposition can only be opposed on the ground

that the history of the spread of sleeping sickness shows that it has followed routes which are infested by fly and have been opened up for trade &c., while as a fact the route proposed does not come under this heading, neither will men who can be recognised as infected be allowed to pass along it. This opposition would be due to the rigid application of general ideas without a full knowledge of existing circumstances which is always a necessity to good administration. It is absurd therefore to say that this method of communication must be stopped, merely on the ground that it was by communication between infected and uninfected areas that the desease has been spread in the past. In this case the communication will not be between infected and uninfected areas.

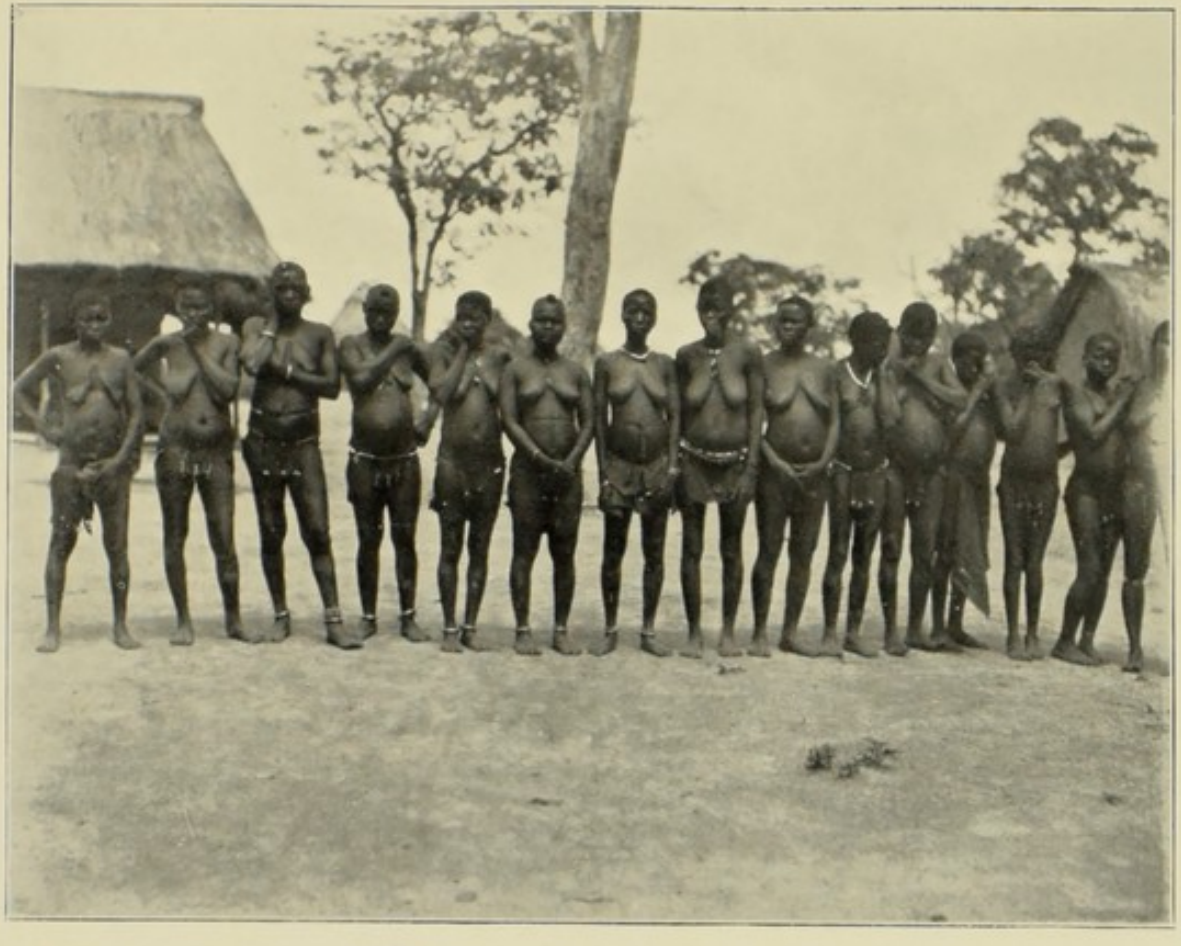
From Fort Jameson I travelled to Kota Kota down Lake Nyassa and the Shire to Chinde.

On my way I stayed a night with the Governor at Zomba, and discussed the question of sleeping sickness and its possible invasion of B.C.A. He kindly gave me every information, which showed that the search for Palpalis so far had been negative. My own observation of the shores of Nyassa would tend to show the absence of Palpalis, wherein I was confirmed by information obtained from those who knew the lake. I think it, however, a pity that a proper investigation by a competent man of the whole shores of this lake by steamer, or otherwise, is not being made, in order to make the matter a certainty, as, if the fly is absent here, the lake should form a very good barrier opposing the march of the disease.

General.

Technique. In the matter of obtaining gland juice I found the following plan better than that usually advised: An all-glass B. & W. ordinary hypodermic syringe was boiled together with its needle in 5% Pot. Cit. solution. The parts were put together and the surplus fluid expelled. The gland was pierced in the ordinary way and the piston *withdrawn entirely* by an assistant,* and the remainder of the syringe withdrawn with the needle; the fluid was then expelled by careful replacement of the piston on to a slide. Clean coverglasses of various dimensions, including some small pieces, were kept ready, and one was chosen in accordance with the size of the drop, that was best calculated to allow of the drop forming a film that would just fill the whole of the glass. In a few cases where the drop was at all inspissated, slight pressure was made.

* S. removed the whole syringe from the needle and then withdrew the latter.



FEMALE GRAIN CARRIERS.

It was easiest to find the organism when the secretion appeared to contain the normal number of corpuscles. The thickness of the film is important, as, if more than one corpuscle thick, the organism is likely to be hidden and overlooked.

Staining was mostly done by Romanowsky when anything more than diagnosis was required.

When the stain used deteriorated by being kept, it lost its nuclear mauve staining (this I find only happens in hot countries). However, it was found that the addition of ordinary meth. blue added to it revived the lost power for about 48 hours.

Ether and other such volatile liquids were found to evaporate through every method of stopping an ordinary bottle, the only satisfactory method being to import in hermetically sealed glass tubes.

In the collection of insects, granulated cork used for packing proved to be very satisfactory in the place of sawdust. In the collection of Mosquitos, in place of a test tube with cotton wool and formaldehyde, a shorter corked tube, at the bottom of which two paraform tabloids were placed under a plug of crushed tissue paper, was found to be more convenient as the killing power lasted a week or two without renewal.

Lymphatic Glands.

It was found that the most typical form of enlarged glands containing trypanosomes was that which included the following qualities :—

(1) A symmetrical enlargement on both sides.

(2) Chain formation as opposed to single glands.

(3) A resilient sensation given on palpation somewhat resembling an elastic distended airball.

(4) Size, about that of a hazel nut, say ; a gland giving the idea of being something a little less than half an inch when taken up in the ordinary way between thumb and finger under the skin.

Individuals were registered as having been palpated by myself ; four sizes being tabulated from those giving the sensation of a number 1 shot to that of a hazel nut, the intervening sizes being likened to buck shot and haricot beans. In 1,327 palpations the percentage of enlarged glands from endemically infected districts was found to be 62·4%, as compared with 3,972 palpations with a percentage of 39·2 where the disease did not exist. On the other hand, in the first list there were more of the two larger sizes, but less of the two smaller.

The following table shows percentage of the four sizes in the total enlarged glands of all sizes :—

	In Infected districts.	In Uninfected districts.
No. 4	39·2 . .	... 1·3
No. 3	17·1 ...	... 13·0
No. 2	19·3 ...	... 26·7
No. 1	24·4 ...	... 59·0

Percentage of the four sizes in total cases examined :—

	In Infected districts.	In Uninfected districts.
No. 4	24·5 ...	... 0·48
No. 3	10·8 ...	... 4·8
No. 2	12·0 ...	... 9·94
No. 1	15·1 ...	... 21·8

This would tend to show that trypanosomiasis is accountable for enlargement of glands of any size, although it is very rare to find the organism under the microscope in any less than the third size,* and this emphasizes the difficulty of passing any native as free of the disease with enlarged glands, however small, if he comes from an infected locality.

But, of course, it is ridiculous to refuse to pass a native with the smaller size glands if he has never been in an infected locality.

In old people and children there was a much larger percentage of enlarged glands than at other ages when due to other causes than sleeping sickness.

These cases also show how ineffective mere gland palpation without puncture and examination under the microscope is towards negative diagnosis.

In these examinations it is always a question whether in any particular case the smaller enlarged gland is a precursor of the larger infected gland. It is unusual to find the organism in a smaller size than the third. It is, therefore, often difficult for a medical man to decide what is to be done with a native, whom he has only the chance of examining on one occasion and cannot detain indefinitely. The matter would be somewhat simplified if he could rely on an accurate history of the man's whereabouts, but on this point a native is usually very unreliable when he denies having been to a certain place.

The question, too, of how far one may be satisfied with gland examination is also not easy. The incubation period is as yet unsettled, and it has been said that it may last for months. Thus, a man may

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* Possibly due to the successful destruction of the Trypanosome by the gland.

have the organism in his body and yet be passed by the doctor as free from disease, if only glands are examined, as these appear to be only an indication of large numbers of the organism in the blood circulation.

Owing to the interval between the infection by the fly and enlargement of glands in man, the whole of my plans for the protection of such and such a village may be frustrated, as it is impossible to say with absolute certainty that the fly at any particular village is not beginning to be infected, however unlikely. On the other hand, to treat all glands enlarged without obvious cause as infected, would be to place nearly half the population under supervision.

Detention of Natives for Examination and Treatment.

This question has many difficulties connected with it. If the wild native is detained against his will, he nearly always manages to escape even when guarded. He has a rooted objection to go where others have died; thus, he seriously looks on a hospital in the light that Mark Twain puts it when he talks of statistics showing that beds are deadly places because so many people die in them. He has no idea of the white man's method of medicine, but considers if he has a pain in his head the doctor should go to his stores and give him headache medicine, without asking more questions, and not require to see him again.

His habit is always to return to his village, and his homing instinct is so strong that if he commits a crime and his village is watched he is sure to be taken there in a year or so at longest, and, if ill, he will deliberately prefer to die on the road to being detained for treatment in a hospital.

On the other hand, in the early stages of sleeping sickness he does not feel ill, and if he is told that he can return to his home in so many months, and is fed and paid for work, he will usually be content (other conditions being suitable) for a period, but he will not remain indefinitely. Notwithstanding, in the quite late stages his village will always be glad to get rid of him.

Map of Palpalis, and Sleeping Sickness areas, and deductions therefrom.

Referring to the accompanying map it will be noted that the principal rivers run from the South to the North, and on the six largest Glossina Palpalis appears to stop as follows, viz. :—

Lubudi River, near Chianda's Village, say, lat.						10°40′,	7 miles beyond found negative.	
Lufupa River	,,	Ndimina	,,	,,	,,	10°25′,	30 ,,	,,
Lualaba River	,,	Nzilo Gorge	,,	,,	,,	10°30′,	30 ,,	,,
Dikulwe River	,,	Chara's	,,	,,	,,	10°30′,	20 ,,	,,
Lufira River	,,	Tsunka	,,	,,	,,	10°50′,	25 ,,	,,
*Luapula River	,,	Kapepwe's	,,	,,	,,	11°30′,	16 ,,	,,

These points coincide to some extent with the plateau descent of the rivers, though of course in places the plateau is much broken. The cessation of the fly coincides with the cessation of certain insects which my son enumerates in his reports to me,† more especially certain butterflies which he places in the Western group in respect of African distribution of Fauna. It is the same thing to some extent with birds. Thus, he says there is good *prima facie* evidence that Glossina Palpalis is a Western tropical inhabitant (as opposed to an Eastern) as it is associated with much of that type here which do not occur on the Zambesi, &c., at the same elevation, and appears to accept the same boundary.

Again, Palpalis ceases as a rule at a place where the character of the bank and the vegetation, as well as of the river, remains the same.

Going East, the next great water system is that formed by Lake Nyassa and the Shire, running from N. to S., which so far have not been found to produce Glossina Palpalis. (Lake Tanganyika is understood to have the disease well established). Nevertheless the Loangwa River must not be forgotten, but so far it has not been found to contain any of this fly. My son is now making investigation of this for the North East Rhodesian Government.

This set of facts requires confirmation by the proper investigation, further south of these points, of the rivers themselves and their tributaries, with all other collections of water. *These points however where the fly ceases, make a remarkable line from East to West, and it raises one's hopes that this is the finish of the fly and that the Zambesi River water system is not contaminated.* I do not wish at present to consider this as more than a theory of mine, but urge the authorities to expend the necessary funds to complete the investigation, so as to be able to state it as a valuable fact if it is one at all.

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* Communicated by Dr. Spillane, of North-Eastern Rhodesia.

† Annexed hereto.

It is obvious that if this theory could be stated as a fact it would be of the greatest value, not only to the owners of the mines, but also to the countries lying S., which would be affected by the spread of the disease, as in the absence of Palpalis I have hardly any doubt that the disease could not spread, and it is they who should assist the work of investigation.

I say this without forgetting what has been said about Morsitans, being the more confirmed in my opinion by the investigation I have related above as to the path of the Baluba caravans to Mwenda's and Mwashia's being free of endemic disease in the Morsitans districts.

The above two facts—if they are facts as I hope,—will be in my opinion much more likely to limit the area of the disease than any concerted action on the part of man if we take the following into consideration.

Retrospect.

It is two years ago since we knew that cases of sleeping sickness had arrived in Ruwe from the North.

To have combatted the advance of the disease only by defensive measures on the enemy's frontier in the best manner possible, it would, in my opinion, have been necessary to have some seven doctors with the assistance of seven other white men (some of whom might have added the necessary duty to that of Chef de Poste). If these had been at my disposal, I should have placed one doctor on each of the Lubudi, Lualaba, Dikulwe, Lufira, and Luapula Rivers, with the other two as travellers. At each post another white man is necessary to act as Chef de Poste. To the other two laymen I should have given the duty of locating the fly accurately (I wish to lay stress on the fact that a young doctor fresh from the laboratory at Brussels or elsewhere is not fit to cope with matters of administration without the assistance of a Chef de Poste. It is not fair on him at the start to leave him by himself in a strange country without some experience of black men, their language and their habits).

All I had, however, by way of assistance was, in addition to my son, one medical man who came out in August, 1907, only, and this when I had to do some general medical work myself at times.

When I left Kambove on 17th November, there were to have been three doctors from Belgium who were, as a compromise, to occupy three posts, while Dr. Ascenzo, in addition to his other duties, was to be expected to direct and inspect them, etc., as described above, and it was arranged that Dr. Stoehr should do the travelling; but these three had not arrived, and it was believed that only two had started and that they would take

four months to arrive. Also I understand Dr. STOEHR has not been considered available for the work.

The proposed arrangement, therefore, was not likely to be in full swing for months, except in respect of the Bunkeya Lazaret which we put into order ourselves.*

Twelve months ago it was arranged at Lukafu, in consequence of my having found some 60 and more cases in the neighbourhood, that these should be sent to Bunkeya, and that the endemically infected villages should be removed, stock and block, that the banks of the Lufira should be cleaned as well as those of the Dikulwe wherever the fly and the villages coincided, and that an effort be made to move Mwenda's people as well.

Lazarets.

I have already explained the difficulties that exist in respect of detaining natives, and the Lazaret is likely to contain but few. The best compromise probably for cases that live in villages S. of the endemically infected regions in the district allotted to the Lazaret is, (1) to treat the patient for some 3 months (or longer according to what experience obtained may dictate) and get rid of the trypanosomes in the glands and peripheral circulation. (2) Then to let him return to his village with provision that he be re-examined within 30 days either at the Lazaret or by the travelling physician.

Where it is possible (as we had commenced to do at Bunkeya) a village should be encouraged to form in the vicinity for the location of any infected that may be induced to stay, together with soldiers and other permanent employees who have come from very long distances, and are not likely to try to get back home so far. Such collections should be free of any taxes and various little encouragements should be given them. In this way they would be self-supporting.

During the building of the post work will be easily found for the patients, and when that is finished they can be employed in growing food, making roads, &c., but probably there will eventually be insufficient remunerative work for them all and this will create further difficulty. The resident medical officer must also have sufficient funds in hand to feed such patients as he may be able to retain in his hospital, and to make them rather more comfortable than in their own villages.

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* I have since understood that this has been removed nearer Lukafu, and that the Dikulwe is left to its fate.

Grass Clearing.

On the whole, while Lazarets will be necessary at the headquarters of the medical officers, I do not think the system will be successful enough to be sufficient in any way, but that reliance will have to be placed on energetic action in respect of clearing the banks of rivers where Palpalis exists, and the removal of villages that are infected as a whole. This will prove troublesome, and each case must be treated on its own merits with tact and firmness. So far we cannot kill the trypanosomes without killing the man, but it appears much can be done by driving off the fly from the neighbourhood of the trypanosomes.

As to the Future.

The personnel will have to have their hearts in the work, and spare no pains or energy. Those who work just sufficiently to conform to the letter of their agreements with their employers, with the mere object of getting their pay and returning home with the least expenditure of exertion, will be worse than useless, as the fact of their being on the spot will lull the anxiety of the world, while the disease will progress onwards round them. The work has a tendency to be disheartening, and it is only those properly qualified men who will doggedly spend all their time in the cause that are likely to succeed, and then only with a knowledge of the native, together with that peculiar tact and firmness necessary in the treatment of him.

The above is what is necessary in the present state of our knowledge, but perhaps the most important point is to try and increase the latter. There is now a very large population existing over hundreds of square miles that is dying off under a disease that is known to take, in some cases, seven years or more to kill, even without treatment. The crying necessity is to set up centres among them for their treatment and the investigation of their disease. Perhaps at the moment not the least important work is on the entomological side of the question. Little or nothing is known of the life history of the Glossina, and what is known has been ascertained under artificial and unsatisfactory conditions. Thus, but few flies have been bred under supervision and that with difficulty. It has been stated that the larva quickly turns into a pupa without feeding, but has its proper food ever been placed within reach? It is well known in the case of other larvæ that they hasten their pupa stage if in unsatisfactory conditions. In fact, one of the most important problems is: of what are the tons of Glossina that exist composed? It is hard to agree with the dictum that they are all formed by the metabolism of blood.

It has been said that Palpalis must be fed every other day with blood to keep it alive, but has it had a chance of feeding otherwise?

Any single new fact in this life history that can be observed by those who have the opportunity would probably be of the greatest importance, and no one with the opportunity should neglect it.

Almost the whole of Africa, and therefore all the European nations connected with it, are much affected by the outcome, and I think it is time for some action to be taken by them in addition to meetings convened annually to discuss theories. Surely it would be more practical to find the funds for a number of medical men and entomologists to study these matters. As it is, it is left to the Comite Special du Katanga, and the Union Miniere, and other Mining Companies. Taking matters, however, as they exist, I think the latter should take the initiative and start the work while applying for assistance from all concerned. The organisation of such an undertaking, and the success of it, would indeed be great results.

One difficulty, even after the collection of sufficient funds which must take time, is the pressure for immediate action owing to the daily infection of many new cases, and the difficulty of obtaining suitable men at the moment. A man who is undeniable in respect of his knowledge and skill in the laboratory, must take some time in learning the ways of the native, and the circumstances of a wild part of Africa, and even if the best men only are sent, only a certain proportion will be successes.

Sundry Details.

About 1,000 blood specimens were obtained from mammals and birds; these I hope to work out later on.

Also a fair collection of insects and diptera was made that will require a good deal of classification.

Very little malaria was seen in the country where the prophylactic use of Quinine is general, but the accessions of temperature, common after alcoholic excess, generally ascribed to malaria, were by no means absent.

Altogether in 13 months, between Broken Hill, where I left the Railway, and Kota Kota where I got a steam boat, I travelled 3,447 miles nearly all on foot, and this of course did not include much other necessary walking. With the exception of some trifling gastric disturbance owing to bad water on two occasions, I did not have a day's illness, and much the same can be said for my son's health.

As to work on Sleeping Sickness, in all parts of the country (exclusive

SHELTER FOR FOOD FOR SPIRIT OF DEAD MAN ON ROAD TO MFUNGWAS.

of work in Lazaret) 7,253 palpations and clinical examinations were made by myself, and 690 microscopic examinations, of which 366 were positive.

In conclusion, I beg to tender my thanks for the cordial assistance and hospitality I received throughout my journey. If it had not been for the active help I received, I should not have got through more than half the work in the time. In every case I received the utmost consideration and courtesy from the officials of the Comite Special and Union Miniere, which was as pleasant to myself as it was conducive to the advancement of my work.

Final Words.

The prophylactic work, as is evident from the foregoing report, has started very late in the day, and is really only at its early beginning. Strenuous exertion for a lengthy period is eminently necessary.

The work of studying the disease and its carrier, Glossina Palpalis, requires to be taken up in this part of the country systematically in a way that is at present totally absent there.

24th May, 1908.

P.S.—I have just read a resumé of the information and recommendations given by Dr. KOCH at the Cenference in London, and I may say that it confirms my above recommendations showing them to be in accordance with the conclusions of others of higher authority.

(*See* Annexe No. II.)

ANNEXE No. I.

REPORT BY S. A. NEAVE, M.A., B.Sc. OXON., F.E.S., ON THE DISTRIBUTION OF GLOSSINA PALPALIS, ROT. DESV. ON THE S. KALULI, LUALABA, LUFUPA, AND LUBUDI RIVERS.

(1) The S. Kaluli River.

This river was visited during the latter half of April, 1907, and observations on it mainly confined to the neighbourhood of Mazanguli Station. In the immediate proximity of the station the river, which is running through a small alluvial plain and with its banks covered with grass, appeared to be free from Palpalis; as also was the crossing by canoe from the station to Mazanguli's village. Above this grassy plain, at a point near Mwanamwate's village, I found Palpalis in abundance on the heavily wooded banks of the river and followed it (perhaps 9 or 10 miles by river) as far as Mulundu's village. The country here is very broken and almost, if not quite, uninhabited, and Palpalis doubtless occurs up to the point where the River descends from the High Plateau. Below Mazanguli station Palpalis reappears at about a mile below Mazanguli's village, is specially noticeable at the rapids near the crossing on the Mazanguli-Busanga road. Below this point Palpalis appeared continuously for 3 or 4 miles and then (the river running in a wide alluvial plain) in patches only. I left the S. Kaluli River some 10 miles lower down.

(2) The Lualaba River.

I followed this river up from a point near Kasanji's Village (some 10-15 miles south of the mouth of the S. Kaluli River) to a point a few miles above the mouth of the Ndeula River.

The Lualaba River in this part of its course may be divided into three regions:—

1. From Kasanji's Village up to Fundaviabo's Village at the crossing on the Mazanguli-Busanga Road, a distance of about 17 miles. Here Palpalis occurs in patches only, viz., in the more wooded portions of the river banks, which are alternated with grassy plains of some size.

2. From the crossing near Fundaviabo's to the extreme top of the Nzilo Gorge (about 66 miles). Here the river runs through broken country and Palpalis appears to occur uniformly throughout it. The river banks are for the most part thickly wooded.

3. From the top of the Nzilo Gorge to a point some eight miles above the junction of the Ndeula River (about 55 miles). Here the river is running in wide grassy plains except for two or three miles a little below the mouth of the Nkando River, where the banks are wooded. No Palpalis was found throughout this region.

(3) **The Lufupa River.**

I visited this river at Chakamulwa's, near Lulua Post, and then some 20 miles lower down at Lukangala's. From this point I followed it nearly to its mouth. The Lufupa River runs in high plateau country until it reaches Ndzimina's Village, near the mouth of the Kamowa stream. I found no Palpalis on this part of the river. Some two or three miles, however, below this point the river descends through a gorge. Palpalis begins to make its appearance here, and occurs almost continuously down to its mouth.

(4) **The Lubudi River.**

I reached this river at Kambata's Village some 10 miles above the junction with the Mkuleshi. Here Palpalis was abundant, and following up the river continued to make its appearance up to a point between Chianda's Village and the crossing on the Lulua-Kaiyoyo Road, near Sompo's Village. At this crossing the evidence was entirely negative, though there was no marked change in the character of the banks.

The Lubudi in this part of its course is a shallow rapid river, with its banks almost uniformly well wooded.

SOME NOTES ON THE HABITAT OF GLOSSINA PALPALIS AND ON THE SIGNIFICANCE OF THE ABOVE MENTIONED FACTS OF DISTRIBUTION.

Upon the four rivers above mentioned I found the existence of Palpalis to almost invariably coincide with a certain type of country and with the characteristic Fauna and Flora arising therefrom. Palpalis seems to be always associated with well-wooded banks, and to avoid the grass-covered banks where the rivers pass through alluvial plains. It seems to be specially associated with rapids, and was often seen basking on the rocks in such localities. In this region, which is comparatively near the watershed of the Congo Basin, these thickly wooded river banks are chiefly found in the more or less broken country through which the rivers descend from the High Plateau. As the rivers descend to lower elevations and (in this region) approach nearer the Equator, the forest areas tend to increase, though they are perhaps not so continuous as in the hilly regions. It appears to me also not impossible that on the lower ground, Palpalis will not be so absolutely confined to localities specially adapted to it, as is the case in this region of Katanga.

In considering the factors which determine the presence or absence of Glossina Palpalis in any part of Africa, it appears to me that the two most important are :—

(1) Elevation with which Latitude is closely inter-related.

(2) The Region (from a Zoologist's point of view) to which the Fauna of the district concerned, belongs.

As regards the question of Elevation, there can be no doubt that Latitude (and to a less extent other climatic conditions such as humidity) must also be reckoned with.

It is thus reasonable to suppose that (other things being equal) Palpalis and the Fauna and Flora associated with it occur at a higher elevation on the Equator than at points 10 or 15 degrees N. or S. of it. In respect of this question of elevation attention may be called to two points in the foregoing account of the distribution of Palpalis as found in Katanga, viz :—

(1) The apparent cessation of Palpalis on the Lubudi River, as one travelled *up* it, *without accompanying change in the character of the banks.*

(2) The non-existence of Palpalis in a suitable but isolated patch of country on the Upper Lualaba near the Mouth of the Nkando River.

In respect of Zoological regions in Central Africa, more especially in that part of it with which we are here concerned, three are generally recognized at the present time :—

(1) The Western Equatorial Region, also known as the West Coast, because much of the Fauna which is characteristic of it was originally obtained from that Coast only.

This region extends along the Western Shore of Africa, roughly speaking from Cape Verde to Benguella, and then over the basins of the Niger and Congo Rivers to the great Lakes, Victoria Nyanza,* Tanganyika, Moero, etc.

(2) The Eastern Region, extending over British East Africa, German East Africa, Nyassaland, etc., with which we are scarcely here concerned.

(3) The Angolan Sub-region, with many South African and some West African affinities occurring over the Southern half of

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* NOTE :—As I have already pointed out of Novitates Zoological 5, XI. (1904), the Rhopalocisa of the Northern and North Eastern Shore is distinctly Western in character, the Eastern Fauna coinciding with the escarpments to the E. of the Lake.

Portuguese West Africa, and, as I hope to be able to show, extending a good deal to the East of the boundaries of that territory.

Now the distribution of Glossina Palpalis, as at present known, closely coincides with that represented by Region No. 1.

With the above facts before us, it is of great interest to inquire into the character of the fauna of Katanga, lying as it does on the boundaries of the Congo portion of the West Equatorial Region, and the Angolan Region.

The higher ground of this country and the upper portions of the rivers where the evidence as to Palpalis is entirely negative appear to enjoy a Fauna which, especially as regards Lepidoptera, is distinctly of an Angolan character. The same may be said, I think, of the other side of the watershed to the South, in the Zambesi basin.

On the lower ground, however, more especially on the larger rivers, the commencement of the appearance of Palpalis coincides with that of many insects, more especially butterflies, of a distinctly Western Equatorial character. This is most markedly the case on the Lualaba River and its tributaries, the Lufupa and Lubudi. I believe the same to hold good on the Lufira River, since the little I saw of it bore out that view. I, however, only visited it for a very short time and at a very bad time of year.

Upon these rivers I took many specimens of such characteristically Western genera and species as *Amauris riarius* L., *A. psyttalea* Plotz, *Bicyclus* sp., *Crenis amulia* Cram., *Pseudoneptis coenolita* Falr, *Catuna crithea* Drury, *Cynandra opis*, *Euphaedra* opp., *Cymothoe* opp., *Telipna* opp., *Belenois dentigera* Butler, *Pseudopontia paradoxa* Feld., and many others. I also found the Fauna in other groups to have a tendency to that characterised on the Tropical West Coast.

This coincidence of Glossina Palpalis with the fauna of the West Coast becomes important when we find that at similar elevations and localities in *the Zambesi basin these Western Tropical forms do* not *occur*. I can at least speak from personal experience of the Kafue, Luangwa and Mid Zambesi Rivers. The Fauna on these rivers is distinctly South African in character, that on the Kafue having also some Angolan affinities. It is, therefore, a fair argument by analogy that Glossina Palpalis does not occur on these rivers, and that we have here, on the Lubudi, Lualaba and Lufira Rivers of Katanga, and on the Luapula and the neighbourhood of Lake Moero, reached the South and South Eastern limits of the distribution of this organism.

KAMBOVE, 1907.

ANNEXE No. II.

DR. KOCH'S RECOMMENDATIONS AS STATED IN A COMMUNICATION FROM BRUSSELS.

1. Employer tels moyens pratiques possibles pour empêcher les natifs de son propre territoire qui souffrent, on sont raisonnablement suspects de souffrir de la maladie du sommeil, de passer sur le territoire de l'autre.

2. Prendre des mesures pratiques possibles pour détenir ou isoler tous les indigènes venant du territoire de Chacun qui sont trouvés atteints de la maladie du sommeil à l'examen medical.

3. Prendre telles mesures pratiques pour empêcher tous les indigènes dans leur territoires respectif d'entrer dans des districts de l'autre pays declarés infectes. De ne pas perdre de temps en notifiant l'un à l'autre les districts infectes.

4. Autant que possible, établir des lazarets dans les territoires respectives vers les regions frontières.

5. Autant que possible, détruire les animaux migrateurs (crocodiles ou autres), capables de servir de nourriciers aux Glossina Palpalis.

ANNEXE No. IV.

TWO LETTERS FROM MR. ROBERT WILLIAMS.

"DEAR DR. NEAVE,

"I have read with great interest your two letters of the 2nd of April from Pande River, and 11th of April from Kambove. It is very satisfactory to note that you are of the opinion that, providing certain precautions are taken, we shall be able to resume work at Busanga. This is encouraging, not only from the point of view of our being able to resume work, but also from the fact that sleeping sickness does not seem to be half so bad in Katanga as was at first thought.

"I have taken special note of the paragraph in your letter of the 11th of April from Kambove with reference to the boys who were partially examined and sent off again to a different part of the country, and no further notice taken of them.

"By this time it is quite probable that their cases will have been forgotten about, and most probably sleeping sickness is now well developed in them.

"I quite agree with you that it is cases like these which make your work much more difficult than it need be, and even actually assist the spread of this disease through Katanga. Strong measures should therefore be taken at once to stop this kind of thing.

"You mention further on in your letter that you have no power to organise a system to do away with this, and moreover, if you had the power, you have not the material to carry it out with. You will no doubt long before this have received my cable sent to you on the 18th of April in which I informed you that the Union Miniere and ourselves fully approved of the suggestions made by Dr. Pearson, as a result of his interview with Dr. Todd, which consultation took place as a result of the cable received from you on the 18th of March.

"You will, therefore, see that you have the fullest authority to organise any system you like by which not only the sleeping sickness that exists in our mineral areas can be stamped out, but also to adopt measures to prevent it entering our Concession.

"As far as material is concerned, Dr. Pearson is at present on his way out with a complete supply of drugs, appliances, etc., and Dr. Stoehr is following him with more. You will therefore see that you have enough material to keep you going for some considerable time at any rate.

"Yours faithfully,

(Sgd.) "ROBT. WILLIAMS."

2nd November, 1906.

"Dear Dr. Neave,

"With reference to the Expedition which we propose to send to Africa with yourself in command to investigate the possibility of Sleeping Sickness breaking out at Benguella, I think that it is very advisable in view of the probability of the rapid development of our mining properties in Katanga and the consequent influx of labour which will immediately set in from all parts of the Congo State, and is of far greater importance to our Company's interest that you proceed at once to

Katanga, instead of going through Angola, and there thoroughly investigate the conditions under which that labour is likely to come into Katanga, in order to report to me as to the advisability of establishing some system which will absolutely prevent the introduction of Sleeping Sickness into our Concession area.

"My own opinion is, and I have already expressed this to the Belgian Authorities, that we should establish "rest-houses" for the natives at one or two convenient points under proper medical supervision and that no labour should be allowed into the country without a proper certificate from the Medical Officer in charge stating that the bearer is free from any virulent or contagious disease.

"I would like you therefore to make this the entire object of your expedition to Katanga, and, if as the result of that expedition we are able to prevent the introduction of this dreaded disease into our mining areas, you will have done great service for our Company.

"Yours faithfully,

(Sgd.) ROBT. WILLIAMS."

ANNEXE No. V.

NAMES OF VILLAGES AND INHABITANTS FOUND INFECTED AND SUSPICIOUS.

	PAGE
Anjoi	2
Bukama	14
Chiona	2
Chamzezi	2
Chiweri	4
Chiangi	4
Chibwi	5
Chamunda	6
Chimungu	8
Charowe	10
Chandulala	11
Chara	11
Cassiobwe	12
Chiengi	13
Chapeta	14
Chimuterwa	14
Chalwontonda ...	14
Chikunkuluka ...	5
Chipete	7
Dibwediakasiku ...	10
Kungabwana ...	7
Kaienja	2
Kalambo	1
Katapena	2
Katanga	2
Kasale...	2
Kazembe	3
Katumba	4
Kalisa	3
Kayumba	4
Kabanda	5
Kikonguluka ...	5
Kakoo...	5
Kikola	5
Kimpenta	5
Kabwenshi	6
Katete	6
Kipete...	7
Kipima	7
Kayombe	7
Kamfwe	7
Kasimina	7
Kasungami	8
Kalassia	6
Kapidi...	8
Kilendo	8
Kalengo	8

	PAGE
Kalumunga	8
Kankwebachi ...	8
Kwongwele	9
Kitumba	9
Kipopo	10
Katore	10
Kisasa...	10
Kapete	10
Kafwi	10
Kalwa	11
Kwamba	11
Katumba	11
Kasenga	11
Katumba	4
Kisenga	12
Kisumbu	12
Kilwa	12
Kitomba	12
Kiboko	12
Kitunga	12
Komungu	13
Kabukazazi	13
Kalalangombi ...	13
Kalengere	13
Kala	14
Kawarara	14
Kalonda	14
Kamalenge	14
Luwendi	2
Lupemba	5
Likuku	7
Lukonzolwa	12
Luanza	12
Lukafu	13
Lusamba	14
Musawira	2
Mwepo	2
Mazanguli	2
Manongo	2
Mkabakazari ...	2
Mpila	2
Mutanda	2
Mwerwa	2
Mfungwa	3
Milambo	3
Mwenda	3

	PAGE
Mazakewe	4
Melile...	4
Mpande	5
Makabwa	5
Msunjuwapondo ...	7
Mukuntansoke ...	7
Monikamudia ...	7
Mwamena	7
Mpongo	8
Musolwa	8
Mulivita	8
Mutekama	9
Mukabi	8
Mwanavuti	10
Mpanja	10
Mitambo	11
Mundombo	11
Musake	11
Mumeno	11
Mutenda	11
Musumbo	11
Mwashia	13
Mkawi	13
Masuka	13
Msomoka	14
Minga	14
Mukobo	14
North East Rhodesia	13
Pande	7
Pwaki	11
Pweto...	12
Sonta	2
Salabwe	2
Sampwe	3
Sabwe...	4
Sambwe	5
Sangachite	8
Sampwe Poste ...	8
Somoka	14
Tengonyika	2
Thalassia	6
Waomeka	2
Wakimwa	7
Washiama	9
Yapala	2
Yamkana	14

See S. N.'s Map.

[Asterisk = Female. x = Infected. Obs. = To be under observation.]

MUSABWIRA, on Lufira, N. of Sampwe—
- Mwasabombwe ... x

SONTA, under Mfungwa—
- Lukantia ... ... ,,
- Kitambela ... ... ,,

MWEPO—
- Muliakama ... ... ,,

KAIENGA, nr. Kilwa? beyond Mwero N. Tanganyika? under Ngembikiambi?—
- Kasomo ... ... ,,
- Kahamwera ... ... ,,
- Kamalondo ... ... ,,
- Kapamooro ... ... ,,

CHIONA, same as last—
- Lewili... ... ... ,,

KALAMBO, same as last—
- Mwamba ... ... obs.

ANGEI, same as last—
- Makubwa ... ... ,,
- Mwamba (wife) ... x

KATAPENA, E. of Lualaba (Hayes' boys)—
- Chamsamba ... ... ,,
- Mtamoyo ... ... ,,
- Mkinamberi ... ... obs.
- Kapeseka ... ... ,,

WAOMEKA, W. of Lualaba—
- Kafwata x

KATANGA—
- Kalumbakarengi ... ,,
- Chipopo ... ... obs.
- Chinasali ... ... ,,
- Matapandawa ... ,,

MAZANGULI—
- Wakufungwa ... x
- Katala ... ... obs.

SALABWE, near last—
- Mfwirebuli ... ... ,,

LUWENDI (Chiwanda district)—
- Lukansha x

MUNENGE (Chiwanda district)—
- Walonda ... ... obs.
- Katenga x
- Mupengalala ... ... obs.

MKABAKAZARI—
- Kapira x
- Malanasia ... ... obs.

CHAMZEGI (Lualaba)—
- Kazimbaia ... ... ,,

MPILA, 18 E. of Lualaba, on River Mwanga, trib. of Fungwe—
- Chinbumbachumi ... x
- Livunda ... ... obs.
- Kafilamatunga ... x
- Mwepawangi ... ... ,,
- Mwetopezhia ... ... ,,

KISALE—
- Lisesi ... ... obs.

YAPALA (Upemba)—
- Kachingwe ... ... ,,

MATANDA (Luapula)—
- Mambarima x

MWERWA, near Chilenge—
- Mwamwerwa ... ... ,,

TONGANYIKA (Kambove)—
- Chitima ... ... obs.

MFUNGWA—

Mtengatenga	... ...	obs.
Kuniki	... ...	,,
Katembele	... ...	,,
Luashila	... ...	,,
Choma Choma	...	,,
Chisenga	... ...	,,
Mwanabuli	... ...	,,
Lukenke	... ...	,,
Kawangula	... ...	,,
Wamusobo	... ...	,,
Tanganesia	... ...	,,
Kaswaya	... ...	,,
Walimenta	... ...	,,
Kasonge	... ...	,,
Nyandwi	... ...	,,
Wandonga	... ...	,,
Kampitana	... ...	,,

KAZEMBE—

Geremiasofu	... ...	,,

SAMPWE—

Sanduku	... ...	,,
Mizende	... ...	,,
Wasongo	... ...	,,
Kamasi	... ...	,,
Tomtamtekesi	...	,,
Takamali	... ...	,,
Misele	... ...	,,
Kapunga	... ...	,,
Yambayamba	... ...	,,
*Kasengo	... ...	,,
*Matubile	... ...	,,
*Kitumba	... ...	,,
Kondo	... ...	,,
Kapiri	... ...	,,
Kituli	... ...	,,
Taiti ...	... ...	x
*Ngeie ...	... ...	,,
*Dilunga	... ...	obs.
*Nymwaya	... ...	,,
*Kaweleka	... ...	,,
Membi	... ...	,,
Kamakombe	... ...	,,
Kamboli	... ...	,,

SAMPWE (*continued*)—

Manboya	... ...	obs.
Diasonge	... ...	,,
Kivanga	... ...	,,
Mienda	... ...	,,
Sanduku	... ...	,,
Kazimbaya	... ...	,,
Yamunjala	... ...	,,
Songa Songa	... ...	,,
Kiele ...	... ...	,,

KALISA—

Mtakamali	... ...	,,
Niasau	... ...	,,

MILAMBO (Mirambo)—

Chikachika	... ...	,,
Yombwe	... ...	,,
Mumakela	... ...	,,
Mkanzia	... ...	,,
Kifukuru	... ...	,,

MWENDA—

Katake	... ...	,,
Kamenga	... ...	,,
Mlongoti	... ...	,,
*Katoto	... ...	x
*Kinda...	... ...	,,
Kischuba	... ...	obs.
Molumbu	... ...	,,
Kala ...	... ...	,,
Wakati	... ...	,,
Yauli ...	... ...	,,
Mrele Mrele	... ...	x
Kabwera	... ...	obs.
Buleke	... ...	x
Kiania	... ...	obs.
Diabola	... ...	x
Kamalukende (dead)	...	,,
Wapura	... ...	obs.
*Kayumba	... ...	,,
Memba	... ...	,,
Munoshia	... ...	,,
Kasseia	... ...	,,
Kasafua	... ...	,,
Kayetelwa	... ...	,,

MWENDA (*continued*)—

Katoto	... ...	obs.
Dungo	... ...	,,
Mukalu	... ...	,,
Kuyakayaka	... ...	,,
Kakuru	... ...	,,
Masikwambulu	...	,,
Kabangi	... ...	,,
Kimama	... ...	,,
Kibuye	... ...	,,
Kanianga	... ...	,,
Mutuomkope	... ...	,,
Kasabwa	... ...	,,
Kalinamikite	... ...	,,
Maiani	... ...	,,
Pembe	... ...	x
Amisi	... ...	,,
Kabwebutesi	... ...	x
Sasera	... ...	,,
Kanyanga	... ...	,,
Wangaliwa	... ...	,,
Mtondikula	... ...	,,
Wankopi	... ...	,,
Yateti	... ...	,,
Mutimwenzi	... ...	,,
Kasonjamapiri	...	obs.
Chomwetombo	...	,,
Lewa Lewa	... ...	,,

CHIWERE (Kisonga)—

Sukumuntu	... ...	,,

KATUMBA—

Mpandachinima	...	,,

SABWE—

Watichupa	... ...	,,

MAZAKEWE—

Wataya	... ...	,,

CHIANGI—

Seremai	... ...	,,

MELILE (Lake Tanganyika)—

Maiijambo	... ...	,,
Kanunanta	... ...	x

KAYUMBA—

Sakomwazi	... ...	obs.
Palulu	... ...	x
Kiticha	... ...	,,
Mtanga	... ...	,,
Matiavita	... ...	,,
Mashmida	... ...	,,
Kitwa	... ...	,,
Kikami	... ...	,,
Talassia	... ...	,,
Tulama	... ...	,,
Mlangu	... ...	,,
Fisali	... ...	,,
Wajitika	... ...	,,
Chimbatwisha	...	,,
Kilomwana	... ...	,,
Maloba	... ...	,,
Ngozi	... ...	obs.
Sambo	... .	x
Msanamo	... ...	obs.
Yapemba	... ...	,,
Mlenda	... ...	x
Mwana	... ...	obs.
Mitenga	... ...	,,
Mbiji	... ...	x
Mutsanda	... ...	,,
Wansa	... ...	,,
Kupila	... ...	,,
Chambango	... ...	obs.
Sambo 2nd	... ...	x
Kayowa	... ...	,,
Kawana	... ...	,,
Kalulumbei	... ...	,,
Perakwaoa	... ...	,,
Konkola	... ...	,,
Dirminda	... ...	,,
Kafwimbi	... ...	,,
Mutantaliambi	...	,,
Matamba	... ...	,,
Mena	... ...	,,
Songota	... ...	,,
Nambula	... ...	,,
Ngoni	... ...	,,
Masoka	... ...	obs.
Kalumbia	... ...	,,
Chindanawamba	...	x

KAYUMBA (*continued*)—

Chipanga	...	...	obs.
Kayombo	...	...	x
Kadrongo	...	...	,,
Dikumbi	...	...	obs.
Masuka	...	...	x
Walembwi	...	...	,,
Mweli	...	...	obs.
Kafita...	...	...	x
Fungamwango		...	,,
Chipaka	...	...	,,
Ndaramba	...	...	obs.
*Mkulu	...	...	,,
*Dilungu	...	...	x
*Katumba	...	...	obs.
*Kavila	...	...	x
*Dilungu	...	...	,,
*Mwamba	...	...	obs.
*Dilungu 2nd	...	...	,,
Chiwangwa	...	...	x
Yaorpa	...	...	,,
Kwanda	...	...	,,
Dilunga	...	...	,,
Kambweli	...	...	,,
Chakoma	...	...	,,
Chioni	...	...	obs.
Huwamendo	...	...	x
Komba Komba		...	obs.
Bangwe	...	...	x
Majowi	...	...	,,
Cheri ...	...	...	,,
Lembaloni	...	...	,,
Chitombi	...	...	obs.
Musana	...	...	x
Chipitali	...	...	,,
Konkola	...	...	,,
Intenda	...	...	,,
*Kayumba	...	...	,,
*Sambo	...	...	obs.
Ditrumbi	...	...	x
Chakuma	...	...	,,
Walembwe	...	...	,,
Disebi	...	...	obs.
Kitanda	...	...	x

KABANDA (Kavanga)—

Lufendisa	...	...	x
Muimingi	...	...	,,
Kayumba	...	...	obs.
Lusambo	...	...	,,

CHIBWE (Lufira)—

Dimbo	...	...	x

MPANDI, N. of Mwenda—

Bendala	...	...	obs.
Tenganesia	...	...	,,
Pembamoto	...	...	,,
Mutungi	...	...	,,

SAMPWE, near Lulua—

Kaumbaia	...	...	x

KIKONGULUKA (Mwenda), Chikunkuluka—

Kokaiwa	...	...	,,
Musonakamwa		...	,,
Mandosa	...	...	,,
Lopato	...	...	obs.
Chombolulu	...	...	x

KAKOO, on Kakoo R, trib Lufira—

Shwainda	...	...	obs

KIKOLA (Lufoi R.)—

Songola	...	...	,,
Shumakwala	...	...	,,

KIMPONTO, R. Kankwesi, trib. Lufira—

Kongoni	...	...	,,

MAKABWA (Mwenda)—

Musabakiama		...	,,
*Kunja...	...	...	,,
Kamboma	...	...	,,
Luya ...	...	...	,,

LUPEMBA—

*Mamba	...	...	,,
Kasongo	...	...	,,

CHAMUNDA (Mwenda)—

*Nanduwe	...	...	x
Moushi	...	...	,,
Murenge	...	...	,,
Lukalabo	...	...	obs.
Lukonzolwa	...	...	x
Kalawo	...	...	,,
Tengeneke	...	...	obs.
Pandwe	...	...	x
Mototowabantu		...	obs.
Kisokele	...	...	,,
Kaperashila	...	...	,,
Kalombola	...	...	,,
Solokitatita	...	...	x
Karadia	...	...	,,
Kikumguwanshilu		...	obs.
Kifoya	...	...	x
Kangombe	...	...	obs.
Tenwamoto	...	...	x
Tokambari	...	...	,,
Sokontwe	...	...	,,
Mwepo	...	...	,,
Isunga	...	...	obs.
Watete	...	...	x
*Mwepo 2nd	...	...	obs.
*Nundu	...	...	,,
*Kalemba	...	...	x
*Kunga	...	...	obs.
*Goie ...	...	...	x
*Msirikwabe	...	...	,,
Wanza	...	...	obs.
Mwenge	...	...	x
Kifita ...	...	...	obs.
Sokorsi	...		x
Kipumbu	...	...	,,
Kafistriwa	...	...	obs.
Wonda	...	...	x
Kirushia	.	...	obs.
Mwewa	...	...	x
Scebo ...	...	...	,,
Kilowo	...	...	obs.
Kokewalukonde		...	,,
Kiola ...	...	...	,,
Wakumiane	...	...	x
Chiaputamanda		...	obs.
Mukunda	...	...	,,

CHAMUNDA (Mwenda) (*continued*)—

Katunga	...	...	x
Wasoka	...	...	,,
Chikunguwansira		...	,,
Wantuamuma		...	,,
Nakopapa	...	...	obs.
Karundi	...	...	,,
Lukalawa	...	...	x
Pembamoto	...	...	,,
Kawembi	...	...	,,
Chiwanda	...	...	,,
Bukalawa	...	...	,,
Tenganasia	...	...	,,

KABWENESHI, on Lufira—

Mukondotole ...	...	

KATETE—

Kapata	...	...	obs.
Watukufu	...	...	,,
Mwamba	...	...	,,
Yamsen	...	...	,,

THALASSIA Kalassia (Mwenda)—

Kirudeke	...	...	obs.
Kipeta	...	...	x
Bwanaburushi		...	,,
Kapopoye	...	...	,,
*Mwewa	...	...	,,
*Waluba	...	...	,,
Kikwe	...	...	,,
Mirambe	...	...	obs.
*Bisonge	...	...	x
*Kaborita	...	...	obs.
Kimgundu	...	...	x
Marire	...	...	obs.
Kinterite	...	...	,,
Subwa	...	...	,,
Kitambara	...	...	,,
Bulumatadi	...	...	,,
Lisango	...	...	x
Mwewa	...	...	,,
Chapewa	...	...	obs.
Woupe	...	...	

KIPELI (Mwenda) Chipete—

Goie	obs.
Mwewa	,,
Makola	,,
Yakolonga	,,
Kasuku	,,
Rupia	,,
Wangewango	,,
Lumondi	,,
Musanapette	,,
Kaezeni	,,
*Busakiako	,,

LIKUKU (Dikuku)—

Messekurbena ...	obs.
Kayema	,,
Yume	,,
Kassakerabo	,,
Kalassa	,,
Mukena	,,
Tekateka	x
Mukeko	,,
Lupuputa	obs.
Mandefu	,,
Chimbembembo ...	x
Mwali	obs.
Mutawka	x
Mwananseke	,,
Chitawaya	,,

WAKIMWA (Dikuku)—

Luketeka	obs.
Waremanina	x
Mutakwa	,,
Pompompo	,,
Kasutu	,,

KITIMA (Lukafu)—

Mweli	obs.
Goie	,,
Warimashela	,,
Musufu	,,
Kairi	,,

MSUNGU WA PONDO (Mwenda)—

Kapapa	obs.

MSUNGU WA PONDO (Mwenda) (*continued*)—

*Kiaputata	obs.
*Tekalonga	,,
*Kunga	,,
*Kumle	,,
Kitange	,,
Kawanda	,,

KAYOMBO (N. Kaluli R.)—

Kayembochi	,,

KAMFWA—

Lombania	obs.

PANDE—

Kambove	obs.

KUNGABWANA—

Kiaeshi	obs.
Mveru	,,

MUKUNTANSOKE (Lufira)—

Wakumuna Bevi ...	obs.
Kitumba	,,
Nokozo	,,
Lunja	,,

MONIKA MUDIA (N. of Mwenda)—

Kunga	obs.
Kyynsu	,,
Kabole	,,
Mitumbo	,,
Mfei	,,
Mukimiti	,,

KASIMINA (close to last)—

Kaliamalaba	obs.
Keleyo	,,
Mombatenga	,,
Tukuta	,,
*Musitu	

MWAMENA (close to last) —

Mwelamutaya ...	obs.

KIAYE—
- Kangeye x

CHIMUNGU—
- Luvinge ... ... obs.
- Fungamwange ... ,,

KASUNGAMI (between the former and the following—
- Chipata ... ... obs.
- Shawaliza ... ... ,,
- Takamwonda ... ... ,,

SANGACHILE—
- *Tampumpa ... ... obs.

KIBOKO—
- Mukangwa x
- Luswala ... ... obs.
- Mwitobi ... ... ,,
- Kamwero ... ... ,,

SAMPWE POST (Kapidi)—
- Mukangwa x
- Luswala ... ... obs.
- Mwitobi ... ... ,,
- Chiana ... ... ,,
- Kalenga ... ... ,,

MUKABE—
- Mfarajowonga ... ,,

KILONDO—
- Kilondo ... ... ,,
- Mwenimwambe ... ,,
- Kavunda ... ... ,,
- Selekiti ... ... ,,
- Wanonga ... ... ,,
- Matumbo ... ... ,,

MPONGO—
- Melula ... ... obs.

MUSOLWA—
- Kapiri ... ... obs.

KALENGO—
- Dagtera ... ... obs.
- Tanwatanba ... ... ,,

MULIAVITA (Kayumba)—
- Kafinyi ... ... obs.
- Ilungu ... ... ,,
- Dimayi ... ... ,,
- Maweya ... ... ,,

KALUMANYA (Kayumba)—
- Lukafu x
- Kalali... ... ... ,,
- Kalemba ... ... ,,
- Makanda ... ... ,,
- Wambuzi ... ... ,,
- Kelanyombi ... ... ,,
- Mukana ... ... ,,
- Kanda ... ... ,,
- Ngoni ... ... obs.
- Bipiamambo x
- Dikalya ... ... ,,
- Mukoti ... ... ,,
- *Kilumi ... ... ,,
- *Ngoyi ... ... obs.
- *Mwendelelo x
- *Dilunga ... ... ,,
- *Mundunba ... ... ,,
- Kondamwefu ... ... ,,
- *Kwanda ... ... ,,
- Kawana ... ... ,,
- Kabuki ... ... ,,
- Maluma ... ... ,,
- Sambo ... ... ,,
- Lukutanga ... ... ,,
- Songa ... ... ,,
- Kanyunguru ... ... ,,
- *Chimba ... ... ,,
- *Chilanga ... ... obs
- *Ngoyi... x
- *Mambeka ... ... ,,

KANKWEBACHI (Kayumba)—
- Kankwebachi... ... obs.
- Selemoni x
- Sikilwi ... ... ,,

KANKWEBACHI (Kayumba) *(continued)*—

*Kasengwanyumbo	...	obs.†
*Charwi	...	x
*Katwalekwa	...	obs.†
*Dilongwa	...	,,
*Mukana	...	,,
*Kinyanga	...	,,

† These nearly certainly infected.

KUENGWELE (Kayumba)—

Kewowe	...	x
*Sunfu...	...	,,
*Lunda	...	,,
*Ganyanzi	...	,,
Caslembula	...	,,
Tasamidi	...	,,
*Katumba	...	,,
*Kasangila	...	,,
Kipili ...	...	obs.
Kisangweli	...	,,
Kifwa	...	x

MUTEKAMA (Kayumba)—

Mutekama	...	x
Mutumbo	...	,,
Ditalwa	...	,,
Dienatweni	...	,,
Komkankuba...	...	,,
Wantanda	...	,,
Chayumuya	...	,,
Chabi...	...	,,
*Chungu	...	,,
*Yakima	...	,,
*Koni ...	...	,,
*Mbuya	...	,,
*Yumba	...	,,
*Chimba	...	obs.
*Kakove	...	x
*Wasengela	...	,,
*Luanda	...	,,
Mawengi	...	,,
Misemba	...	obs.
Mkeya	...	x
Myensbwakunde	...	,,
Kalimbwa	...	,,

MUTEKAMA (Kayumba) *(continued)*—

Sokatonda	...	obs.
*Numbi	...	x
Mukolwe (child)	...	,,
Kampangwa	...	,,
Mfumva	...	obs.
*Kitwa...	...	x
*Mkulu	...	,,
*Kapenda	...	,,
*Charwe	...	,,
*Kambara	...	,,
*Mukuba	...	,,
*Chuverli	...	,,
*Mabeya	...	,,
*Kapito	...	,,
*Kanini	...	,,
*Mukuvile	...	,,

WASHIAMA, further up Lufira—

Washiama	...	,,
Wasongo	...	,,
*Pambe	...	obs.
*Vilowa	...	x
Kanunka	...	obs.
*Shialila	...	x
Mlunda	...	,,
Kapanda	...	,,
Kitenta (child)	...	obs.
Endapanshi	...	x
*Vanja ...	...	,,
*Kabori	...	obs.
*Kasongo	...	,,
Kionjo (child)	...	x
Kapeye ,,	...	,,
Tumbwe ,,	...	obs.
Chinyiweya	...	x

KILUMBA (Island village)—

Kanyanta	...	,,
Wasongola	...	,,
Muntemba	...	obs.
Katoko (child)	...	x
*Watwiwa	...	,,
*Mwanya	...	obs.

KIPOPO, further up Lufira—

Waika	...	...	x
*Nonda	...	...	,,
*Kaboli	...	...	,,
*Kapia...	...	...	,,
*Charwe	...	...	obs.
*Nkutu	...	...	x
Pawonzo	...	...	,,
Bowola	...	...	,,
*Kamnakabola		...	,,
*Dilunga	...	...	obs.
*Arnuya	...	...	x
Kipope	...	...	,,

KATORO, further up Lufira—

*Kazembi	...	...	,,
Sanga...	...	...	,,
Sangaila	...	...	,,
Mwamba	...	...	,,
Mkina	...	...	,,
Mutakaila	...	...	obs.
*Kitamba	...	...	x
Kitote	...	...	,,
*Mfwka	...	...	,,
Mukeya	...	...	obs.
Kisuma	...	...	x
*Kakidilwa	...	...	,,
*Kisombo	...	...	,,
Nyonga	...	...	,,
Mukimbi	...	...	,,
Zibona	...	...	obs.
*Mtenga	...	...	x

DIBWEDIA KASIKU, Island 9 miles from Katore—

Dibwedia Kasiku	...	x

KISASA, further up Lufira—

Kisasa	...	...
Mushiami	...	...
Sola ...	...	...
Kasika	...	...
Msesogola	...	...
Twite (Child)...		...
Mombela (Child)		...
*Wadimapo	...	...

KISASA (*continued*)—

*Chamuseru	...	...
*Mutore	...	...
*Kaboli	...	...
*Mumudi	...	...
*Musangu	...	...
Dilungu (Child)		...

MUKABI, further up Lufira—

Six probably...	...	x

KAPETO, on trib. of Lufira, Kishia R.—

Kapito	...	x

MWANAVUTI, Lufira—

Mwanaka	...	...	x
Bulaya	...	...	obs.
Karireka	...	...	x
Sikibwi	...	...	,,
Kasumba	...	...	obs.
Kakoba	...	...	x
Pumbacharu	...	...	,,
*Pamba	...	...	,,
*Msengwa	...	...	,,
*Mumba	...	...	,,
*Muruki	...	...	,,
*Wasokela	...	...	obs.
*Mpafu	...	...	x
Disrisha	...	...	,,
Finga	...	...	,,

KAFWE, nil—

CHAROWO, Lufira—

Porta...	...	...	obs.

MPANGA—

Nansanga	...	...	,,

GOBERA (Sampwe)—

Mungani	...	...	obs.
Kapoba	...	...	,,
Luvimbi	...	...	,,
Kishinde	...	...	,,
Charwe	...	...	,,
Masbelemuka		...	,,

GOBERA (Sampwe) (*continued*)—
- Kamfwa ... ... obs.
- Kayawarenga ... ,,
- Kansi... ... ... ,,

MILAMBO, Sampwe, Mirambo—
- Nduku na vidia (Child) x
- Ditanda ... ... ,,
- Kapata ... ... ,,
- Pilipili ... ... ,,

CHANDALALA (Dikulwe)—
- *Chatula x
- Mambilima ... ... ,,
- Mukavi ... ... obs.
- Monika ... ... ,,
- Maruti x

PWAKI, Dikulwe—
- Wakuma ... ... obs.
- *Ndala... ... ... ,,
- *Kafwa ... ... ,,
- *Vibeli x
- Kaberi (Child) ... obs.
- Vanga ,, ... x
- Gombi ,, ... ,,
- Kamateni ,, ... obs.
- Sempa x

MUNDEMBO (Dikulwe)—
- Sone x
- Kavimbi ... ... obs.
- *Sembaya x
- *Sankananji ... ... ,,

KALWA (Charwa, Dikulwe)—
- Maleka ... ... obs.
- Kapungwi ... ... ,,
- Bulangi ... ... ,,
- Kanyaki ... ... ,,
- *Seya ... ... ,,
- *Kabongo x
- Chivakula ... ... obs.
- Maura ... ... ,,
- Kapontwi ... ... ,,
- Lusambo ... ... ,,

KIVAMBA (Dikulwe)—
- *Mwaba (child) ... obs.

KATUMBA (Dikulwe)—
- Tanganika x
- Mulikani ... ... obs.
- Katatapanshi ... ... ,,
- Mukubu .. ... ,,

LUKISI (Dikulwe)—
- Kapara ... prob. x

CHARA (Dikulwe)—
- Kakonchama ... ...

KASONGA (Luapula)—
- Kisumbo ... ... obs.
- Kasongo ... ... ,,

MUSEKO (Luapula)—
- Likopela ... ... ,,
- Katue ... ... ,,

MUMENI (Luapula)—
- *Kikoie x
- Muwembo ... ... obs.
- *Mpwalelo ... ...

MULENDA (Luapula)—
- Katuba ... ... obs.
- Mulengo ... ... ,,

KALUMBA (Luapula)—
- Musongi ... ...

MUSUMBU (Luapula)—
- Mpanda Shara ... obs.

KILOMBA (Kilwa)—
- Yambayamba ... ,,
- Kipinduka ... ... ,,
- Givera ... ... ,,
- Nyondanyonda ... ,,
- Mgoshi ... ... ,,

CASSIEBWE (Luapula)—

Seraysi	... ...	obs.
Furoshia	... ...	,,
Sindigara	... ...	,,

KISENGA (Luapula)—

Kansamiso	... ...	,,
Matafai	... ...	,,

KISUMBU (Luapula)—

Kapira	... ...	,,

KILWA POST (Matenga)—

Mafrosso	... ...	x
Busanga (soldier)	...	obs.
Kambove	... ...	x
Kikunka	... ...	obs.
Kayombo	... ...	,,
Sapati (soldier)	...	,,
Sunga (Congo) (soldier)		,,
Wife of Busanga, soldier		x
Karutu	... ...	,,
Lukatanga	... ...	obs.

KITOMBA (Mweru)—

Kitombetombe	...	,,
*Kasonga	... ...	x
Kawelwa	... ...	,,

MUKOBI (Mweru)—

Kapelelwa	... ...	obs.

KIBOKO (Mweru)—

Mimajambo	... ...	,,
Kampela	... ...	,,

KITUNGA (Mweru)—

Chunya Nkondi	...	,,

LUKONZOLWA—

Djanjalimabi	... ...	,,
Mukala	... ...	x
Kawonta	... ...	obs.
Likukani	... ...	,,
Balai ...	... ...	x
Mansansa	... ...	,,

LUKONZOLWA *(continued)*—

Sambonja	... ...	obs.
Inde ...	... ...	,,
Mundarisa	... ...	,,
Mkonge	... ...	,,
Mwana Mwenji	...	x
Mopunja	... ...	,,
Biamango	... ...	,,
Puju ...	... ...	obs.
Katurubai	... ...	,,
Dunga	... ...	,,
Yonga	... ...	,,
Kanjarnbill	... ...	,,
Kamalondo	... ...	,,
Ambaruki	... ...	,,
Panga...	... ...	,,
*Musungiva	... ...	x
*Numbi	... ...	obs.
*Mulenda	... ...	,,
*Mafukwe	... ...	,,
Kamalufumbi...	...	,,
Kasongo	... ...	x
Katurushi	... ...	obs.

LUANZA—

Dilunga	... ...	x
Kasakwi	... ...	obs.
Lufwakia	... ...	,,
Lumkinda	... ...	,,
Kaputa	... ...	,,
Kanwambo	... ...	,,
Katankia	... ...	,,

NYAMBAKUNDA—

Mfumba	... ...	,,
Mantu	... ...	,,
Fwamba	... ...	,,

PWETO—

Lumatisa	... ...	,,
Kaleva	... ...	x
Galuba	... ...	,,
Kasembo	... ...	obs.
Kambi	... ...	x
Senga...	... ...	obs.
Mutukama	... ...	,,

PWETO (*continued*)—

Twadibengi	... ...	obs.
*Ngoie	... ...	,,
Fataki	... ...	,,
Mushinda Yabu	...	x
*Mwamine	... ...	obs.
Luba	... ...	,,
Chikoti	... ...	x
Steamer, crew and captain	... ...	obs.
Kato	... ...	x
Wife of	... ...	obs.
*Konjoto	... ...	x
Kapendela	... ...	,,
*Yakopewa	... ...	obs.
Bawili	... ...	x
Bawili 2nd	... ...	,,
Kimbawi	... ...	,,
Kabila	... ...	obs.
Tagbwa	... ...	x
Konkamirambo	...	obs.
Kampungwe	... ...	x
Sopia	... ...	,,
Nine seen in lazaret	...	,,

KIWELLIWELLI—

*Mundaguabe	... ...	obs.
Tombisana	... ...	x
Masuja	... ...	obs.
Mashati	... ...	,,
Mwanamote	... ...	,,
Kavobo	... ...	,,
Mabaruti	... ...	,,
Bilari	... ...	x
Malumalu	... ...	obs.

CHIENGI—

Kalande	... ...	,,
Chongo (child)	...	,,

KAMUNGU on Morphia—

Chipoya	... ...	x

LUKAFU—

11 Soldiers	... ...	,,

MWASHIA—

Mkenge	... ...	obs.
Chitenta	...	,,
Kondamachimwe	...	,,
Shiwatumbwa	...	,,
Muika	... ...	,,
Shiaamkondi	... ...	,,
Karusi	... ...	,,
Kafumha Mutonie	...	,,
Chamawambo	...	,,
Kikete	... ...	,,
Chipokesse	... ...	,,
Kiampati	... ...	,,
Lukebe	... ...	,,
Kableke	... ...	,,
Mwindakibunda	...	,,
Luifi	... ...	,,
Kasangila	... ...	,,
Kafungampiri	...	,,
Bundera	... ...	x

KABUKAZARI, Megabi Kazari—

Kamabwi Kasati	...	x

MWAKE—

Tingi Tingi	...	Prob. x
Tonse	...	
Masonura	...	
Tokambule	...	

KALALANGEMBE—

Katuta	... ...	x
Kalesi	... ...	obs.
Kasuku	... ...	
Lukalula	... ...	x

NORTH EAST RHODESIA—

Mambarima (Matanda)	x

MASUKA—

Kankungwala	...	x

KALENGERE, Kawengere—

Mwendalui	... ...	x
Mwananfwa (Chitenzatenzu)		,,

KALENGERE, Kawengere (*contd.*)—
- Wangenkingenki (Kitenta) x
- Musome (Kitenzutenzu) ,,
- Wansenkeshi ... ... ,,
- Kitambi ... ... ,,
- Petemoya (Tengutengu) ,,
- Kapira (Chisandi) ... ,,
- Lukanzia (Kinimumkata) ,,
- Mutumkangwa (Chisandi) ,,
- Kafirimatungwa ... ,,
- Sitandi (Kandiavome) ,,

BUKAMA—
- Kalule (Dyasuka) ... x
- Malele (Chikoma) ... ,,
- Msanta (Chikoma) ... ,,
- Mwanangwa (Chikoma) ,,
- Makoni (Chikoma) ... ,,

KALA en Bunkeya—
- Kasengo x

KAWARARA (Kabukazeri)—
- Masanumbwe... ... x

KALENDA (Pwete)—
- Muniani x

KAMALENGE en Kabanga—
- Makasini x

CHAPETA, near Lukafa—
- Rupia... x
- Katanko ... ... ,,

LUSAMBA—
- Galeka x

CHIMULERWA, near Mpira—
- Kipenda ... ... ,,

CHALAWANTANDE (Mwenda)—
- Manameye x
- Kasero ... ... ,,

MSOMOKA, Somoka (Mwenda?)—
- Mtumgiamai ... ... obs.

MINGA—
- Wia Wia x

YAMKANO, Kafwe R. trib. of Lufwa River—
- Mikombi x

MUKEBO, on Lukeloweshi—
- Kipasi ... ... obs.
- Kaikipendo ... ... ,,

KALONGA, Sampwe—
- Kawangala x

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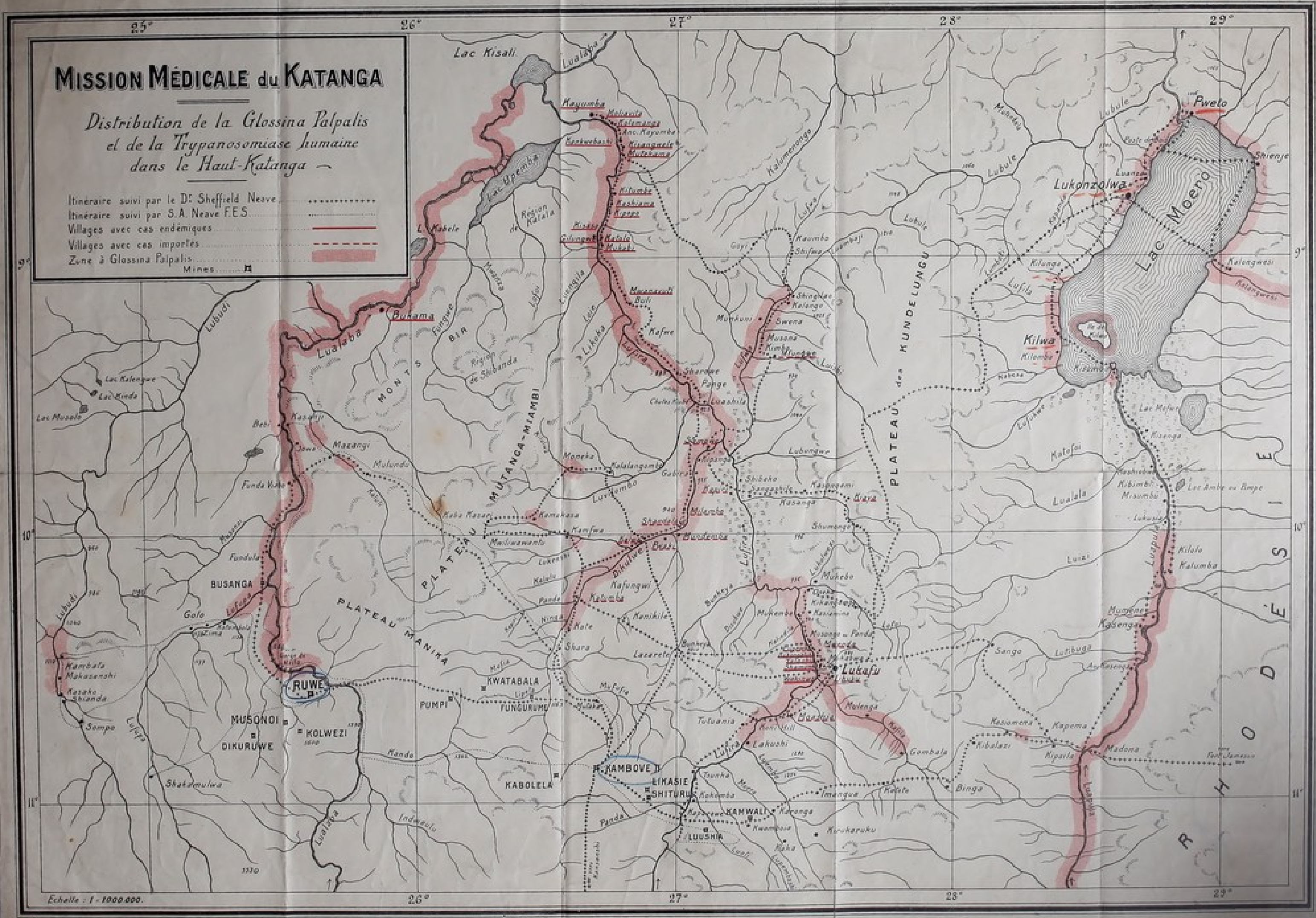

Belgian Congo. Katanga

map taken out