



UNION OF SOUTH AFRICA

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DEPARTMENT OF AGRICULTURE

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ENTOMOLOGY MEMOIRS  
.. MEMOIR No 1 ..

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CONTENTS :

# Tsetse in the Transvaal and Surrounding Territories

AN HISTORICAL REVIEW

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Education and Research.

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**THE CROCODILE-LIMPOPO,**

Breaking through Haartebeespoort. Tsetse probably extended as far south as this point in the summer time. The poort here seen is now closed by a great dam behind which is spread out an extensive lake.

# Tsetse in the Transvaal and surrounding Territories: An Historical Review.

## I.—INTRODUCTION.

SINCE coming to the Transvaal, much of my leisure has been spent on the farm "Zilkaats Nek,"\* through which runs the road to Brits, as this descends the northern slopes of the Magaliesberge. Below Mzilikatzi Nek the range is fringed with a fascinating belt of forest composed very largely of combretum, karee, and acacia, with an occasional dense moepel and a wide-spreading meroola. Within this belt one finds a succession of "plant umbrellas." Almost always in the shade of these there shelters a termite-rampart, and very few exist from which does not ascend, signal-like, a many-armed narboom. These local floral conditions extend narrowly down the banks of the Crocodile, as, hereabouts, the Oli or Limpopo is invariably called.

So it came about when I visited the fly country of Zululand last year that, notwithstanding the absence of moepel and karee, I fell to imagining myself back on the slopes of the mountains of Chief Mogale, repopulating them with their former denizens and finding tsetse. Then I asked myself whether fly ever did exist so far south, and this review is the outcome of such communing.

The voortrekkers and contemporary English hunters, I had learned, first met with tsetse on crossing the Limpopo; but the inference always was that this happened at points much farther north, beyond the junction of the Marico. As, in times now passed, the old Republic lay straddled by a great horseshoe shaped nagana zone, 20 to 60 miles wide, or 24,000 square miles in extent, and had, within comparatively recent years, been entirely freed of this encumbrance, it became more than a question of academic interest to ascertain the whereabouts of tsetse in the days of the Great Trek and subsequently.

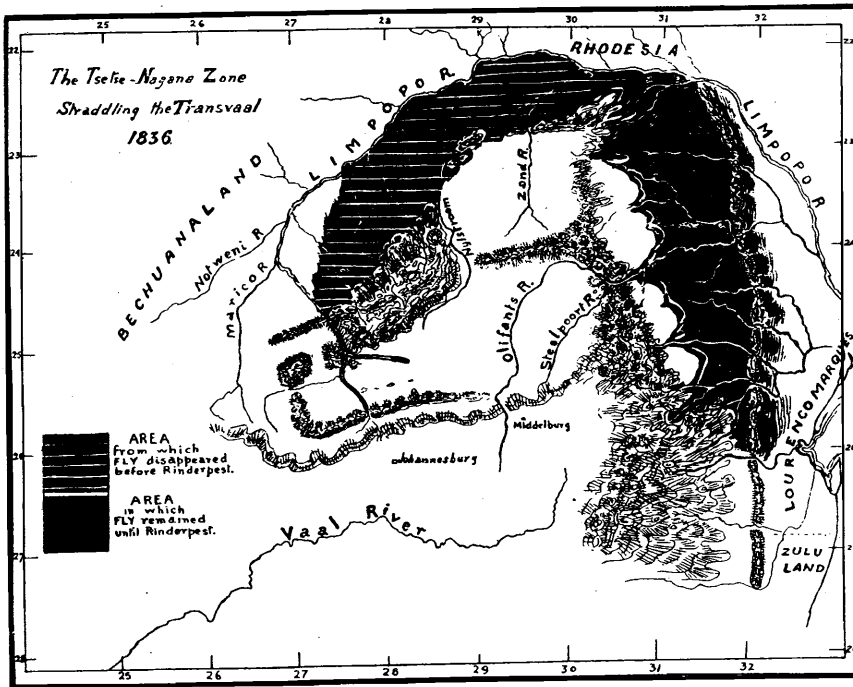
In endeavouring to collect the necessary historical data, I could not help feeling assailed with poignant regret that no scribes existed among the pioneers of our older population, that among them there was only Trigardt to set down where he encountered fly in his adventurous wanderings, and none to say where, having once observed it, in later days they found it gone.

Great indeed would be the value of an account of the fly-belts of the northern Transvaal by Andreas Duvénage, who, Thomas Baines (10) tells us, lived in 1871 "eighteen miles to the north of Marabastad," and who "was reported to know a safe track between the various patches of fly that overspread the country" (p. 58), as well as "a safe road through the fly between Blaauwberg and Zoutpansberg" (pp. 80-81). Equally valuable would have been the knowledge and views

\* "Zilkaats" is a gross corruption of "Mzilikatzi"; other corruptions are: "Moselikatzi" and "Umselegazi." The Sutu and Chwana corruption is "Moselekatze."

of Theunis de Klerk, who, at his farm near Nylstroom, told Baines he "knew where to ride his horses with safety through the fly," and "thought," as long ago as 1871, "that the fly was a curse that *was being removed from the country*" (p. 68).

For the first six decades of our history tsetse existed in the Transvaal, and it is common talk that it finally disappeared immediately after rinderpest swept over the sub-continent in 1896-7. Without question, up to the year 1897, both malaria and nagana closed much of the eastern low country to settlement, and fly-belts occurred from north to south between the Drakensberge on the west and the Lebombo on the east. The suddenness with which both tsetse and nagana seemingly disappeared from this region synchronizing as it did with an enormous destruction of domestic bovines, and much of the native



I.

*The Nagana Zone straddling the Transvaal in 1836.*

fauna, links the two circumstances firmly together; and, for this reason, the benign effect of rinderpest, where nagana is concerned, goes unquestioned.

A point usually lost sight of, however, is that, before the coming of rinderpest, tsetse had disappeared from a relatively greater area, and there is sufficient evidence to show that a contraction along the west and north of the Transvaal—beginning long ago—was gradually consummated. There is, indeed, much reason to believe that tsetse was extinct in from one-half to two-thirds of the country at one time under its sway, well before 1890; the year usually spoken of is 1888.

One cannot assert positively that fly is entirely absent from the Transvaal, because it so happens that many of the more recent fly-haunts are still out of the beaten track, and no entomologist has made

a particular search for fly in any one of them. On the other hand, the fact remains that since rinderpest no one claims to have seen fly nor has a case of nagana been reported; further, that cattle and horses are taken anywhere without heed of nagana.

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## II.—THE FIRST PERIOD: 1836-1838.

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### “THE DAWN OF THE TRANSVAAL.”

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In so far as historical records are concerned, our knowledge of the existence of tsetse in South Africa begins with the year 1836; a year of contrasts marking also the dawn of the history of the land across the Vaal. To show just who was the first to furnish a record of the presence of tsetse, in what is now Transvaal territory, involves a deeper search into the literature of the past than I have been able to make. But, perchance, the earliest account to be published was that of David Hume. Theal tells us that Hume returned to Grahamstown in February, 1836, and, among other things, gave an account of the damages caused by tsetse observed in the course of a journey along the Limpopo.\* But there were certainly other experiences, some never now to be recorded, in the fair land where Mzilikatzi held bloody sway, and where, far to the north, the children and clan of the notorious freebooter, Coenraad Buys, found a home.

Looking backwards, we may conjure up Trigardt's wagons toiling northwards, ever with the Drakensberge on their right, till, far beyond their objective, they came to rest, as the wanderers thought in the land of Egypt and the valley of the Nile. We may picture the meeting of the Eerste Voortrekkers with the Buysvolk as they neared the Zoutpan. We may see Van Rensberg's expedition of forty-nine ill-fated souls passing beyond the Zoutpansberge to the Limpopo and battling down the great river to awful deaths; and who shall say that, among the added hardships of this luckless expedition, nagana was not one?†

So we visualize a panorama of enterprise, of endurance, of privation, of disaster, into which presently enters an officer of the Honourable East India Company on furlough. He is bent on a few months of sport in the “Wilds of Africa.” Well equipped, out for and getting a right royal time with the prototypes of the Noah's Ark of his childhood, multiplied beyond imagination, spread lavishly around, and come amazingly to life.

Several years before our history opens, so the story (1 and 2) goes, Coenraad Buys had left his promiscuous offspring near the Zoutpan to fend for themselves and had betaken himself to the region of Sofala, to the society of kindred spirits and the raising of still another coffee-coloured brood. Although he had forbidden his last rearing to follow him, they decided to, and set out upon the way. But soon

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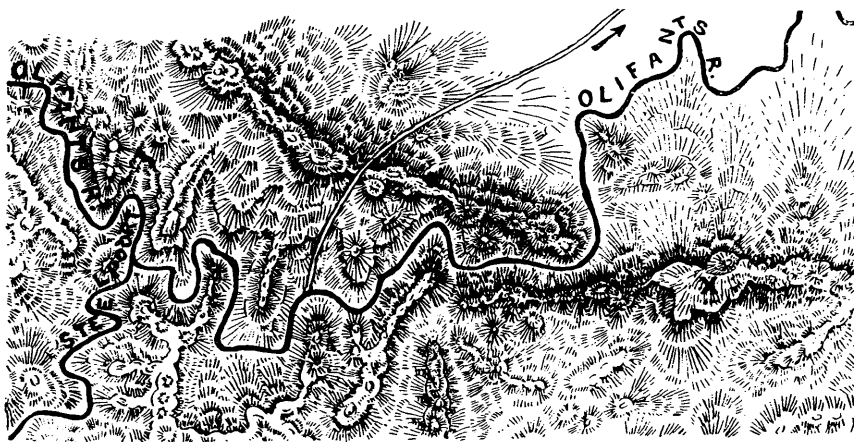
\* Cf. “The History of South Africa” by George McCall Theal, Vol. IV, page 96. I have not been able to find the original account referred to by Theal; but if contemporary maps show Hume's route at all correctly, he encountered tsetse along the Limpopo (Crocodile section) where it flows through the District of Rustenburg.

† Fly was afterwards recorded hereabouts by Elton. The massacre took place in July, 1836, on the Limpopo, somewhere near the junction of the Olifants. Trigardt learned of the calamity a year later, March, 1837.

after crossing the Limpopo their progress was arrested; malaria decimated the people and nagana laid waste the herds. So they turned back and settled where Trigardt found them, calling the land Mara, or the place of bitterness.

Almost a year elapsed, after the passage of the Vaal, before Trigardt set down in his diary (2) any word concerning "the fly." Then the record we find (p. 48, 12th March, 1837) is of so casual a nature that it leaves no room for doubting the scourge was long and well known. The entry relates to the return of Pretorius and his party to the fold and a dispute regarding some fly-struck cattle. Later, in his diary we find further references confirming our first impression.

After being in the Zoutpansberg District for more than a year, at about the middle of 1837, Trigardt and his company of forty-seven souls, of whom only nine were huntsmen, set out with their flocks and



## II.

*The Defile of the Olifants River through the Drakensberge.*

In 1837-38 tsetse would appear to have extended well along the pass of the river. Trigardt may have crossed at any point farther up-stream, on that part of the river shown in this sketch, than that indicated. In any case the wagons were first lifted and then lowered 3,000 feet in a progress of a few miles. The peak marked X on the right of the river is Manoutsa (5,354 feet). The peak nearest to the left of the stream, opposite Manoutsa, is Sulemele; beyond it the peaks range in elevation between 5,600 and 6,000 feet. The floor of the defile lies at 1,500 to 2,000 feet above sea-level.

herds and ivory to trade with the Portuguese at Delagoa Bay. It was the intention to go due east, but this they were dissuaded from doing by the natives on account of the prevalence of fly on the Massouw (Klein Letaba) River. So they trekked south, and by way of Pietersburg and Chunjespoort came to the Baloele\* (Olifants) River on the 2nd October, 1837, at a point opposite Sequati, Magalis Location.

Down by the tortuous path of this river they progressed into the recesses of the mountains, crossing the stream—in all thirteen times—and coming at last to a cul-de-sac and a barrier of tsetse.

On the 16th, when near Gramanispoort (p. 224), came Diederyk (one of the coloured men) with three flies, saying they are the same, or nearly the same, as those that had stung his cattle when in the country of the Knobosed Kaffirs, but are slightly yellower and more blue. There is much consultation. Louis Trigardt thinks they are

\* Balule is the Zulu name of the Limpopo: Rimbela, the Nkuna of the Olifants.



like those that stung his cattle at the Brak River (a tributary of the Zand River beyond the Zoutpan), although the veld and bush there were different. Trigardt hesitates to identify them as the same species. Jan Pretorius says these flies, being dead (and crushed, no doubt), cannot be recognized properly, but they appear greater of head and somewhat darker (? *Glossina brevipalpis*).

Then, on the 2nd November (p. 234), after passing the thirteenth drift, Trigardt tells how his son, Pieta, came to him in the evening with a fly, saying he had caught it and shown it to Jan Pretorius, and how it was the same fly that had formerly stung the cattle to death. Pieta gave the fly to his father. It flew out of Trigardt's hand; "but," writes he, "I had seen enough, it was the same." Fly was again found in another poort on the 3rd.

We learn of their struggle to negotiate the mountains. In sheer desperation men, women, and children set themselves to making a track over the mountains; climbing upwards stage by stage in the retreat from the fly. In sixteen days the caravan rested on the summits, and there in the mist the fly-struck cattle began to die.

In front lay the great escarpment. First the flocks were taken down; then, on the 1st December, 1837, the wagons were dismantled and brought part way down. Twenty-three days were occupied in this arduous task. To clear the foothills more roadmaking was involved, and it was not until the 5th February, 1838, that the trek again started forward from a point but a few miles east of where tsetse was found on the 2nd November (in the neighbourhood of the junction of the Steelpoort). Hereabouts Trigardt describes the country as open without many high trees, and the grass dry and sweet on the riverside.

On the 14th of February the Baloela (Olifants) was successfully forded.

When near the crossing-place, Trigardt consulted the chief whose services had been obtained to help in getting the flocks and wagons through the river (p. 307). Trigardt told how he had seen fly for more than a week past. The chief replied that he had taken cattle into the part indicated without losing them, but on the other side of the Baloela no people lived with cattle. He then offered Trigardt some of his indunas to guide the party through the fly country ahead of it.

Trigardt gives the name of the chief as Marmanelle Omsana; the first part of the name is possibly one of the many corruptions of Mashishmala. The entry, read in conjunction with Erskine's subsequent experiences, goes to show that the natives were unable to keep cattle on account of tsetse, and that fly must have been abundant in places along the foothills of the region where the Blyde enters the Olifants.

Many days elapsed before any further meeting with fly was recorded; not until six days or five treks after crossing over the Lebombos. On the 10th March, 1837, the kraal of Halowaan was reached. Here the ground is described as stony, and again came Pieta (p. 330) to report that he had seen many flies on the horses. This, says Trigardt, doubled our fears, as the cattle were all sick and a good way behind the trek. (See Appendix F 13.)

There is an interesting passage in the diary here relating to the possibility of the area having once been free from fly. Trigardt writes of asking the local natives (Macquambas) whether there were any cattle at this place in their time. They said "yes," and showed

him an old cattle kraal. Other kraals were seen, which were large and must have been long in use. "We were astonished," says Trigardt, "that cattle could have lived here so long among the fly." It is likely, however, that fly had come after the cattle had been stolen by raiders and bush had grown up. They then trekked right down the Wiensaana to the Incomati.

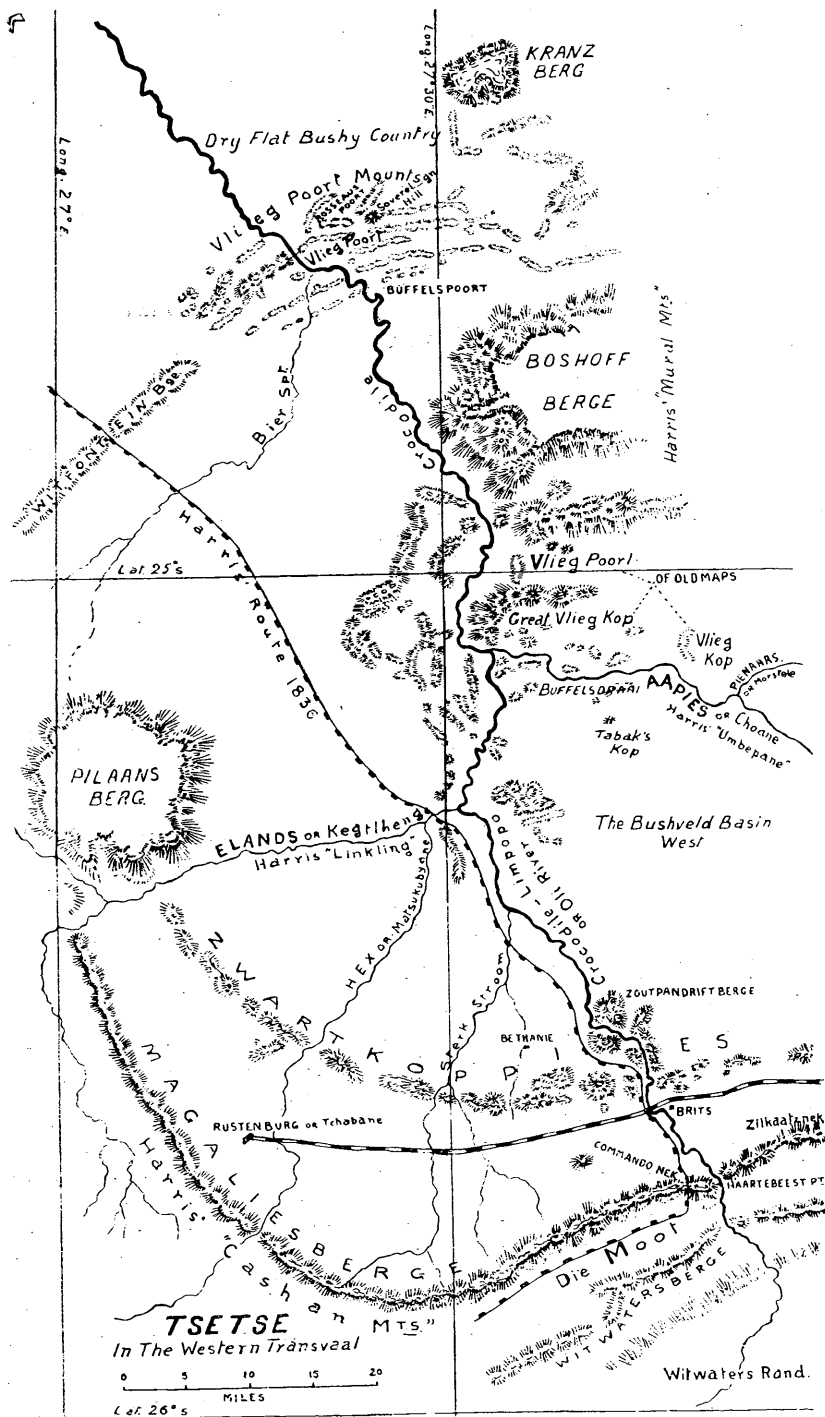
Finally, about the middle of April, 1838, the expedition arrived at Delagoa Bay wrecked by disease and disaster. There most of the party died of malaria, including the dauntless leader.\*

Returning to the year 1836, we learn that from October to into December Captain William Cornwallis Harris (3) hunted in, and later made famous, the triangle formed by the Marico and the Limpopo (Crocodile section). He travelled the ancient round-about route from Grahamstown through Bechuanaland, by the way of the mission stations. From Kuruman he went to Copaine (lat. 25° 20' S.; long. 25° 50' E.), and there (October, 1836) he sought and obtained the permission of Mzilikatzi to hunt in his dominions. Accompanied by men of the king, Harris turned south-east, crossing the head-waters of the two Maricos in the latitude of Zeerust. He then traversed Zwarttruggens and hunted over the sources of the Oli (Limpopo-Crocodile). When hereabouts (not far north of Krugersdorp) he climbed the Rand, describing it as "unquestionably the highest part of Southern Africa" (p. 227). Because the natives with him, fearing Dingaan, would not cross the Oli (Crocodile), he travelled down stream and outspanned in Die Moot, no doubt in the neighbourhood of the farm Schoemansdal. Thereabouts he shot elephants, rhinos, and smaller game, of whose abundance we get an idea, perhaps too graphic (*cf.* 6, p. 7, Vol. II), in several parts of the chapters devoted to "Hunting in the Cashan Mountains."† From his camp in Die Moot he rode east among the highlands south of Pretoria (Choane), and ultimately, on the 15th November, 1836, crossed to the north of the Magaliesberge. This is his account of the passage over the mountain:—"By a perilous and barely practical path" (*Commando Nek*) "we were enabled to camp on the western banks of the Limpopo some distance from below the point where it winds through the bowels of the mountains," (*Haartebeestpoort*) "which rise on either hand in abrupt precipices as though torn apart by some mighty convulsion of nature" (p. 231). Little, one may suppose, did Harris imagine the waters of this wild ravine, in less than five score years, bridled by a mighty dam, with never a white rhinoceros within 300 miles, and his camp site in Die Moot submerged. From his outspan north of the range he sketched the following word picture of the prospect before him, into which I have interpolated the necessary modernities to make it more readily recognizable:—

"Here (*north of the Magaliesberge*) the country again assumes a more level character (*east to beyond De Wildt, north to Brits, west towards Rustenburg*), but is broken towards the eastward by detached hills and low ridges (*the Pyramids and Zwartkoppies*), imperceptibly increasing in size (*to the westward*), until they grow (*in the distance*)

\* In this account of Trigardt's trek and in that of Harris' expedition which follows, it should be borne in mind that both journeys took place in midsummer when, doubtless, tsetse ranged farther afield than in winter.

† I have not found it possible to indicate the origin of the name "Cashan" by which Harris describes the Magaliesberge. The native name given to Rustenburg when Mzilikatzi moved there was "Tlhabane." This is very suggestive.



III.

*The Mural Mountains abounding in Tsetse, 1836.*

A sketch map of the Valley of the Limpopo-Crocodile; the most southern upland extension of Tsetse (Brits, 3,775 feet; Buffelspoort, 3,024 feet). Showing to the north the notorious Vlieg Poort and the traditional Vlieg Poort and Vlieg Kops on lat. 25° S.

into a great range of mountains known as the Mural. During the rainy season especially they are infested by a large species of gadfly, nearly as large as a honey-bee, the bite of which, like a similar pest in Abyssinia, proves fatal to cattle.\*

"A desire to escape the officious visits of these destructive insects, whose persecutions relieved us of two of our oxen, soon obliged us to abandon the willow-fringed river which threads the (*Zoutpansdriftberg*) mountains (*from Crocodilepoort to Snymansdrift*) for a considerable distance; and, after crossing the Lingkling (*Kgetheng or Elands*), the embouchure of which is not many miles above that of the Umbepane (*Choane or Aapies*), our difficulties were not a little increased by the broken and stony character of the country. The third day after crossing the mountains we encamped on the Mac-hochan River (? *the Machothoane, beyond the Pilaansberge*), near the scene of the signal defeat of Barend Barends' Griquas in 1831" (pp. 231, 232, 233).

According to his map, with particular reference to the rougher sketch which accompanied the earlier Indian edition (1837), the Mural Mountains represented those of the Waterberg Plateau. It has been suggested to me that Harris coined the word "Mural" to describe the wall-like krantzes so characteristic of these mountains. But this is open to question, as he does not appear to have approached them sufficiently to observe this feature. In the region of the Waterberg Plateau there are several farms long ago named Maroelaknop, Maroelafontein, Maroelapoort, *et al.* These place names at once suggest that Harris employed a corruption of "meroola," the native name of the sweet acidulous fruit bearing *Sclerocarya caffra*. On the other hand, the abundance of this tree rather excludes this possibility and favours the acceptance of the explanation offered by the Rev. W. Behrens (Appendix C), more especially as further inquiries I have made go to show that the "moralo" is the kaffir orange (*Strychnos*), a fruit less frequently met with in the Rustenburg region than the meroola.

Curiously enough, since the seventies almost to recent days, it has been the habit of map-makers to build up a range of "Mural Mountains" against the east bank of the Limpopo, where there is a wide plain with but some insignificant koppies. To keep these fictitious mountains company, as it were, on the opposite bank lie the purely cartographical range of "Morati Mountains."

Harris appears to have trekked with rather extraordinary rapidity down the valley of the Crocodile after crossing the Cashan (Magalies) Mountains, and it is not quite easy to say at what point he abandoned "the willow-fringed river." Although stretches are willow fringed to-day, I understand that in the great flood of 1893 the floral character of the banks was considerably modified. They were much denuded of trees, and have since remained so. From the context of his account and the topography of the district it would appear that he veered to the west before reaching Brits, the Crocodile Poort region of the Zwartkoppies. His observations strongly indicate an extension of tsetse far up the Crocodile from the fly haunts of 1870 at the junction of the Aapies. As he trekked at a time of many heavy thunderstorms

\* The gadfly of Abyssinia to which Harris refers, had been brought under notice in 1813 by James Bruce, who said of it that the natives of the sea-coast of Melinda were obliged to change their habitations at the beginning of the rainy season to prevent all their cattle from being destroyed. Tsetse flies and nagana have since been reported from Abyssinia.

(cf. p. 217), and was north of the Elands River in three days, the early death of the oxen rather indicates that they were struck at Hartebeestpoort, near the camp on the south side of the Magaliesberge.

Although Harris trekked into the angle formed by the Marico and Limpopo (Crocodile section), and from there rode on horseback to the south bank of the Matlabase (his Clabatze or Balapatse), and then returned through the District of Rustenburg, he makes no further allusion to fly. However, he was never again close to the Limpopo, as he tells how he was hustled from pillar to post among the Zwartkoppies by the natives.

#### FIRST PERIOD: REMARKS.

There are several features of interest revealed in this story of the first period. Trigardt's diary discloses an extension of fly through the rift in the Drakensberg, and Harris' experience shows a much more southern extension of fly on the west along the Limpopo-Crocodile than there was any good reason to surmise, although these may have been summer extensions only. It is also fairly plain that all the way from the Pilaansberg to Marico mouth, and from there down to the junction of the Matlabase, away from the Crocodile, fly did not occur. As Harris had some good reason for associating fly with the mountainous parts, especially the hilly district through which the Limpopo-Crocodile flows to the east of the Pilaansberg, it is abundantly clear that the natives knew the fly, its habits, and the ill-effects of its bites on domestic animals.

### III.—THE SECOND PERIOD: 1846 TO 1849.

#### "THE DAYS OF THE FIRST ELEPHANT HUNTERS."

Fascinating as it always is to follow the movements of our early sportsmen and explorers, it would be difficult to find a recital of events that holds one's attention more than the thrilling story Gordon Cumming gave to the world in 1850 (4) on his return from five years of hunting in "The Far Interior of South Africa." By checking each date and incident in his diary, one finds that Cumming made four different expeditions, starting either from Grahamstown or Colesberg as his base. His first hunting was done between Grahamstown and Colesberg, and occupied the period October to November, 1843. From December, 1843, to March, 1844, he hunted along the Orange, Vaal, and Riet Rivers. The period April, 1844, to January, 1845, was devoted to an expedition as far as the Bamangwato Mountains (Shoshong and Mahalapsi), in Bechuanaland. The next period, March, 1845, to January, 1846, was spent in going over the same ground as in the previous period. In his last two expeditions, Cumming visited the Limpopo. The first period was March, 1846, to February, 1847; the second, March, 1848, to April, 1849. In both expeditions the same route was followed. In the second he did not go quite so far down the river, halting just short of the Lotsani. In neither did Cumming get so far as the Nylstroom (Magalakwin), and yet the map accompanying his book leads one to believe that he did cross the Nylstroom into the Zoutpansberg District.

Although Cumming had been twice to the Bamangweto (Sho-shong) Mountains, 30 to 40 miles to the west of the Limpopo, he had neither seen nor heard of tsetse, showing that, at this latitude, there was no serious penetration of the scourge into Bechuanaland.

For the purposes of this review it will be sufficient to sketch briefly the route of the first expedition, giving only a prosaic outline of his account of a world of adventure more picturesque than that of Harris, and, because recorded in detail, more valuable than that of the reticent, good-natured Oswell.

Travelling from Grahamstown (11th March) by way of Livingstone's headquarters (Chouaney, Chouay, or Chooi of those days, Chwaing of these), Cumming reached the Notweni (his Ngotweni) and travelled down its west bank to the Limpopo. This was crossed (17th June, 1846) just above the junction of the Matlabase. The bank of the Limpopo was then closely followed and the Pongola (Macloowey) and Palala forded. For about a week (1st to 5th July) he hunted with Selika's village (farm Beauty No. 2228) as his headquarters. After this he went down to the Limpopo and outspanned. Then he hunted on horseback to Selika Kop (his Gaupa or Lingaupa Mountains), in Bechuanaland, for six days. On the 29th July he crossed the Limpopo with his wagons at the drift just above Palala mouth, and then trekked steadily down the main stream, crossing the Lotsani on the 8th August, the Sukim on the 10th, and the Makweze (Mokojay) on the 16th. Two days later he halted somewhere in the neighbourhood of Zwanepoel's Drift (lat.  $22^{\circ} 35' S.$ ; long.  $28^{\circ} 32' E.$ ). From this point he turned back (21st August, 1846) and established a camp near a Bakalahari village below the Lotsani.\* Across the river from here Cumming did most of his hunting, especially at Palmietpan † and Upapa Pan, and it was during the first night of the six weeks spent there that his servant, Hendrick, was carried off by a lion. Later (8th October) he broke camp and went to Selika's Kop (Lingaupa), where he again outspanned (17th October) and established the camp "My Forest Home" in the "Mountains of the Sable Antelope." Selika's Kop was left on the 15th November, and the homeward trek soon developed into a nagana disaster, from which the hunter was only saved by timely help from Livingstone.

When Cumming came to the latitude of Zwanepoel's Drift his natives wished to go no farther and warned him of the fly. "They told me I should lose all my cattle by the fly called Tsetse" (Chapter 27). As, apart from Cape natives, those with Cumming were Selika, from the Palala, there is little doubt as to the tribe from which the word "tsetse" was absorbed into the English language. From the manner in which both Cumming and Vardon employ the word, one at once arrives at the conclusion that it had a special significance among the natives from whom it was acquired. The natives with Cumming were men of Selika, and at least from that day to this these particular natives have used it in a specific sense to describe *Glossina morsitans*. Among them an ordinary fly is called "mtsi" (pl. lintsi), whereas the tsetse was a fly whose bite destroyed their cattle.

\* On the Bechuanaland bank of the Limpopo, opposite farm Wagonmaker's Vlei No. 1044 (sub-division Essexdale No. 1052); lat.  $22^{\circ} 40' S.$ ; long.  $28^{\circ} 10' E.$

† Palmietpan, lat.  $22^{\circ} 43' S.$ , long.  $28^{\circ} 18' E.$ , is on farm Jakalsfontein No. 736, called "Sebooma" by Cumming. Upapa Pan, lat.  $22^{\circ} 47' S.$ , long.  $28^{\circ} 18' E.$ , is on farm Biesjesfontein No. 1089. It is referred to as "Paapaa" and "Pepe" by Cumming in his text and "Pipefontain" on his map.

It was in the northern part of the Waterberg District Cumming first experienced the dire results of tsetse bite. He refers (Chapter 27) to the incident in the following words:—"When under the mountains I met with the famous fly called 'Tsetse,' and the next day (17th August, 1846) one of my stud died of tsetse. He had been bitten under the mountain range lying to the south of this fountain." The context relates to hills south of Upapa Pan, probably Witkop on farm Biesjesfontein No. 1089, or to the Silokwano Hills, with special reference to the kop called "Boschrand" or "Impogwi" on farm Koornhuis No. 1118. In this connection it may be noted that Cumming's map shows "Pipefountain" as adjacent to "Impogwe Mountains."

In his second expedition, Cumming first fell in with tsetse (June, 1848) at Selika's village (Matshu Hill or Die Witten Koppies), farm Beauty, where neither he nor the Oswell-Vardon party seemingly encountered it two years before (1846). Regarding this event, he writes in Chapter 31:—"We formed the wagons at my old camp, but, observing tsetse on the horses, I at once resolved to leave Selika's on the morrow." That his animals were bitten is obvious, as he says:—"On the 25th of July, at sunrise, we inspanned and held down the river, leaving three more of my stud behind me, two dead, and the other dying of tsetse."

The disaster that overtook Cumming on his homeward route in 1846 strongly indicates the existence of fly at Selika's Kop in Bechuanaland, but in view of his previous visit there one is led to suspect that his oxen were struck when in the neighbourhood of the Lotsani, and only fell to the disease after the rainy season set in. Soon after leaving Selika's Kop (15th November) he enters the following remarks (Chapter 30) in his diary:—"The rains still poured down, rendering the country impossible to travel, and my oxen died daily of the tsetse bite. . . . At length I came fairly to a stand . . . and in a few days all my oxen died. I left the sable antelopes' mountains mainly in consequence of a general falling off amongst my cattle. I did not then know to what cause to attribute this sad, and to me important, change in their condition. Alas, it was now too evident that nearly all of them were dying, having been bitten by the fly 'tsetse' at the mountain. The rains of the last three days have made this melancholy truth more strongly manifest" (cf. Appendix F, 8).

Contemporaneous with Cumming's experiences of 1846 comes the less serious, but in other respects more important, encounter with the fly by Oswell and Vardon, since it was a specimen the latter took to England which became the type of *Glossina morsitans* Westwood.

When Oswell was near the Marico, about the middle of May, 1846, Vardon was hunting "on the Limpopo, three days' march upstream from the junction of the Marique." Oswell (6) writes:—"Hearing I was within a short distance, Vardon proposed to join parties and shoot together." There is evidence to show that no great advance down stream was made at this time by Oswell and Vardon. The former says:—"Two marches (about 20 miles) from the junction of the Marique we found elephants in such large herds that we halted for a week or ten days" (p. 96), i.e. below the Matlabase.

Meanwhile, unknown to Oswell, Cumming had pushed ahead of him down the Limpopo, ultimately reaching a farther point than either Oswell or Vardon ever visited. One can make a shrewd guess that Cumming did this deliberately, and later wittingly misled

Livingstone as to where he had been and as to where he had located a harvest of ivory. At any rate Livingstone, writing to Oswell, in India, in 1847 (6), says:—"Cumming has shot few elephants this year. He had a bad attack of illness beyond the Bamangwato which prevented him from much execution. He intends to follow your 'spoor' henceforth" (p. 149). Cumming was no doubt hiding his preserve against his next exploit of 1847-8; we know he had a bad attack of malaria at Zwanepoel's Drift.

It is very certain that Oswell and Vardon made no farther northing than just beyond the junction of the Palala. The former's own statement (6) reads:—"We pushed down the Limpopo, beyond the Siloquana ridge, four or five marches, then crossing the river near a high rocky hill returned to the Marique" (p. 115). The route map shows that they crossed the river opposite "Lingwapa" (Selika's Kop), and in the vicinity of the "Motleencraal of Basilica" (Selika's village on farm Beauty). This would, on the basis of "four or five marches," bring the so-called Siloquana Ridge forty to fifty miles short of Selika's village. We may, therefore, safely conclude that the hills on Oswell's map, described as the "Siloquana Hills infested by Flies Destructive to Cattle," are in the angle formed by the Pongola (the Makolwè of Oswell, the Macoolwey of Cumming) with the Limpopo. Hence a nameless bosrand\* close against these rivers, about lat. 23° 15' E., is the type locality of *Glossina morsitans* Westwood.

Oswell (5) says:—"On the low Siloquana Hills near this (i.e. the Limpopo, cf. p. 110) we made our acquaintance with the tsetse fly, which we were the first to bring to notice, Vardon taking or sending to England some he caught on his favourite horse" (p. 113). Elsewhere (6) he adds:—"The fly infests particular spots and never shifts" (p. 137, I).

Concerning the type, Austen (7) writes:—"The specimen bears the following label in Westwood's handwriting: '*Glossina morsitans* Westwood (Setse) fm. Lake Tchad, Central Africa, Captn. Frank Vardon.' But this locality must be wrong. So far as I can discover, Major Vardon never visited Lake Tchad, and the specimen is almost certainly from the Siloquana Hills, which are in the north of the Transvaal, in the angle formed by the Nylstroom River with the Limpopo" (p. 83). Austen refers the taking of the specimen to the year 1845, and adds:—"In a letter to Westwood, dated May, 1850 (published by Westwood, Proc. Zool. Soc., 1850, p. 260), Vardon speaks of the fly of South Africa so destructive to cattle" (p. 84).

The Silokwano Hills of the official maps of the Transvaal are where Austen places them (lat. 22° 50'). Oswell was, however, considerably out in his reckoning, and this was brought to his notice by Livingstone. In the letter already quoted from, Livingstone is at great pains to have his benefactor alter his map,† and says (6), *inter*

\* Possibly one of the three hills upon farms Hermansdal No. 636, Bouwlast No. 1431, Bellvue No. 1425, and Wolmunster No. 635, one of which is called Witkop. "Pongola" is purely a map-name for this river; known also as the Zandrivier, the local natives call it the Mokòlò; hence the names given by Cumming and Oswell!

† The map (6, opp. p. 150, I) here referred to is described as a "Map of the Routes of Mr. Oswell and Lieut. Vardon in South Africa in 1845 and 1846" and was first published in the "Madras Journal of Literature and Science," 1847. It gives an entirely wrong impression of the latitude and longitude of the places visited by Oswell. The hunters made a little more northing than Livingstone thought, and were not nearly so far east as they surmised. By correcting the farthest point they reached to the neighbourhood of lat. 23° S., long. 28° E., it is possible to show, as I have attempted to in the copy of the map herewith, the correct course of the Limpopo north and east thereof.





*alia*:—"I have felt exceedingly anxious to inform you of this, lest you should give your name to any map-maker with the mistake you seem to have made, and therefore begin the subject at once. . . . If the Basilika are not more than sixty miles N.W. of the Bampela you have not made more northing than that from the latitude of Chonuaney 24° 30' " (p. 148.) Oswell never attempted to correct this error, and it is for this reason that there are two Lingaupa mountains on old maps of the Transvaal.

Into this period falls part of the information given by Mnr. H. J. Grobler in Appendix A, and so does not call for repetition here.

It was, however, at about the beginning of the period that the "Celebrated Commando Path" is reputed to have been made. This path, mentioned by Thomas Baines and described somewhat in detail by Selous to the Sleeping Sickness Commission (1913), is spoken of as a great prophylactic undertaking accomplished by a flying column of Voorste Voortrekkers hastening far off to overthrow Mzilikatzi in his refuge among the Motoppos. It is greatly to be feared that so remarkable a feat existed only in the imaginations of some too communicative descendants of the pioneers. Selous' statement is worth repeating. It reads: "When the Boers followed Umziligazi from the Transvaal in 1840 and crossed the Limpopo, they chopped their army road. It was a quarter of a mile broad, and they trekked with their oxen through that cleared space and did not lose their cattle by the fly. I only heard about it from the Boers, and that was a long time ago, so I cannot say exactly the width."

#### SECOND PERIOD: REMARKS.

An examination of Oswell's meagre accounts and of the more graphic story Cumming supplied, coupled with the absence of any direct statement to the contrary by Livingstone, show very clearly that in Bechuanaland, along the main route to Bamangwato and on the hills there, tsetse was not met with. In other words, it did not penetrate the country to where the railway from Mafeking to Lotsani passes to-day. There is indeed no evidence of any penetration west of the Limpopo until the latitude of the Macloutsi River is reached, except for what Cumming tells of Selika Kop (Lingaupa, or more properly Nwapa), ten miles west of the Limpopo. Even here there is an element of doubt, as his oxen may have been struck much farther north and only exhibited symptoms of nagana after the onset of the rainy season. Oswell did not find fly along the Mahalapsi, and he and Vardon evidently did not meet with it along the Limpopo until they reached the Pongola.

Each instance in which these travellers met with tsetse it occurred on or in the close neighbourhood of wooded hills or bosrande, and this probably reflects a distinct association of the fly with a certain floral environment dependent on soil conditions.

It is very plain also that, though often not far off, the tsetse did not infest the forest avenue of the Limpopo. Both Cumming and Oswell made their treks close to the river, shooting many hippo,\* but nowhere mention meeting fly when doing so.

\* The reason why the hippo. were shot out is to be sought in the higher price per pound paid for their tusks in those days, hippo. ivory being preferred to that of the elephant for making artificial teeth.

One may also gather from the writings under review that certain wild animals which were particularly abundant in those days in the fly country have since disappeared. These were giraffe, elephant, rhinoceros, buffalo, and hippopotamus. Of other animals, antelopes, wildebeeste, and zebra, the hunters say but little, but these animals were nevertheless there, and are still there, although probably now in relatively small numbers.

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#### IV.—THE THIRD PERIOD: 1868-1873.

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##### *THE LURE OF GOLD.*

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Before the wealth of the Rand was suspected, the gold-seeker had been lured both to the Transvaal and Monomotapa (Rhodesia): and hence, at the time now under notice, such places as Mac-Mac, Pilgrims Rest, and Marakastad were on the road to fame. It is only natural that men should come from afar to explore the possibilities of the land, and there were few corners of the Transvaal that were not poked into and fossicked over for traces of the yellow metal.

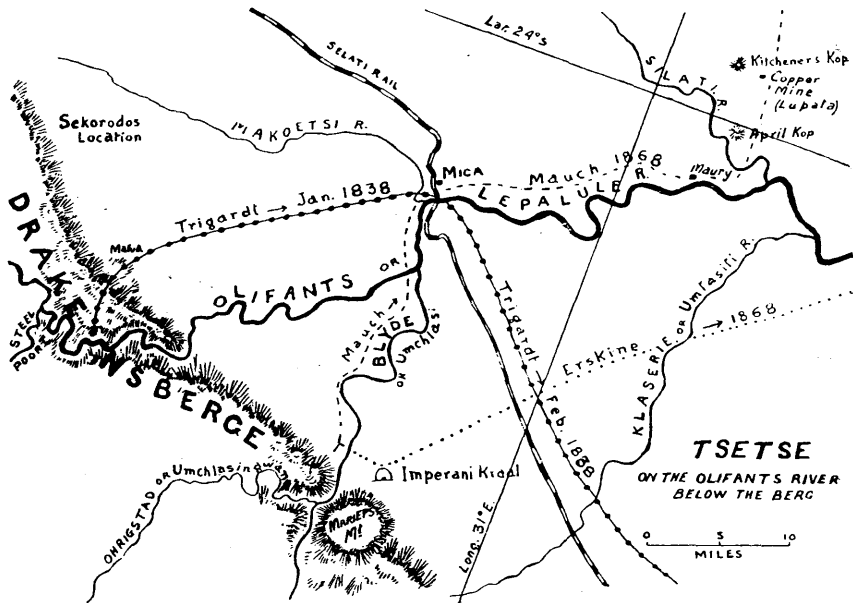
In May of 1868, W. St. Vincent Erskine, son of Major Erskine, a former Colonial Secretary for Natal, left Pietermaritzburg in order to join Karl Mauch and devote his leave to accompanying Mauch a part of the way upon the latter's expedition to Matabeleland.

At Lydenburg the two friends parted company, and Erskine went on alone. He passed through the deserted village of Ohrigstad to Schoeman's farm, and then on to Trigardt's farm. From here he scaled the Drakensberge, descending the Blyde Canyon by way of the Giant's Staircase. He calls the Blyde the Umchlasi, and a few hours' walk from the river brought him to a kraal and waterhole which he calls "Imperani." There is much reason to suppose this was the kraal of Moletele, chief of the Lepulane, who lived in those days close below Marieps Mountain. At any rate it was here that Erskine first saw tsetse in the middle of July (9). "The Caffres," he says: "have a few miserable cur dogs, which are not affected by the fly; these resemble jackals, and are generally a light brown colour; their coat is rather long and hairy." He describes the Klasarie (Umtasiti or Umtasera) as the only running stream met with after crossing the Blyde, and adds:—"The bush here is not large, principally mimosa of different kinds. You cannot hunt on horseback on account of the fly." This remark seems to apply to the belts marked east of the Klasarie on Mr. Travers' map.

From Imperani, Erskine walked more or less due east, crossing the Umtasiti (Klasarie), "a fine stream as clear as crystal," then through the dry bed of the Sorgobite, and on to the Imbabati. From here he proceeded to Imbomduna's kraal on the Bombo Hills, and thence to that of Macigamana at the junction of the Olifants (Lipalule) and Limpopo. Then he started down the Limpopo (Bembe or Meti) to discover its mouth, a sorry enough spectacle to recompense him for all the troubles he experienced in attaining his object. He was helped by Macigamana and foiled by Manjoba, and spent much time going backwards and forwards along the Limpopo before he succeeded in overcoming the difficulties placed in his way, and reached the sea.

About thirty miles south of the junction of the Olifants, at the kraal of Matonse, he saw the first herd of cattle since leaving Lydenberg. About half-way between the kraals of Uhamba and Manjoba he passed "signs of old kraals like fairy rings, formerly the residence of the late chief Shosonga, father of Manicose."

From Manjoba's kraal, Erskine walked 140 miles west by south to join the Du Bois party, and then accompanied them back to Natal. They crossed the Lebombos at Sabi Poort, and proceeded south to Swaziland, keeping close to the hills. The party was spent with fever and left one of its members, Woods, buried at Sabi Poort. They reached their wagons south of the Umbelusi after "dragging our diseased bodies from the Bembe" in about thirty-seven days. They then went inland to the neighbourhood of Utrecht.



V.  
*An old-time Fly Haunt.*

Trigardt's Route as shown accords with Mr. Preller's interpretation. It is not unlikely that the trail crossed the Olifants River to the west of the confluence of the Blyde River.

Erskine tells no more of tsetse than this: "The country within thirty miles of the Bombo Hills is flat and bushy, abounds in tsetse fly and game . . . on the eastern side of the range it is extremely unhealthy . . . there also tsetse fly abounds." The latter part of this remark relates to the country through which run the courses of the Uanetzi and Massintonto from the hills to the Incomati; insignificant as streams, since Erskine does not even comment upon them although his track crossed both.

Erskine was largely content to tell only where he first encountered tsetse. Thus, in his subsequent expedition to Gazaland (1871), he tells how he first met it at Simini, in dense, heavy forest between the kraals of Siduda and Umvuna. This fly-belt was probably about thirty miles north north-east of Chibuta, and about twenty miles from the sea (approx. lat. 24° 20'; long. 30° 50').

Mauch, with his pack-ox and dog, seems to have wended his way down the west bank of the Blyde and crossed the Olifants at the confluence of the two rivers. He then followed the latter stream eastwards to its junction with the Silati. At this point he turned north, and appears to have been in the Palabora country and near Kitchiner's Kop on the 20th July, when he wrote (8):—"For two days past we have been in the fly (tsetse) country." This brief notice has its interest, since Mauch probably passed the point where Trigardt crossed in February, 1838. The difference in the time of year may explain why he did not come sooner in contact with tsetse.

At about this time (1870), P. Hope went down through Swaziland to Delagoa Bay, and gave a brief account of his journey in *The Journal of the Royal Geographical Society* (Vol. 44, 1874). The route he followed ran due east from Bremersdorp, a little south of the present Tembe road, and crossed the Lebombos in the neighbourhood of Buchanan, passing Josan's (or Japane's) kraals on the west of the hills. On the Portuguese side it went across the Little Lebombos in a north-easterly direction to Bomboi (opposite Boane). Speaking of Mafootane's kraal (about twenty-eight miles west of the Lebombo), he said: "I should advise that, for the present, oxen should be left here and not taken to Josan's kraal, although I saw no fly either going to or coming from Josan's." Of Josan's kraal he wrote: "At about one and a half mile there is a break in the Lebombo . . . many years since five wagons were taken up here by Dutchmen; three spans out of five died of fly." From his remarks one gathers that Hope regarded all the country east of the hills as infested. (Cf. Appendix F 12.)

It is from Thomas Baines' "Gold Regions of S.E. Africa" (10) that we get the best view of the extent of tsetse in the Transvaal at this period. Baines knew Southern Africa well by this time, having arrived in the Cape in 1842. The year 1871 found him on his way back from Matabeleland with Lo Bengula's grant in his pocket. He had travelled north from Magaliesberg under the guidance of Henry Hartley by way of Rustenburg, Saulspoort, and the lowest drift across the Marico; thence along "the forest clad banks of the Limpopo" (p. 18) to the Nomani (Notweni) and "across a broad dry flat" to Shoshong, "by Hartley's Road, via Ba-Mangweto, and Tati, clear of tsetse" (p. 170). So far as the last part of the Transvaal section of this is concerned (Saulspoort to the Marico Drift) it may be described as that of Harris, 1836. The rest of the route to Shoshong was much the same as that of Cumming and Oswell (1845). The homeward route was taken to please Lo Bengula. Speaking of this, Baines says:—"He told me that a more direct road existed to the southward, through the tsetse fly, but that some of his father's (Mzilikatzi's) people knew of passages by which the danger might be avoided, and to his great gratification I consented to open the road by going that way" (p. 48).

After crossing the Macloutsi, between it and the Pakwi, a tsetse belt was entered (pp. 56, 57, 58, 59, 61) and fly found. Here they "were in hopes of finding the 'commando path' of the Emigrant Boers, where in old times they had cleared away the bush, 100 yards on each side of the road, but we found reason to believe that this was still to the east of us, and we knew no safe way of reaching it" (p. 58).

On the 28th October, 1871, the expedition arrived on the north-west bank of the Limpopo, having crossed the Lotsani, "a narrow branch of the Limpopo" (p. 62), and trekked four or five miles upstream so as to "avoid a patch of fly that holds the bank opposite" (p. 63).

The crossing\* was made at Hellenspont (lat. 22° 43' S.; long. 28° 17' E.), and as soon as the party outspanned on the eastern bank (30th October) fly was met with (p. 63). Baines was now 20 miles upstream from Cumming's 1846 "Bakalahari Village" camp, and directly opposite the official Silokwano Hills, which stretch in a south-easterly direction from the Limpopo for 15 miles, over about a dozen farms. The finding of fly induced the party to move off, and they trekked to Peerie's Village against the Impopo Mini Rapids. These place-names are extant to-day, and Peerie's Village is, I am told, still on Worcester No. 1035. Here a stay of a couple of days was made, and although fly was looked for, it was not found. "Biles, Jewel, and Carl went to a pool to watch for tsetse, but did not find any" (p. 64). Leaving Peerie's Village, two treks along the banks of the river brought them "nearly abreast of the Tsagool Hills (the Silika or Siloquam of the maps) on the opposite side of the forest-fringed river."†

Hereabouts Baines made a short-cut across the sharp bend of the river (Fly Kop of old maps), embracing farm Eersteling No. 857 on the west. That his Masara guides knew they were about to enter a fly-belt is illustrated by the following remark:—"I feared we were pushing on too early. . . . At 7 p.m. it was quite dark, and we thought it safe to span out until the moon rose. . . . At 12.10 a.m. we moved on again. . . . At 1 a.m. we passed a granite hill covered with bush and infested by the dreaded fly" (p. 65).

The next day's trek brought the party to where the track turned away from the river, and here their guides left them. They then trekked south-east through the night to avoid fly.‡ In the morning (3rd November) they found themselves near Madala Pan, which is on the boundary line of Kameelfontein No. 625 and Hanover No. 1287. Here they learned from the local natives that "the pan in front was called Madlala (letshe la Madala),§ and a day's journey beyond it, was 'Schimmel Paard Pan'; there was fly between them, but no water, and there is also fly beyond Schimmel Paard Pan" (p. 65). As Baines trekked by day as far as Bugelpan, this part of the road through the farms Hanover and Berne No. 1286 must have been considered free. Baines does not specifically allude to Bugelpan, but it is plain that from this point the pace was forced through Genoa No. 1290, Cornwall No. 1297, Bordeaux No. 1281, Victoria West No. 838, and Marnitzkraal No. 839, trekking through a night "dark and cloudy, but affording us additional security against the insect

\* This crossing-place is correctly indicated on Jeppe's map of the Transvaal, 1899 against farm Clanwilliam No. 1036. "Baines Drift" of all other maps, including Bartholomew's latest edition, is incorrectly placed some 30 to 40 miles to the north-east.

† This remark has no bearing on tsetse, but it is apt to lead to confusion as regards place-names. The hills referred to are those shown on official maps as "Mabilibili Kopjes." They have no relation to either the Selika Kop, which is 10 miles from the river, or to the Silokwano hills of Oswell or the maps.

‡ Showing they knew of it or feared it on the farms Grootwater No. 1840, Welvaart No. 1194, Klipfontein No. 1621, and Van Wykfontein No. 1195.

§ Not to be confused with Matala (Madlala) Silimo Pan of the official maps; lat. 22° 47' S., long. 28° 30' E.

pest" (p. 66). However, they still regarded themselves as in dangerous country, since Baines says:—"By early dawn we were again fleeing for the lives of our cattle and . . . outspanned just short of Schimmel Paard Pan" (p. 66).\*

As a halt was made for twenty-four hours, it is possible that, adjacent to the pan, fly was not present; this may also be inferred from Baines' account of how this pan got its name (*cf.* p. 66). Apart from warning him of the fly-belt on the road beyond Schimmel Paard Pan, the natives had also told him that when he came to the "Maghaliquain" he should not cross, as there was fly between it and the "Madzalan," the Madala of the maps.

Accordingly we find the expedition preparing for a night trek to the Nylstroom:—"On November 5th we inspanned about half-past five so as to get into a definite road before dark, and about seven we descended into a sandy tract haunted by tsetse. We made about seven miles and halted, the night being dark and cloudy and rain coming on towards morning. At dawn on Monday we trekked again, a steady shower protecting us as we laboured on through the infested district, and in 10 miles 3 furlongs we reached the west bank of the Maghaliquain" (p. 66).†

It would appear that Steilloop No. 663 was not infested. To-day the undisturbed conditions at this well-known drift show short scrub on the west bank and bosrande reaching down to the east bank. For four days a rest was made on the west bank, but not with impunity. "Our cattle," writes Baines, "would not eat the poor and scanty grass, but crossed the river to the better pasturage they saw on the other side, but unfortunately fly was there and we had to drive them back again" (pp. 66-67). This indicates fly on the farm Magalakwin No. 1671. Baines then goes on to say:—"After sunset on the 9th November we crossed the river and trekked up its eastern bank for some distance, and passing through the last patch of fly outspanned on a plain nine and a quarter miles from our last camp. . . . We had now cleared the infested parts between the Blauw Berg and Hang-Klip Mountains . . ." (p. 67).‡

So much for Baines' personal experiences. Quite apart from them, however, we owe to him records of a number of contemporaries; experiences which otherwise might not have entered into the history of tsetse in the Transvaal. If we examine the map published with his book (10), the following legend will be found written over the course of the Limpopo where it turns south-east on entering Portuguese territory:—"Tsetse Fly. Abundance of Game on the River." Many friends helped Baines, he tells us, in the preparation of his map. Among them was Captain J. E. Elton, who, sometime before 1871, went down the Limpopo from Tati to Delagoa Bay. This, then, is one of Elton's observations. In Elton's account of his journey down the Limpopo (*Proc. Roy. Geog. Soc.*, Vol. 16, 1872), he tells of meeting fly only just below the junction of the Nuanetsi. Here he

\* The farms falling into this part of the route are: Karnemelksfontein No. 672 Klippoort No. 577, Eyseselmonde No. 579, Kalkfontein No. 797, S'Gravenhage No. 682 Bloemendal No. 1269, Sydney No. 1276, and Mazila No. 1277.

† These two treks imply the presence of fly on the following farms:—Baltimore No. 1310, Cosmopolite or Slegtvoorby No. 471, Groenfontein No. 432, Roodebokspruit No. 363, Rexford No. 684, Rookop No. 858, Elim No. 850, and Steilwater No. 710.

‡ Baines is very insistent on the name of the mountains being "Hang Klip" not "Hanglip," as in modern parlance. On old maps Baines' crossing-place is marked "Great Vlieg Poort."

passed through two belts about a day's march apart (approx. lat.  $22^{\circ} 40'$ ; long.  $31^{\circ} 50'$ ).

In describing the route between Pilgrims Rest and Delagoa Bay, Baines says:—"Great caution should be exercised in using this road. I believe the only safe months are June, July, and August, and perhaps the first half of September; in the latter part of September, and to May inclusive, travellers are liable to fever. . . . The tsetse abounds in this low country nearly to Pretoriuskop. Mr. MacDonald's expedition lost, I think, 114 oxen, and Mr. Arrowsmith reports a loss of fourteen" (pp. 182, 183). He tells also that fly and fever were prevalent south-east of Pretorius Kop.\*

In describing the route from Pretoria over the high veld past Lake Chrissie and down through Swaziland to Delagoa Bay, Baines points out that after passing the Lebombo Range tsetse was met with. He says:—"On crossing the Lebombo into Portuguese territory, however, fly was met with." Again he writes:—"A considerable portion of this strip (to Delagoa Bay, 30 miles) is infested by tsetse" (p. 109). And further:—"The road passing through the Lebombo by a tolerably level poort or valley south of the Umbolosi . . . immediately after passing (the Lebombo) the tsetse fly . . . awaits the traveller" (p. 108).

It is worthy of remark that this route, given to Baines by William Leathern, should show an absence of fly on the west side of the Lebombo, a little south of the Umbelusi. Just to the north of the Umbelusi the floral conditions and other surroundings are essentially typical of fly-country, and it is most difficult to imagine any reason why tsetse did not extend the whole length of the Lebombo flats. These flats are continuous with the fly-country of the Incomati, and reach south through Swaziland to Zululand without, as far as I have been able to ascertain, any observable physical or floral barrier. It is difficult to imagine any thermal factor, as certain termites (*Anacridotermes*), which inhabit the Limpopo Valley, have a southerly extension to northern Zululand through the country east and west of the Lebombo Range.

In the winter of 1873, during June and July, Dr. E. Cohen (11a) travelled from Lydenburg to Delagoa Bay over Crompton's route, via Pretorius Kop, Nellmapius and Furley's Drift. The account he gives is full of detail. Naturally, it is a geological and topographical record, but contains numerous references to both the floral and faunal characteristics. Its most interesting feature, from our present viewpoint, is the mapping of the western and eastern limits of tsetse according to native testimony, and so far as the route followed is concerned.

The western limit is charted at Pretorius Kop (Taba Nēu). Cohen says that whilst he puts the boundary here, he himself did not see any fly until he was twelve to thirteen miles farther south-east. He

\* This information was probably given to Baines by D. R. Wilson, Dr. Graham, and Mr. Crompton (cf. p. 182). The route in question passed through Pretorius Kop No. 102. Jouberts Hoop No. 108, to Nellmapius Drift on the Eastern Crocodile, thence through Lodwichslust No. 107, to Furley's drift, through the Incomati, the railway line intersecting it just west of Oorsprong Station. Then it passed through Cooperdal and Castilhopol's and over the Lebombo range a little south of lat.  $25^{\circ} 0' 30''$  S. C. Warren, in describing the route "From the Gold Fields in the Transvaal to Delagoa Bay" (VI. *Roy. Geog. Soc. Journal*, Vol. 48, 1878), gives no clues to the exact whereabouts of tsetse. He tells, however, of the road-making and the clearing away of trees done by Monsieur Nellmapius.



places the eastern limit at thirteen miles or so east of the Lebombo, and some thirty miles north-west of Lourenco Marques, and states that he did not find fly actually east of rocky parts, where the game-paths ceased. He remarks, however, on the fact that the natives kept no domestic stock farther east, and one concludes that his informants gave him summer rather than winter boundaries. Cohen also speaks of the natives to the south of Delagoa Bay keeping cattle, a remark which doubtless refers to the country bordering on the estuary of the Umbelosi or English River.

He describes the tsetse met with as agreeing with Livingstone's figure except for a discrepancy in the drawing of the abdomen. He tells that the four blackish cross bands on the second to fifth abdominal segments are divided by a pale median stripe into equal parts, and the last two are not, as the drawing shows, connected by a small dark stripe.

Cohen speaks of the fly being in patches, where it occurs in dense swarms, whilst absent from other parts.

At Nellmapius Drift he found tsetse in great numbers. Across Furley's Drift, between the Incomati and the Lebombo mountains, he tells how, shortly before sunset as he was carrying a bucket of water in each hand, he was unmercifully bitten; but, hardly had the last ray of sunshine disappeared, than not a single tsetse was to be seen.

This, the third period of the history of tsetse, may be closed with the first published record I know of relating to Zululand. It is an account by E. C. Buxton (11b) in 1871, no doubt a contemporary of Baines (*cf.* Baines' map) who appears, at about this time, to have penetrated northern Zululand to beyond the Mkuzi River. He writes:—"The plains (? *Makatini Flats*) on the south (*north-east*) side of the Lebombo Mountains toward Delagoa Bay was the only district where I met with tsetse fly. Immediately below the mountain they seemed more numerous than at a greater distance. The belief of the natives in the dangerous character of the fly is universal. I have never heard any doubt expressed about it among the white hunters, many of whom have come to this district for many years. . . . The fly which was pointed out to us as tsetse is very common. . . . We were frequently bitten by them. I caught several, but mislaid them somewhere, as I have been unable to find them. . . . The fly district nearest to Natal is about twenty days' journey distant. Our horses and oxen we did not take into the fly country at all."

Buxton also writes:—"The fly appears only at certain seasons and in limited localities. The head of a kraal about thirty miles distant from where we found the tsetse most abundant told us that at that time (*winter, no doubt*) the fly was not in his district, and pointed to a heifer and some goats which he intended to send away before the fly season came on."

#### THIRD PERIOD: REMARKS.

The recorded history of this period introduces a recognized contraction of the fly, since it was in 1871 Theunis de Klerk told Baines that he "thought that the fly was a curse that was being removed from the country." Moreover, Fynney, writing in 1878, states:—"Many parts which six years ago (1871-2) were known as fly country are now entirely free."

It is also noticeable that fly was not encountered close to the Limpopo, but was expected as soon as the track turned away east from the river, or where bosrande occurred.

Baines' route to Rhodesia confirms the general absence of tsetse in Bechuanaland west of the Limpopo; his home route shows that this did not hold good north of lat.  $22^{\circ} 20' S.$ , or the region of the Macloutsi and Pakwe.

A. C. Bailie, in describing the route to Rhodesia (*Proc. Roy. Geog. Soc.*, Vol. 48, 1878), says: "From Shoshong to the Magalapsi River is through hills over a deep black soil for twelve miles.

Not many years ago this place was infested with tsetse fly, and now since the buffalo and other game have been driven out it is so healthy that Chief Khame has made it one of his cattle-posts. Both Khame and Lobengula are of the opinion that the fly disappears from the district when the buffalo do. They are both thinking, experienced men." Bailie wrote on hearsay evidence, and was in error as regards this locality. The information he gathered may have related to some other locality.

Another feature that stands out clearly is the importance of malaria and nagana upon the Lydenburg, Pretorius Kop, Delagoa route. It is curious that Baines should lay so much stress upon the danger of malaria along this route when he had gone over so much malarial ground. This rather indicates that the malaria of the eastern low country was always of a more malignant type than that of the western, but higher, low veld.

Since it is the fashion to deny to the Zulu any knowledge of the link between tsetse and nagana, it is interesting to have Buxton's positive evidence to the contrary.

The western arm of the fly-zone that once extended down through the Waterberg and Rustenburg Districts appears to offer many engaging features in relation to fly distribution therein. But of these one can only speak tentatively, as even to-day it is sparsely occupied and virtually unexplored as regards those characters one wants to know most about. It may be described as a wide pan-bespattered, kop-strewn basin hedged about on the east and south by mountainous tracts, whilst on the west it is bordered by the great Dorstland, which reaches down to the bank of the Limpopo. To the north it is open and continuous with the low veld of the Zoutpansberg District, which, where the Blauwberge and Zoutpansberge do not intervene, falls away, almost unnoticeably, from the Pietersburg plateau.

All the evidence goes to show that in this north-west area tsetse was closely associated with hills upon which the vegetation is denser than that of the surrounding bush country, also that tsetse inhabited spots where, it is possible, warmer conditions prevailed in winter, and where, perchance, leaf-fall is not so marked.

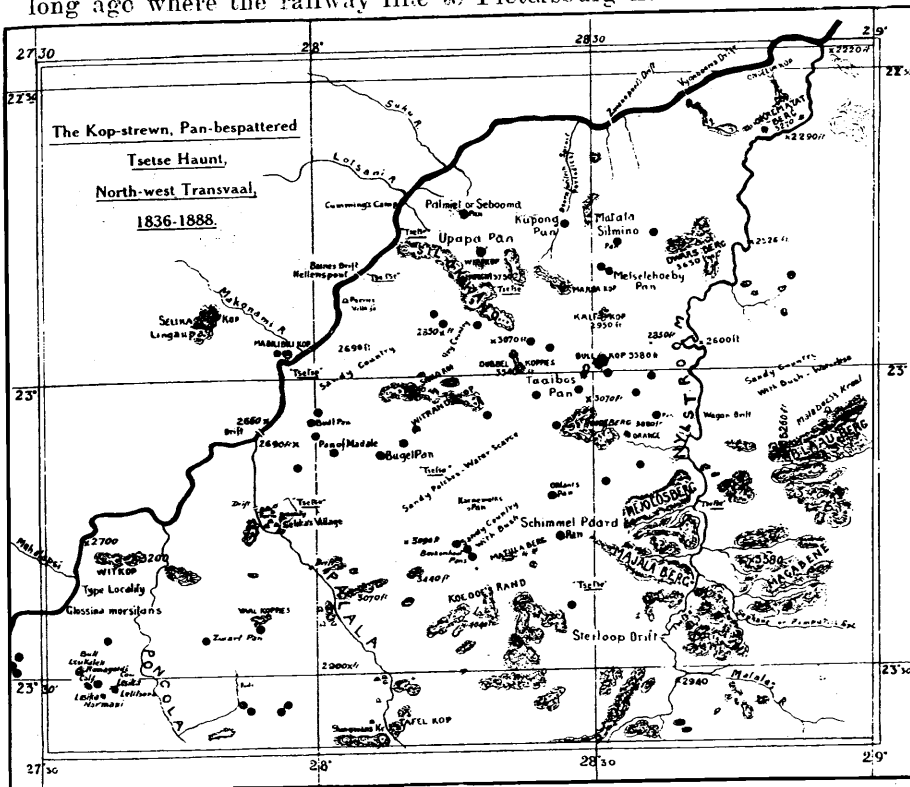
It was very true of this area that tsetse did not depend for its permanence on game animals alone, and that both climatic and floral factors influenced its existence considerably. It seems that it was such slight differences which inhibited extensions of fly into Bechuanaland when southern extensions along the Crocodile and Aapies Rivers were permitted.

It is very remarkable that up to this time fly still existed so near to the settled areas as the Aapies River (*cf.* Appendix F, 6), and may even have extended into the Bushveld basin.

Even to-day one spot to the north of Rustenburg is notorious as a former fly-haunt. This is where the Limpopo-Crocodile breaks

through the mountains to enter the western low country in the region of farm Donkerpoort No. 830 (about lat.  $24^{\circ} 40' S.$ ; long.  $27^{\circ} 17' E.$ ). This is the celebrated Vlieg Poort, and, by common consent, it is now a break in "The Vlieg Poort Mountains" (*cf.* Appendix F, 10).

The only documentary evidence, if so it may be regarded, to show an extension of tsetse up the Apies River is the Vlieg Kops (and Poorts) of old maps (*cf.* Wylde's Map of Eastern South Africa, 1889, and Troye's Map of the Transvaal, 1892; also Appendix C. On the other hand, my colleague, Mr. F. Thomsen, of the Division of Entomology, has for years past told me that tsetse was said to occur long ago where the railway line to Pietersburg now crosses Pienaars



## VI.

River. He resided there thirty years back, and then the old people using the road told how they once had to cross higher up stream because tsetse held the passage on the more direct route.

## V.—THE FOURTH PERIOD: 1888-1897.

## "THE LAST."

However little the gaps and lacunæ of the earlier periods may be filled by further inquiry, the last period is within the memory of living man, and there are still many who can, of their own experience, speak of the whereabouts of fly. This is illustrated by the excellent

data with which Mr. H. J. Grobler, Mr. J. E. D. Travers, and Mr. B. H. Dicke have kindly supplied me, and which are included in the appendices attached hereto.

The fourth period ends with rinderpest, but is one during the whole of which there seems to have been a decided independent shrinkage of the fly-country.

In the interim (1871 to 1888) is to be found a statement by F. B. Fynney (12) that reads:—"Zoutpansberg forms with Waterberg the northern boundary of the State, lying to the N.E. . . . Many parts of this district, as well as Waterberg, are infested with the tsetse fly; but there is scarcely need to attach so much importance to this fact as is commonly done, because the fly is merely a temporary and ephemeral scourge and always disappears with the large game. Many parts, which six years ago were known as fly-country, are now entirely free, and therefore it may be fairly hoped that the extinction of the pest is only a matter of time" (p. 120).

Writing in 1888, Jeppe (13) makes the following observations concerning the state of affairs obtaining in De Kaap Valley:—"Game has almost disappeared, frightened by the report of dynamite and the prospector's gun, and the tsetse fly has gone away with the game, save in some parts of the valley. The valley formerly teeming with all kinds of game, from the elephant to the steenbok, is now deserted" (p. 441).

The remaining records for this period relate rather to museum specimens, excepting always the tale that is told in "Jock of the Bushveld," and Millais' (14) "A Breath of the Veldt." This latter work of sport and art is interesting mainly because it shows the author-artist hunting the Zoutpansberg in 1903 and not meeting tsetse until he reached the Nuanetsi River in South Rhodesia. Even here he learns of the shrinkage of fly, for he writes:—"Two years previously to my visit hardly a hunter had penetrated down the Nuanetsi, and even now only a bit of the upper portion is known. This is, of course, on account of the much-dreaded tsetse fly, but now the fly seems to have shifted from a central strip of the river over to within a day's reach of the Lundi . . . we are now almost as near as we dare go to this part, being within a day's ride of it" (pp.142-3).

Coming to the few odd relicts of the myriads of tsetse that from time immemorable overflow many parts of the Transvaal we find them represented, apart from the type specimen, by less than three dozen of *Glossina morsitans* collected at the following places and times\* :—

- (a) "Little Crocodile River," two days' march from Barberton, R. Crawshay, 1888. (Crawshay's Collection.)
- (b) Louw's Creek, Barberton. Dr. Percy Rendall, 1873 (Distant's Collection.)
- (c) Tzende River, N.E. Transvaal, C. Heseltine, 1896. (British Museum.)
- (d) Sabie District, near Olifants River, E. Transvaal, P. Krants, 1896. (Transvaal Museum.)

To this it may be added that, according to Austin (7), Heseltine also saw fly on the Shingwedsi, just west of the Lebombo, and on the Great Letaba where it crosses long. 31° E.

\* Determined by Austen. There may be other specimens in continental collections, but I have no information bearing on this point.

## VI.—TSETSE EAST OF THE TRANSVAAL.

## IN PORTUGUESE POSSESSIONS.

Writing in 1910, Mr. C. W. Howard (18) recorded fly-belts north of the Sabi\* River, but none were known to exist with any certainty south of latitude 21° S. At this time, however, there was supposed to be a belt of *Glossina morsitans* in the south-west corner of the Province of Lourenço Marques (lat. 26° 40' S. E.; long. 32° 15' E.). I understand from Mr. C. B. Hardenberg that this belt is still said to exist. Upon what grounds the supposition rests is not at all clear, since it has not been stated whether cases of nagana occur there or whether tsetse have been noticed by traders or huntsmen. All things considered, especially as the place indicated is where the Usutu River breaks through the Lebombo Mountains, it is highly probable that the report relates to *Glossina brevivalpis*.

The country immediately adjoining the north-east Transvaal (Altoave, in the south-west corner of the territory of the Companhia de Moçambique, and much of Gazaland) is described by Mr. Howard as "very little known and seldom entered by white men." It is questionable whether, after a lapse of thirteen years, any more definite a statement can be made regarding this area.

However, as regards the Districts of Inhambane and Lourenço Marques, Mr. Howard wrote authoritatively as follows:—"The southern part of the Province . . . was at one time noted for the presence of tsetse. After rinderpest passed over South Africa, however, the fly began to disappear, and we have been unable to locate a single tsetse belt in this portion."

The information scattered through this paper shows that tsetse had been commonly observed east of the Lebombo from latitude 24° to 27° S. As is to be expected, a want of continuity is evident, and there is also some evidence of a limited eastern spread. As regards the Districts of Gaza, Inhambane, and Lourenço Marques, it seems hopeless to collect much definite information. Baines and Hope leave their readers to infer that tsetse was to be found all the way from the hills to the bay across what is actually a narrow neck of the region involved (lat. 26° S.). Cohen, however, makes it fairly clear that this was not the case as far as his route was concerned, the fly country ending where the lala palm country began. He also saw cattle along the estuary of the Umbelusi.

General statements lead to the supposition that the whole country was infested. Such is one that is to be found in *The New South Africa* (19). It concerns the effect of tsetse on donkeys, and reads: "I myself have seen them (donkeys) traverse safely the distance from Delagoa Bay to Leydenburg, Z.A.R., in 1874, when the country was thickly infested with flies" (p. 67). A few lines in *The Sportsmen of South Africa* (20) apply to Gaza and Inhambane to the same general effect. These read: "The low-lying veld and most unhealthy country between the mouths of the Zambesi and the Crocodile (Incomati) which are impenetrable to horses on account of the presence of the tsetse fly pest" (p. 17).

\* Not the Transvaal Sabi.

Further, the history and the customs of the native population strongly confirm a general and ancient distribution of fly.

On the other hand, we know that such fly-belts as existed must have been scattered, as there is so much open country and the river valleys are mainly plain-like and free of forest. Little as Trigardt related of the nature of that part of Gazaland he passed through, he is constrained to tell when in bushveld. He only mentions this type of country twice, first when at the kraal of Halowaan, and, again, on coming opposite that of "Macolaar" on the "Wiensaana" river. Erskine also makes a point of mentioning those occasions when his path took him through scrub or forest, and when at the junction of the Olifants and the Limpopo wrote: "I was informed by the natives living here that no tsetse fly exist within some distance of the banks of the river; that at one time they possessed cattle, but the Amaswazi had so plundered and harrassed them that they had ceased to keep any. Our ivory, they said, we can hide, but our cattle we cannot." There were, therefore, two factors leading to the general absence of practice of paying lobola with cattle amongst the tribes of the Limpopo region—marauders and tsetse.

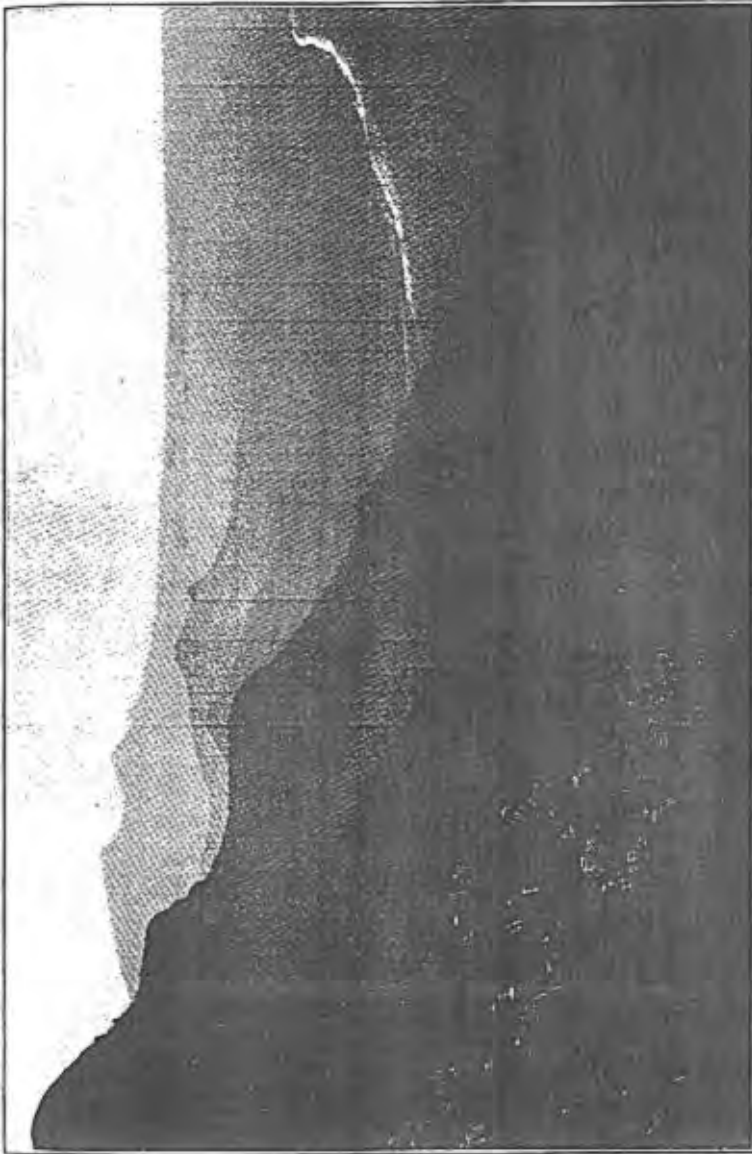
Upon the whole it would appear that, east of the Lebombo, fly-belts were to be met with where bush grew on ridges between the valleys. The elusive kraal of Halowaan is one example; Erskine's observation at "Simini" is another. To these must be added that of E. H. Richards (21), who, writing in 1885, stated: "The tsetse fly was first met with in Makwakwaland to the west of Makwakwa ridge." The context of this remark indicates the country of the Macaucas west and south-west of Inhambane, and places the belt about sixty miles inland at about latitude 24° S. These belts, as well as that at the source of the Tembe River, are suggestive of *Glossina pallidipes*.

## VII.—TSETSE IN ZULULAND.

The earliest reference to tsetse in Zululand is the one already brought under review in the last period and dates back to about the year 1870. That the presence of fly, and to some extent its distribution, was well known prior to the time of Buxton's visit is evident from the concluding sentence of the quotation. Buxton also makes it clear that the Zulus were acquainted with summer extensions and winter contractions. Up to the present, however, I have not been able to find any other published record of early date relating to Zululand.

My own first experience was in the year 1904, when I was bitten by a fly whilst driving across the drift of the Umhlatuzi River on the road from Eshowe to Melmoth (lat. 28° 45' S.; long. 31° 28'), and I have a very clear recollection of the driver telling me we were passing through "fly," and that the trees had been cleared away from the drift on account of fly.

In view of a more recent belief that tsetse did not exist so far south as this point in the valley of the Umhlatuzi, I wrote to Sir Charles Saunders asking him whether I could have been mistaken. To my inquiry he has been good enough to reply in the following words: "The southmost point I knew tsetse to exist was in the region



[Photo by A. L. Hall.]

**THE OLIFANTS RIVER,**

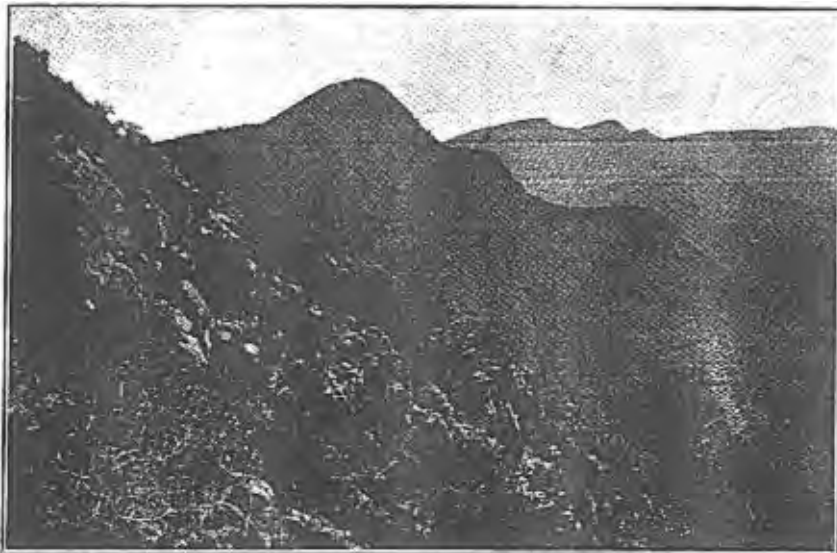
Escaping out of the bowels of the Drakensberge into the Eastern Low Country. View looking north-north-east across Olifants Poort. Down the hills beyond the river Trigardt trekked, January, 1838, and probably crossed at a point within or not far beyond the range of this picture. In the Low Country hereabouts Trigardt saw tsetse.



[Photo by A. L. Hall.]

**THE DRAKENSBERGE.**

View of the Great Eastern Escarpment, south-east of Haenertsberge. Typical of the enormous physical obstacles Trigardt had to contend with.



[Photo by A. L. Hall.]

**THE DRAKENSBERGE.**

View looking northwards from south side of Olifants Poort, which lies directly beyond the conical kop nearer the foreground. Down the foothills beyond the kop Trigardt descended into the Low Country.

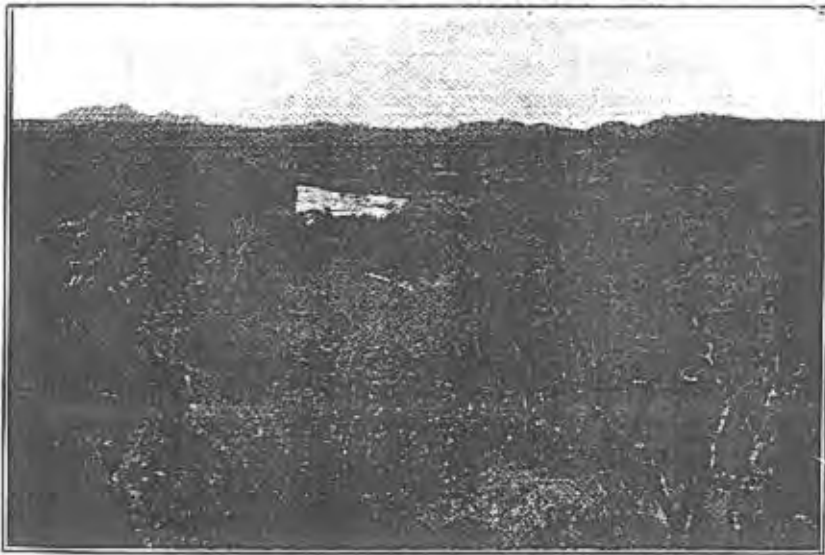




[Photo by A. L. Hall.]

**THE OLIFANTS RIVER**

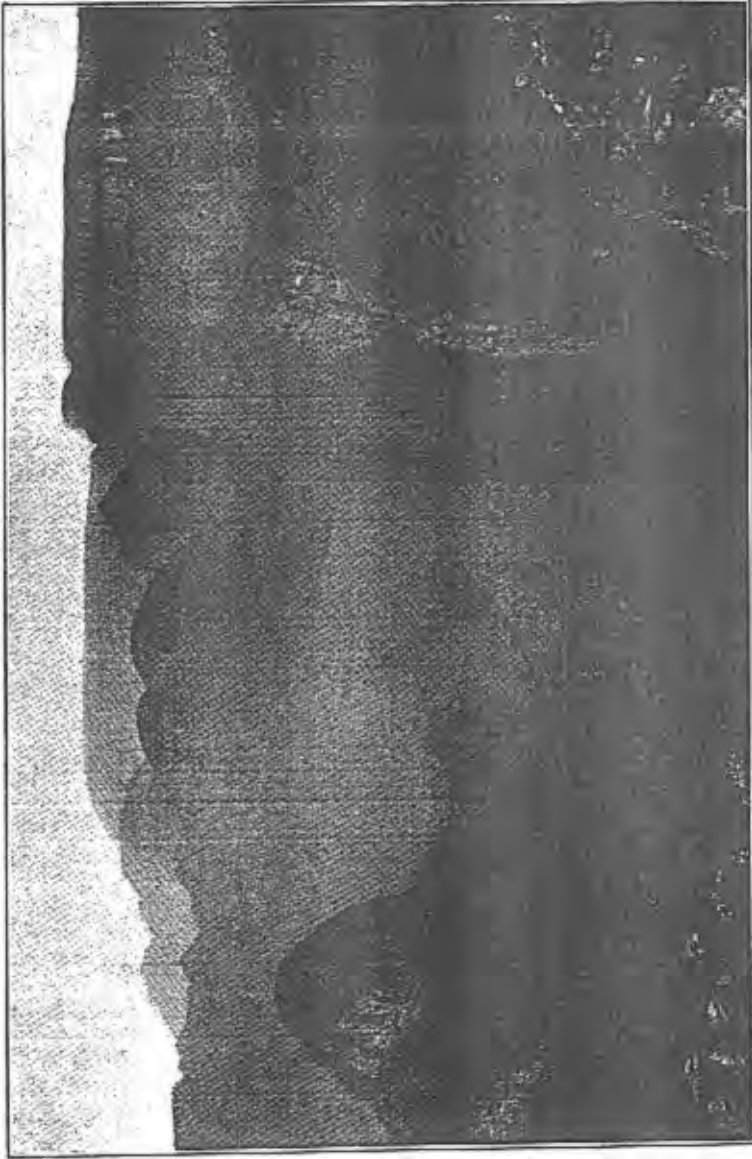
On its way (from right to left) through the mountains. View looking westwards from near the mouth of the M'Hlapetsi. The Trigardt Trek passed this point about 16th October, 1837.



[Photo by A. L. Hall.]

**THE OLIFANTS RIVER.**

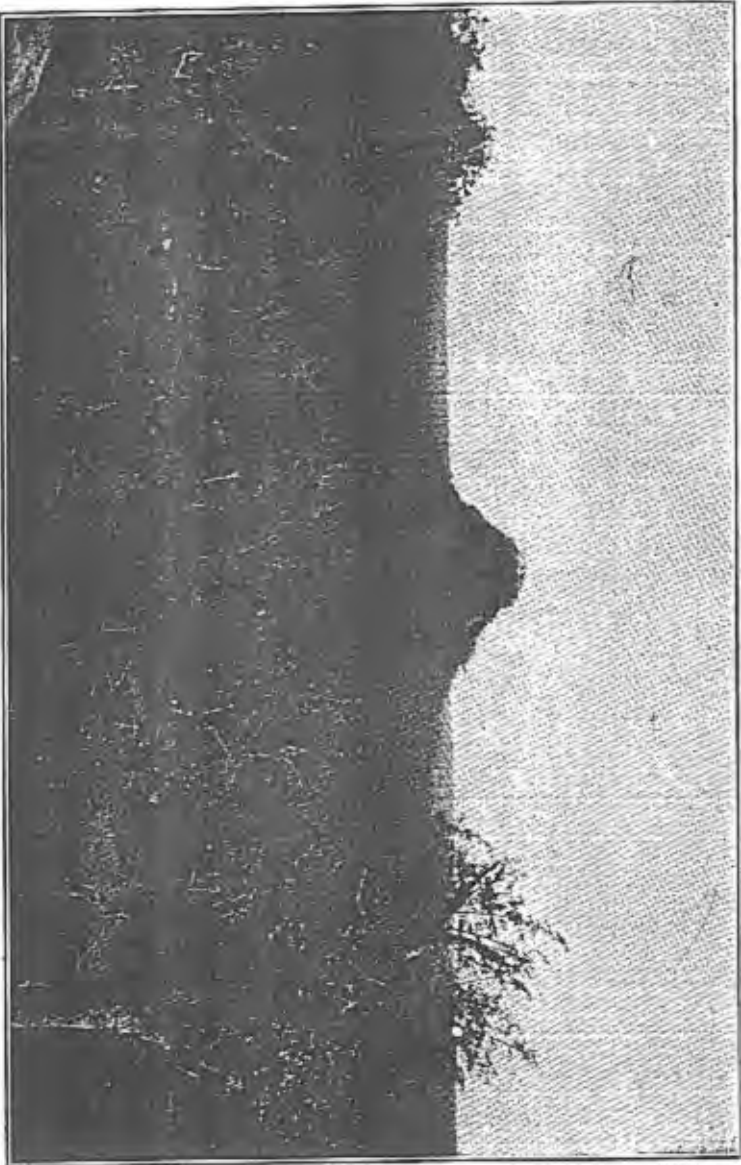
View looking westwards up river from Maury Camp. In foreground with Acacia and Mopane Vegetation. In this region Mauch (1868) observed tsetse.



[Photo by A. L. Hall.]

**THE GRAND CANYON OF THE BLYDE RIVER.**

Down part of this canyon St. Vincent Erskine descended into the Eastern Low Country, July, 1868. Near the centre is seen the Blyde, deep down in the floor of the canyon. The flat-topped feature along the centre of the sky line is Mariep's Mountain, approximately 3,000 feet above the bottom of the canyon and 6,100 feet above sea-level. Somewhere near the foot of Mariep's Mountain Erskine first met with tsetse.



KITCHENER'S KOP, PALABORA.

Typical Eastern Low Country. In this region Karl Mauch met with tsetse, July, 1868.

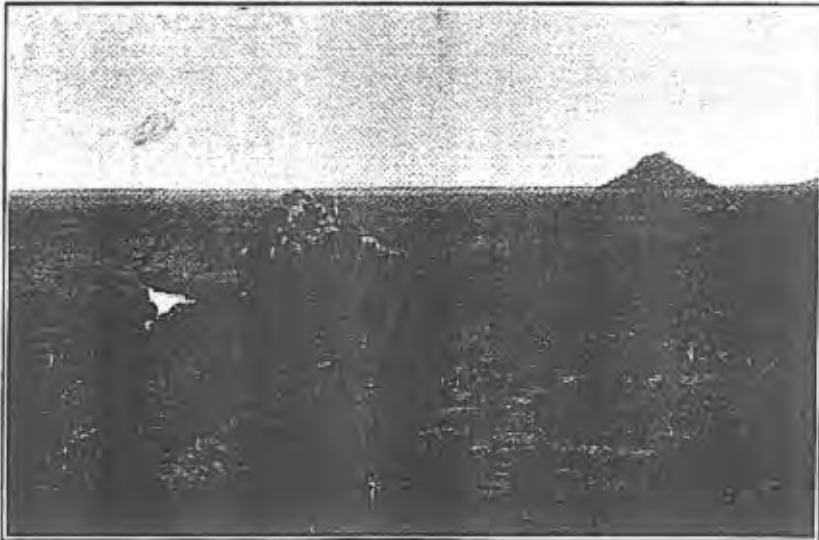
[Photo by A. L. J. A. 's]



[Photo by I. B. Pole Evans.

**THE KLASARIE RIVER.**

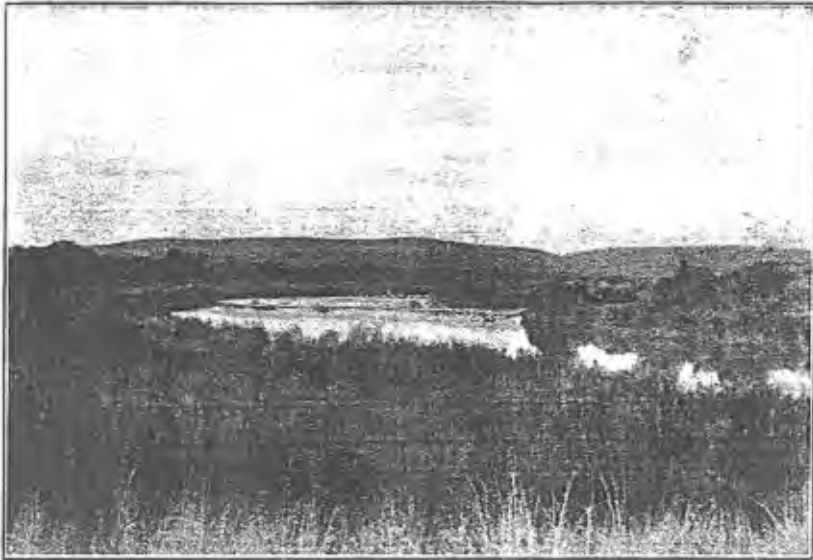
View taken in the region where Erskine found tsetse in 1863.



[Photo by A. L. Hall.

**THE SELATI RIVER, PALABORA.**

View looking westwards up river, from the summit of April Kop. Characteristic Bush Veld of the Eastern Low Country with isolated koppies of granite.

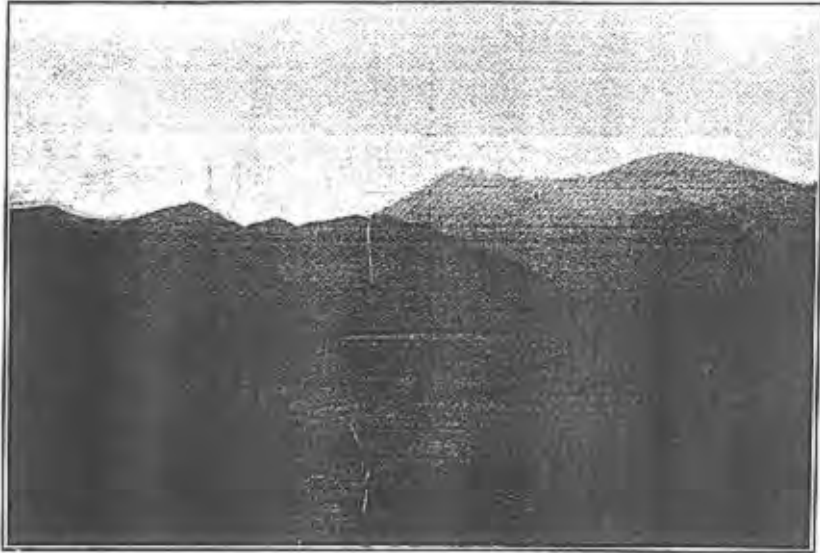


[*Photo by H. Kynaston.*

**THE INCOMATI RIVER AT FURLEY'S DRIFT,**  
Looking east, across the Lebombo Flats, to the Lebombo Mountains. Here Cohen  
found tsetse in 1873.

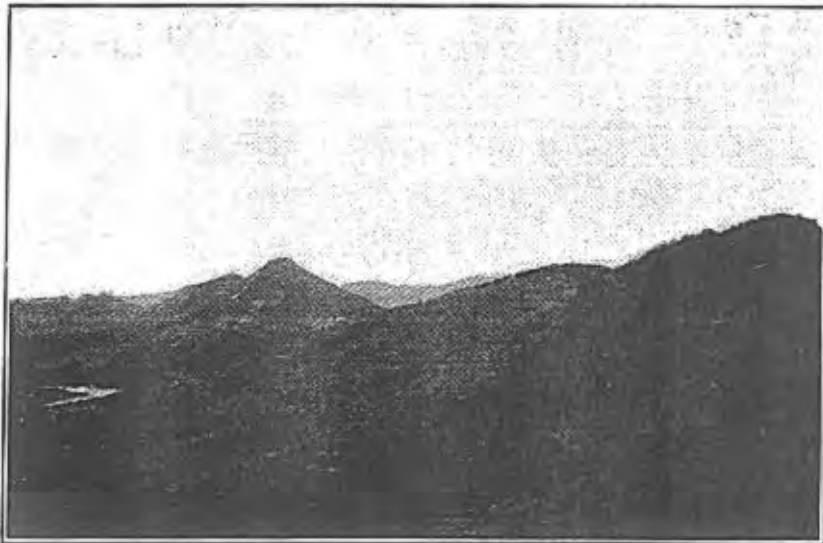


**THE EASTERN CROCODILE RIVER,**  
Looking south-west ; Oorsprong Kop is seen in the distance. Here Cohen found tsetse  
in 1873.



**THE Vlieg POORT MOUNTAINS.** [Photo by P. A. Wagner.

The Vlieg Poort range in middle distance. The Rosseanpoort range in the background



**THE Vlieg POORT MOUNTAINS.** [Photo by P. A. Wagner.

The Crocodile-Limpopo in the middle distance near the point where it pierces the range in Buffels Poort.

of the old wagon drift across the Umhlatuzi River between Melmoth and Eshowe, so it is quite possible you saw one there at the time you mention." (Melmoth, Zululand, 17th March, 1923.)

Earlier, in 1904, I had received two specimens of tsetse from Sir Charles Saunders; these he had secured for me in the Umfolosi Reserve. From my letter-book I extract the following remarks in a communication addressed to Sir Charles under date of the 9th November, 1904:—

"I thank you very much for your letter of the 3rd instant. I have been unable to reply earlier, as the specimens arrived only yesterday. I have examined them carefully, and decided that they are both examples of Austen's new species, *Glossina pallidipes*. This species is very closely allied to *Glossina morsitans*. The characters on which Austen bases the species are (1) its larger size, (2) its darker abdomen, (3) the fact that in the common tsetse the last two joints of all six legs are black and in contrast with the rest of the leg, whereas in *G. pallidipes* it is only the last pair of legs that have black feet."

Through the kindly offices of Mr. E. C. Chubb, Director of the Durban Museum. I have been able to examine the unpublished map of the fly-areas of Zululand made by the late F. Toppin in 1912, and also a letter Toppin wrote at this time. These I am permitted to publish as an appendix (E) to this paper. Toppin had a very good knowledge of the fly-country west of Lake St. Lucia and collected many specimens, taking only *pallidipes*.

Another document (15) on tsetse in Zululand, passed unnoticed by reviewers of tsetse literature, is a paper by my friend, Dr. Park Ross, published in 1911. This contains a number of interesting statements, one of which reads:—"Out of some 150 flies collected in the wide area detailed below, I failed to obtain a specimen of any other variety than *G. pallidipes*, and kept a careful watch for *G. morsitans* in particular, as this is supposed to be prevalent in Zululand. *Glossina pallidipes* thrives well in low, dry, thorny country, and in Zululand its range appears to coincide with that of the greater Kudu. It is found most abundantly on the outer border of the strip of dense bush which clothes most of the river banks and which may extend on either side for some 400 to 500 yards. I have obtained specimens on a treeless, wind-swept hill, but consider it possible that they had followed wildebeest there, although none were about at the time" (p. 165). The "area" referred to is "the wide flat between the Mkusi River and Intambana Hill" (p. 166). Dr. Park Ross concludes his paper with the following statement:—"The constant disturbance of the haunts of tsetse by the genus *Homo* will have its effects on them, and will occur in each part of the country as it becomes closely settled. When that happens the wild game will disappear, and the fly will follow suit" (p. 170).

#### VIII.—THE TSETSES OF SOUTH AFRICA.

There are four species of tsetse recorded from Africa south of latitude 22° S. These are *Glossina morsitans* Westwood; *Glossina pallidipes* Austen; *Glossina brevipalpis* Newstead; and *Glossina austeni* Newstead (Syn.: *G. brandoni* Chubb).

*Glossina morsitans*.—For aught we shall ever know to the contrary, this was the only species met with in the Transvaal. Where else below latitude 22° S. it may have existed there is really no evidence to show. We cannot even say at this time whether the fly met with in the sixties and seventies east of the Lebombo was this species or not.

There is, however, a specimen of *morsitans*, according to Austen (7), in the Oxford Museum labelled "Grahamstown, Cape Colony (purchased from Higgins, 1869)." We may safely conjecture that this specimen was brought to Grahamstown from the region of the Limpopo, or even farther to the north. It would indeed be interesting to find who brought it there and whence it came, since it is impossible to regard it as having been captured in the neighbourhood of Grahamstown.

Further, there are two specimens of *morsitans* in the Verrall collection (*cf.* Austen) which bear the label "Zululand." In the absence of any other evidence, past or present, of the existence of *morsitans* in Zululand, I regard this record as wholly unacceptable. If Verrall obtained these specimens from Mons. Bigot's collection the record is open to grave suspicion.

*Glossina pallidipes*.—This is the predominant tsetse of the nagana areas of Zululand that lie between latitudes 27° 25' and 28° 35' S. The observations of Toppin (Appendix E), Park Ross (15), and the Division of Entomology all point conclusively to this being the case.

*Glossina austeni*.—The existence of this species in Zululand is known from one specimen only, and this was described by Chubb (16) under the name *Glossina brandoni*. It is said to have been captured in the Court-house on the bare heights of the Ubombo by Mr. J. M. Robertson in March, 1915.

*Glossina brevipalpis*.—The discovery of this species had its birth in the finding of *austeni*. Mr. Chubb asked Mr. Brandon to secure more specimens of tsetse for him, and was sent a specimen of *brevipalpis*, together with several *pallidipes*, captured "near Ubombo. 25th April, 1915."

There is little doubt that these were collected at the foot of the mountain, in the Mkusi valley. Later, Mr. D. T. Mitchell presented the Durban Museum with a specimen of *brevipalpis* he had obtained in the Mkusi valley, 20 miles from Ubombo. More recently (1921) the Hon. Denys Reitz caught a specimen of this species at Lake Inyamate, a long narrow bayou of the Pongola, within three miles of the Portuguese border, where the species seemingly exists in fair abundance.

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## IX.—CONCLUSION.

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The interesting phenomenon with which we are faced is that from certain geographical limits tsetse has vanished in recent historical times. These limits may be fixed for the Provinces of the Union as between latitudes 22° S. and 26° 40' S. Unfortunately, one cannot speak with any great certainty regarding the Portuguese possessions between these latitudes east of the Transvaal; although



there is very good reason to suppose that most of this territory is no longer infested with vectors of nagana. This is almost certainly the case for the district of Lourenco Marques, since nagana is said to be no longer met with immediately east of the Transvaal border.

The outstanding feature of the historical review presented is that, while tsetse remained abundant in the low country between the Drakensburg foot-hills and the Lebombo range down to the time of rinderpest, it had disappeared before that epoch from two-thirds of the territory it previously infested. Consequently, whilst it may be claimed with much reason that rinderpest led to the rooting out of the fly from the eastern region of the Transvaal, no occurrence of so cataclysmic a nature can be held to account for its vanishing from elsewhere in the Transvaal.

The process in the Rustenburg-Waterberg Districts may be likened to the slow lifting of a miasmatic fog, rolling northwards. Whatever the riddle may be, it is to this particular area that we must first look for its solution; and we must go back to the days of Theunis de Klerk, who, in 1871, regarded tsetse as "a curse that was being removed from the land." We must study the happenings that took place there, especially in the period 1872 to 1878, and the following ten years, during which, according to tradition, tsetse disappeared "when the buffalo went north." (1888.)

Although tsetse maintained a firm hold in the eastern low country down to 1896, there was evidence of contraction. This, however, appears to have been a simple departure from parts most frequented by men armed with guns.

Another feature of this account is the evidence of a distinct association of fly with certain "bosrande" in the western Transvaal. We now know so many spots where fly actually occurred that it should be quite an easy matter to classify the local conditions, and so ascertain the physical-floral association which provided suitable environment and limited the fly. By deduction we may then arrive at some estimate of the unknown factor, the removal of which left the insect to die. The same applies to the eastern low country, although here there was more an association of fly with the wooding of rivers or rivulets.

The question at once arises whether such an investigation would confer any practical benefit, in view of the fact that the fly which has disappeared is *Glossina morsitans*, and the one (of importance) that remains is *Glossina pallidipes*.

If any secure evidence existed of a previous presence of *morsitans* in the nagana areas of Zululand, it might be argued that this species received its quietus there at the time of rinderpest. As there is no acceptable evidence to show that *morsitans* did inhabit Zululand, such an argument becomes untenable. It is also highly probable that *morsitans* would not find a wholly suitable environment in Zululand where, it must be admitted, the climatic conditions of the fly-favoured areas are somewhat different from those of the Transvaal, being near the sea and without any great intervening physical barrier.

All things considered, it seems to me extremely probable that *morsitans* did not extend its range indefinitely east of the Lebombo mountains, or south along the Lebombo flats of Swaziland, whilst *pallidipes* probably ranged from far north in Portuguese possessions to the Umhlatusi River in Zululand.

It cannot be urged that *pallidipes* in Zululand has been for an indefinite period as distantly cut off as it now is by 700 miles from its present more northern haunts on the east coast, and it is reasonable to assume that this species was also a vector of nagana east of the Lebombo Mountains.

Since tsetse once existed (1837-1896) in the District of Lourenco Marques from the Olifants to the Tembe River, it is only reasonable to believe that the bushy, watered ravines and gullies scoring the sea-face of the Lebombo range to the south of the Tembe were also infested. Hence the break of 60 miles in our chain of evidence regarding tsetse habitats between the Tembe and Pongola poort would be materially reduced.

Accepting these premises as correct—I think they are scarcely debatable—we are compelled to the conclusion that the process which removed *morsitans* from the Transvaal acted similarly upon *pallidipes* in southern Portuguese habitats.

Granting that *pallidipes* once extended, at least in patches from north, where it is to-day, to south, where it also is to-day, one is faced with a further problem: What was the nature of the bridge now broken? If it be granted that the insect cannot now spread northwards because of the present-day physical-floral faunal condition that obtains just beyond its northern limit in Zululand, it cannot be said that an exactly similar set of conditions prevents it from spreading from the north to the south. There is no baulking the fact that a southern spread from the far north is not hindered by known floral or physical factors. Since it cannot be a climatic factor, one is driven to the conclusion that what is missing is of a faunal nature.

I can only think that *morsitans* is also prevented from returning to its old Transvaal haunts because the faunal bridge is no longer entire.

Personally, I cannot look with equanimity upon the non-extension of *pallidipes* to the north, simply because it appears not to have bridged a gap created 27 years ago; a gap which game preservation might, all unwittingly, fill up from both ends. It is thought, for instance, that *pallidipes* will not spread north of its present Zululand confines because the floral condition beyond does not permit of such a spread; but, given the necessary faunal factor, I can see no reason, in our present knowledge of the species, why it should not traverse the forest avenue of the Pongola or reach the old tsetse haunt west of the Lebombo mentioned by Mr. Von Wissel (*cf.* Appendix F 12). Who is there to say that it is not already en route along obvious passage-ways?

As *Glossina brevipalpis* has been found at the northern extremity of the Pongola, where this river merges into the Usutu to form the Maputa, and also in the valley of the Mkusi, in the latitude of the Utombo Magistracy, there is every reason to think that a survey of the Pongola and its chain of lakes would show a strip of country inhabited by this species, right through Amatongaland, and possibly an extension into Portuguese territory [*cf.* Howard (18)].

I would like to close this review without entering any controversial field, and I would willingly do so were it not for the contention that it was not wholly rinderpest which explained the eradication of fly from the eastern low country of the Transvaal.

I have long been profoundly influenced by the sensible arguments advanced by Major J. S. Hamilton (17) and endeavoured to imagine what other cryptic influence could have been at work when rinderpest invaded the land. When one stands between this plausibility and the evidence brought forward to show that tsetse can survive on herbage, or even thin air, the few other speculations to be advanced will not bear any critical examination.

It does seem extraordinary that *morsitans* should die out in the western and northern Transvaal during a series of years and in the presence of at least a problematical food supply. Thoroughly as the old Boer shot out the fauna, some animals always escaped him, and to nowhere would these be more likely to retreat than into the cover of the bosrande, and, above all, those frequented by tsetse. Moreover, the shooting out of the game was of necessity more extensive and thorough, as regards big and small, in the earlier rather than the later period of fly existence in the western Transvaal.

It is quite as remarkable that the fly should have disappeared from the eastern low country when so many animals were not affected by rinderpest, and, of those that were, some of every species seemingly escaped destruction.

As rinderpest never did operate against tsetse in the west and north, and as it has been shown experimentally that disease-laden blood does not militate immediately against the fly, one can only arrive at the conclusion that rinderpest, as it ran its erratic course through one fly-belt and another, brought about the death of the insect by starvation. Circumscribed by the floral factor to relatively small areas, it may have happened that the pertinacity of the flies drove forth any animal entering their shelters so that they contributed to their own undoing; or, inversely, the want of food caused them to scatter and to succumb to the adverse conditions surrounding their native environment.

Approached from any angle, a consideration of both the gradual and sudden changes in the Transvaal leads one towards the acceptance of a greater dependence of this insect-parasite on certain animal hosts than is commonly granted; not necessarily an absolute dependence of fly on buffalo, as the old Boer and Selous taught, but an intricate dependence upon animals whose habits brought them regularly to the haunts of the fly.

It is very true that insects which are ecto-parasites of animals, when limited by circumstance, tend to become more and more dependent upon their accustomed food and unable to propagate indefinitely upon a change of diet. For this reason the possible dependence of tsetse on certain animals calls for examination. It is not sufficient that for three years a series of generations were successfully reared on the blood of guinea-pigs and rabbits. It is essential to show that such a rearing need not have terminated, as it did, by the elimination of the female sex.

In a sense tsetses are indiscriminate feeders upon animals, and do not refuse the opportunity to bite and take a fill of blood when such is offered; it is equally true that they are attracted to fresh carcasses, and have been bred for short periods upon unusual food supplies; it may be that there exist many unusual but unobtainable food supplies that suit them. However, in their native environment their permanency may depend on few of the many kinds of animals frequenting their haunts.

The toll levied upon the fauna of Zululand according to the testimony of Sir Charles Saunders (Appendix D) materially affected the abundance of *Glossina pallidipes* in Zululand. It is notorious that this was so, and Mr. F. Vaughan Kirby (22), who has had more opportunity than any one to analyse the local evidence critically, agrees that such was the case.

In admitting that "a mysterious partial disappearance of tsetse fly" synchronized with rinderpest in Zululand, Mr. Vaughan Kirby says (p. 388) that the plague did not bring about "any appreciable diminution of all sources" of food supply, and that "there could have been but a comparatively small percentage of the supply cut off. . . . Zebra . . . were immune from the disease, wildebeesten . . . suffered but very slightly, if at all, consequently these were left in great numbers, as well as many bushbuck. The presence of these species alone would have furnished ample food-supply, to say nothing of such bush-pig, buffalo, and kudu as certainly remained. I lean to the opinion that possibly a certain proportion of the existing fly was killed by absorbing the virus-laden juices of the dead carcasses of animals killed by the plague, and the diminution of their numbers accentuated by existing climatic conditions, which were overlooked at the time or not considered in relation to the bionomics of tsetse fly" (p. 388-9).

All things considered, could there have been an influence working, veiled in impenetrable obscurity, during the few months when rinderpest raged through the country that similarly affected two species of *Glossina* to the exclusion of other insects? And was it the same sinister process that had with mystic force been operating for decades in the west and north of the Transvaal? Here, indeed, do we set sail on an uncharted sea whose subtle currents carry our barque past many ports, but never to any safe anchorage.

Apropos of a possible close association between parasite and host, the following remarks by Mr. Vaughan Kirby are not without peculiar significance. On page 389 he writes:—"What will be said when the gradual extermination of the game brings the fly to the doors of the kraals and other habitations, seeking from domestic stock some of the sustenance they are denied by the scarcity of game, and, later still, when virtual extermination is accomplished and nothing remains but domestic stock for their food supply? Domestic animals, in gradually increasing numbers, themselves constitute almost as serious a factor in the spread of nagana as do wild animals, and it would be a grave error to delude ourselves with the idea that when the game is destroyed the fly will vanish."

But we have seen tsetse disappear from the Rustenburg, Waterberg, and Zoutpansberg Districts, where, after the flight of Mzilikatzi, the natives have since kept cattle, even against fly-country, and where fly extensions penetrated the areas they occupied. But *Glossina morsitans* did not invade the kraals. Then came the voortrekkers. They slaughtered the game: and, within certain limits, game destruction and bovine replacement went hand in hand. The old Boer had no delusions, and his domestic animals did not bring the fly to his habitation. Perchance, even in Zululand, time will show that *Glossina pallidipes* has not been able to establish itself permanently among the flocks and herds, notwithstanding many opportunities to do so, and the plenitude of spots as suitable for breeding-grounds as are laboratory bottles.

Finally, if as regards *morsitans* in the Transvaal we are compelled to deny all dependence of parasite on host, then the vanishing of fly can only be set down to something prodigious. Were this so, annihilation would not have been the gradual process it was; but would have been coincident with some unusual occurrence such as rinderpest and boldly blazoned across the annals of the country.

The survival of tsetse in Zululand was probably due to some simple circumstance, perhaps the compactness and greater depth of the fly-belts were sufficient. In the fly-country of Zululand the general floral condition is so arranged that surviving fly could always follow up surviving game and find suitable breeding-places. Moreover, it may be possible to show that in the denseness of that fly-country a relatively greater proportion of the long-protected and susceptible wild animals escaped rinderpest than in the Transvaal. I can imagine no claim being made to "Game Preservation," dating back to 1887, in the Transvaal.

## X.—SYNOPSIS.

### A.—REMARKS.

(I) The experience of the hunters in the years 1846-1848 served to show:—

- (1) The absence of tsetse from Bechuanaland.
- (2) The absence of tsetse from the forest avenue of the Limpopo.
- (3) The definite association of tsetse with bush-clothed ridges and hills (bosrande).
- (4) An abundance of elephant, hippopotamus, rhinoceros, giraffe, wildebeest, and many antelopes in the Districts of Rustenburg and Waterberg.

(II) The travels of Baines illustrated:—

- (1) The absence of tsetse from Bechuanaland south of the Macloutsi River.
- (2) The absence of tsetse from the forest avenue of the Limpopo.
- (3) The definite association of tsetse with bosrande.
- (4) The abundance of tsetse after elephant, hippopotamus, and rhinoceros had practically disappeared.

(III) On the authority of Major T. G. Trevor, Inspector of Mines, the bosrande of the Waterberg low country are clothed with trees, sometimes densely at their bases, and are overgrown with a tangle of plants. In this respect they are impenetrable islands in a surrounding bushveld through which, owing to the spacing of the trees and the absence of thickets, one can gallop on horseback.

(IV) The observations of Mr. J. E. D. Travers and of others disclose the fly-belts of the eastern low country as occurring along rivulets and, on the whole, as elongate patches two to five miles in width and from four to nine miles in length: usually with wide intervening spaces.

(V) The observations of Toppin and others show the Zululand fly-belts as broad and extensive. The smallest is 64 square miles in extent (8 × 8); the two larger are 600 square miles in extent (20 × 30).

(VI) The tsetse which predominated in the Transvaal was *Glossina morsitans*. That which now occurs in Zululand is *Glossina pallidipes*, a very closely related species which co-exists to-day in the same terrain with *G. morsitans* north of the Zambesi.

(VII) There is at present no available evidence to disclose what species inhabited the Districts of Inhambane and Lourenco Marques, and the evidence pointing to the existence of *G. morsitans* in Zululand cannot be accepted in the absence of confirmation.

(VIII) Although it is assumed on fairly reasonable grounds that tsetse is extinct in the Transvaal, no positive statement should be made in the absence of a scientific examination of former haunts in the north-eastern area.

(IX) The observations of Mr. B. H. Dicke serve to show that—

- (1) Tsetse remained abundant in the Singwetsi-Letaba basin after the larger game animals had been destroyed or driven out, i.e. elephant, rhinoceros, giraffe, and, to a large extent, buffalo.
- (2) Tsetse subsequently disappeared from that part of this basin settled by natives prone to the chase and becoming possessed of fire-arms.
- (3) Although the disappearance of the insect followed upon a considerable reduction of the wild fauna, this reduction could not have approached eradication, but did involve the constant harrassing of the remaining animals.
- (4) Tsetse failed to accommodate itself to the changed habit of the remaining game or the new food supply as represented by the blood of man.
- (5) The incidence of rinderpest was providential. Had there been no such epidemic, the subsequent disarming of natives in erstwhile fly-country would have led to a decided increase in the wild fauna and the return of the fly.

#### B.—CONCLUSIONS.

Omitting evidence to the contrary, accumulated in approaching tsetse problems elsewhere and by other methods, the conclusions and inferences to be arrived at from this historical review may be summarized as follows:—

(I) A practical interest cannot fail to attach to a full examination of the causes which led to a gradual disappearance of tsetse from the Transvaal and the surrounding territory, because—

- (a) the disappearance of the insect accompanied the extinction or driving away of certain large wild animals;
- (b) the disappearance took place throughout many large areas in the absence of any general settlement by Europeans;
- (c) in the greater part of the infested territory the disappearance did not coincide with any abnormal climatic condition;
- (d) the disappearance also took place in the presence of many possible sources of food supply, as presented by a variety of wild animals, including antelopes, wildebeeste, zebra, and, in settled areas, by domestic stock.

(II) Tsetse existed in the north-west Transvaal by virtue of peculiar and localized floral-faunal associations. Thus the fly seems to have been strikingly dependent upon peculiar and circumscribed plant assemblies for a favourable habitat, and to have found an appropriate food supply in the blood of certain wild animals regularly frequenting its haunts.

(III) As these plant-assemblies or woodings remain and have always harboured, to a greater or lesser extent, a variety of wild animals, it seems as if some inter-relationship existed between the tsetse and its animal hosts. On the floral-faunal combination the permanency of the insect depended, and this permanency was either governed by the regularity of habit on the part of the hosts or the suitability of their blood to the successful and continuous propagation of the insect.

(IV) The disappearance of tsetse from the eastern low country of the Transvaal and the adjoining Portuguese territory (Gazaland, Inhambane, and Lourenco Marques) followed suddenly upon rinderpest in the absence of any regular or recognized system of game preservation.

(V) It may be assumed that the extinction of fly in both the Transvaal and in the part of Portuguese East Africa under reference was due to the sudden and universal application of a process, leading to extinction, which had been working gradually over many years in the west and north of the Transvaal.

(VI) It is extremely probable that *Glossina pallidipes* occupied parts of the Districts of Gazaland, Inhambane, and Lourenco Marques.

(VII) As *Glossina pallidipes* and *Glossina morsitans* both survived rinderpest north of the Zambesi, and as *Glossina pallidipes* survived south of the Maputa, it may be reasonably assumed—

- (a) that *Glossina pallidipes* formerly inhabited parts of the intervening 700 miles of territory, and was not always so isolated as it is to-day in Zululand;
- (b) that *Glossina pallidipes* was eliminated from the intervening territory by the same process that led to the ultimate disappearance of *Glossina morsitans* from adjacent Transvaal areas.

(VIII) The process leading to the disappearance of *Glossina morsitans* from the eastern Transvaal at the time of the rinderpest tended to eradicate *Glossina pallidipes* in Zululand, but failed probably because the plant assemblies of Zululand, affording this tsetse a favourable environment, were relatively vast, and successfully harboured a greater food supply. This is explained by these plant assemblies being game sanctuaries in a gunless land, wherein a sustained effort at game preservation had been maintained by the Imperial Government during the period 1887 to 1897.

(IX) It may be assumed for *Glossina morsitans* that this species, at least, is not able to accommodate itself to changes of environment following the settlement of fly-country by a population possessing fire-arms and given to hunting regularly.

(X) The complete eradication of the wild fauna does not appear to be essential to tsetse suppression, but a decided reduction thereof—followed up by a constant disturbance of the animals which escape, and to such an extent as to bring about changes of habit and shyness—tends to lead to the disappearance of the insect.

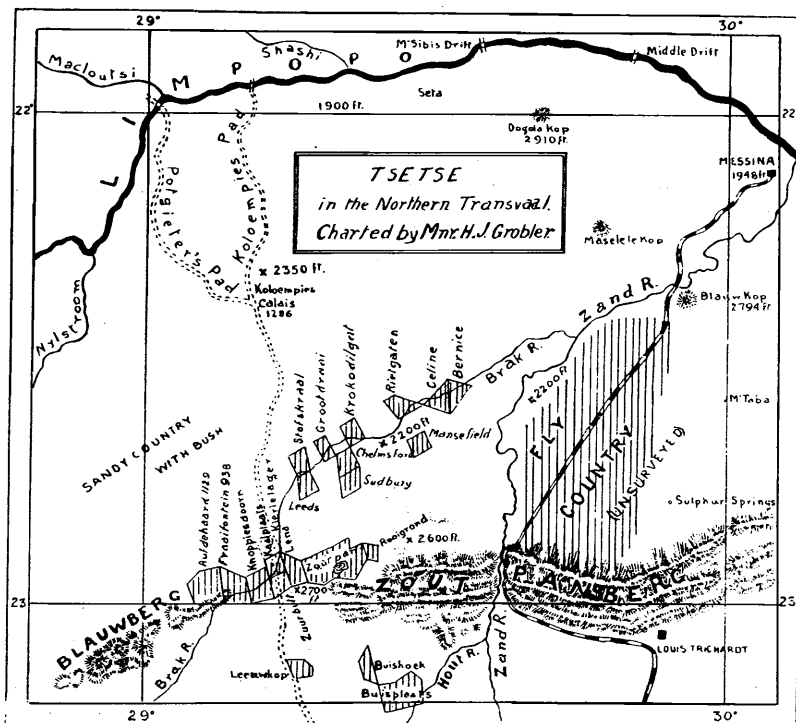
## APPENDIX A.

## TSETSE IN THE ZOUTPANSBERG DISTRICT.

By Mnr. H. J. GROBLER, Groblers Plaats, Zoutpansberg.

(Being a translation of a letter to the author, with a map prepared upon data furnished by Mnr. Grobler.)

In reply to your letter of the 11th April regarding tsetse fly, I wish to inform you that, in 1849, I accompanied the Potgieter's Trek to these parts, and lived in the old town of Skoemansdal. The tsetse fly was to be found at that time on a bushy hill (ruigekop), now farm Leeuwknop, also on a spot then called "Tsakalala," and now known



VII.

as Buisplaats and Buishoek. As the buffalo were soon exterminated after the arrival of the Europeans the flies also disappeared. However, tsetse remained for a long time on the farms Zuurbult, Kaalplaats, Lena, Knopjesdoorn, Fraaifontein, Aufderhaard, behind the east end of the Blauwberg. Until the year 1869 great care and caution was taken hereabouts—cattle and wagons having to pass through the infested veld by night as far as a farm now known as Kierielager, a barren farm on the Brak River. The buffalo were



entirely driven off the above farms between 1869 and 1872; since their extermination, flies were no more seen, and we could trek freely towards the Limpopo without seeing a single fly.

The present Knopneus Location, east of Louis Trichardt, remained a densely infested region until about the year 1873. After that, fly was found lower down along the Groot Letaba and Olifants Rivers. Only in 1890 did that region become free of fly. Tsetse was, however, still present in small areas between the Olifants, the Groot Letaba, and the Palabora Rivers until the year 1894.

You will notice that I frequently make mention of the disappearance of buffalo followed by that of the fly. Now, just a short paragraph to clear the matter.

The old Boer had always a deep-rooted belief that the buffalo was to be held chiefly responsible for the presence of the fly, because just where buffalo were found there were flies. Thus hunters were always on the lookout for flies where they found buffalo tracks so that they could take precautions.

As regards the big trek road to the Limpopo, as far as I remember no clear road existed; it was only a trek road made by the commando of Potgieter in 1847. It went from the Hout River along Wetfontein to the Risie Camp; from there to Koloempies farm Calais (old No. 1286); then across the farms Du Prat, Concordia, Aanswires, Duikerfontein to Stinkwater, and on to Wegdraai Krokodilrivier; then across the farms Onrust, Eenvogelpan, and Breslau as far as the confluence of the Macloutsie and Krokodil Rivers; then on to Umzilikatse's. I do not know how the trek went farther. But the road was a very bad one, and here and there you would find a tree cut down which had stood in the way of the party trekking.

As far as possible I have marked on your map the road and the fly areas. The whole country from Zoutpan-Brak River north-east was infested with tsetse until 1869, and in the bushveld near the Zoutpan, fly was found still later.

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#### APPENDIX B.

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#### TSETSE IN THE EASTERN LOW COUNTRY.

By J. E. D. TRAVERS, Acorn Hoek, Eastern Transvaal.

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Prior to the rinderpest, tsetse fly was numerous all over the low veld. The fly seemed to disappear completely about 1897. At the time we all conjectured as to whether this was due to any infection of the fly through sucking blood of animals suffering from rinderpest.

In the year of the rinderpest, kudu, warthog, bushbuck, and wildebeest died from the disease in very large numbers. It was quite common to find untouched carcasses, i.e. untouched by vultures, lions, hyenas, or jackals, so satiated were all such vermin and carnivora. On one occasion, early in 1897, I found the carcasses of three giraffe (also untouched by any birds or beasts of prey) lying side by side on the veld, evidently also victims of rinderpest.

So far as I know, there were no scientists investigating in this region at that time, or the cause of the exit of the tsetse in these parts might have been accounted for. It is certainly remarkable that it

should have disappeared with the rinderpest. No one who saw the hundreds of game lying dead in those days has any doubt about the association of the two events.

Tsetse was known to local natives as "Tseka" or "Imbo."

In those days I was much in the veld for the purpose of hunting big game (hippo., giraffe, zebra, blue wildebeeste, waterbuck, kudu, sable and roan antelope).

Game was plentiful, and so was fly. Directly one entered the shade, and very often in the open sunlight, fly would attack one, sometimes in ones and twos, at other times in veritable swarms. Tsetse alight in an almost noiseless manner, and the first intimation one usually has is the very sharp prick which announces their presence. One's hands and uncovered portions of one's legs would stream with blood from their vicious bites. The fly was exceedingly wary and hard to catch. We used to run a knife-blade along our arms and pinion their feet with it.

On one trip all our donkeys—used for wagon transport on account of fly—died when they got into the mist-belt on the Drakensberge, after their return. It was usual for donkeys to outlast all other animals. Cattle and horses succumbed very quickly, as also did dogs, and I lost many dogs in the fly-country.

It is stated by old and renowned hunters like Selous and Oswald that fly always are found with or close to buffalo. In this locality wherever buffalo were found, fly was sure to be there.

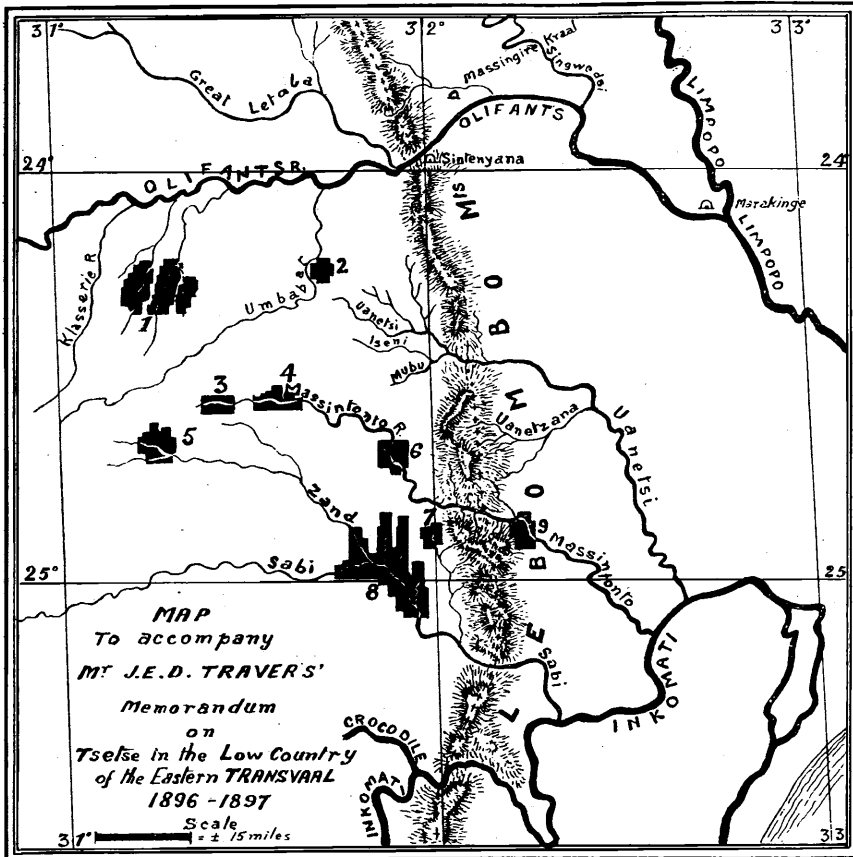
One remarkable fact was the definite manner in which fly would stick to a certain area, and native residents averred that they would never pass certain (to them) fixed boundaries. In the vicinity of the Lebombo Mountains in 1896 I have had tsetses flying about me, and have seen cattle belonging to natives feeding unmolested by fly on the other side of a creek, a matter of 200 yards away. Natives stated that the fly never crossed that creek. From what I have learned of natives since, I should have thought they would have lost all their cattle, so careless are they in regard to herding. However, in the fly-country possibly the danger kept them up to the mark. The creek in question was one of the small northern affluents of the Sabi, just west of the Lebombo, on either farm Venetia No. 633 or Strangersrest No. 931.

As regards the distribution of fly, it is difficult after so long a lapse of time to be positive as to exact localities; and, unfortunately, all my old diaries were destroyed during the Boer war, so I have no notes, made at the time, to draw upon. But what I have set down on the map I have seen myself. As viewed from to-day, my impression is that fly became more prevalent as one travelled eastwards towards the Letombo. The country along the Lebombo, between the Sabi, Massintonto, and Uanetsi Rivers was particularly dense, but even there I have a distinct recollection that it was not one continuous belt of fly-infested country.

I encountered fly just east of the Lebombo below the Massintonto River, and fly was prevalent up to and northwards from the kraals of the natives Massingire and Sintenyana on the Portuguese side, and from there northwards to the Singwedzi River. I have questioned some of my old hunting boys about fly in Portuguese territory immediately contiguous to the Lebombo, and they assert that there were very big areas in which there was no fly. For instance, from Sintenyana's (just through the port of the Olifants in the Lebombo) right

down to Marakinge's at the junction of the Olifants and the Limpopo. Also at Gungunyana's head kraal, known as "Biyin," and situated on the Limpopo, just below the junction of the Olifants.

So far as the Transvaal area was concerned, in the vicinity of the Lebombo Mountains, as well as my memory serves me, fly was everywhere, right up to the Olipants River, and probably beyond it. The rivers Massintonto and Ubabate (M'badati) were particularly closely infested, especially between the Ubabate and the Olifants on the numerous spruits running northward. Here at the time several large herds of buffalo were located. From the present Sabi bridge



## VIII.

*Former Fly-belts of the Sabie Game Reserve.*

The distribution of these belts serves to show how improbable it was that the Trigardt Treis went by way of the Zand and Massintonto Rivers.

down towards the Lebombo on both banks tsetse were very numerous; but I fancy there was a break also on both banks opposite Hqbo's Kraal (Rome No. 940).

To the best of my recollection, fly-country was entered hereabouts when twelve to fifteen miles east of the Drakensberge, or thirty-five miles west of the Lebombo. It was not continuous, but was in belts or zones.

The first belt one encountered in this area was at Mahaman's, on the Zand River, where the farm Rolle No. 276 to-day stands. From there eastwards fly was found in belts. These belts became well known and did not seem to move, although fly would move from one area to another or enlarge its area. On some instances tsetse covered large areas; in others the area would be only a mile or so in extent.

A fly which excited my interest was encountered on the Ubabate River about this time. Its species is unknown to me, but in view of what information has since been disseminated in the Press in regard to tsetse I would regard it as another variety. It was about the size of the tsetse, possibly slightly smaller. It was the same silent flier. Tsetse made a slight buzz as they flew about one. This fly was entirely silent. His body was hirsute and appeared to be covered with fine down as if one had dusted the fly with olive-green powder. It was a remarkable fly, and he bit remarkably too, even more viciously than ordinary tsetse. At this time buffalo were close by the locality I name. This is the only occasion on which I saw this species, but it was extremely plentiful and gave one no peace.

#### FLY-BELTS OF MR. TRAVERS' MAP.

No. 1.—This is composed of three separate patches:—

(a) West, on Tsirigoul Spruit, centred on Ross No. 917.

(b) Intermediate, on Hluumi Spruit, centred on Nederland No. 823.

(c) East, on unnamed spruit, centred on Ceylon No. 750.

No. 2.—West of the Ubabate, centred on Jacobushoop No. 851.

No. 3.—At headwaters of the Massintonto, centred on Welverdiend No. 414.

No. 4.—On the Massintonto, overrunning Jeukpeulhoek No. 855, Dargai No. 403, Imlay No. 345, and Gowrie No. 348.

No. 5.—At headwaters of the Zand or Mandhlamare, overrunning Ludlow No. 1258, Allendale No. 279, Roll No. 276, Edinburgh No. 266.

No. 6.—On the Massintonto, on east part of Troyes No. 830 and west part of Besancon No. 1250.

No. 7.—On small affluent of Sabi, on east part of Venetia No. 833 and west part of Strangersrest No. 931.

No. 8.—On Sabi and affluents. Extends down Sabi from railway bridge to vicinity of Hobo's Kraal on farm Rome No. 940. The areas more or less involved are:—

(a) Sabi north bank: Sabibrug No. 63, Zamenleup No. 66, Glenend No. 713, Campbell's Hope No. 213, Sardinia No. 1249.

(b) Sabi south bank: A strip about one to two miles in depth opposite farms on north bank.

(c) Zand: Teulcn No. 729, Charleston No. 719, Dudley No. 720, Flockfield No. 413.

(d) Mushlamu Spruit: Egypt No. 730, Prairie No. 712, Alburnen No. 984.

(e) Manzindlovo Spruit: Elandsdale No. 385.

(f) Unnamed spruit: Legerstee No. 632.

No. 9.—South of Massintonto, east of Lebombo (Nuamolongo of the Portuguese Map, 1903).

## APPENDIX C.

## NOTES ON THE RUSTENBURG DISTRICT.

By the Rev. W. BEHRENS, Bethanie Mission Station, Rustenburg District, 24th of April, 1923.

My late father came here in 1864, and I in 1869. I arrived in South Africa in 1857, and am resident missionary here since 1880.

I could tell you much of the past sixty years of South Africa; nevertheless, I would not have been able to answer all of your questions if I had not, fortunately, had the help of two old native men of my congregation who are between eighty and ninety years old, and know the Rustenburg District down to the Motlhabatse River.

The following are the answers to your questions:—

1. *Linkling River*.—The Elands is not called Linkling, but Kgetiheng. By this name it is known by all the natives of this district.

2. *Machachocan River*.—This is perhaps the Machòtlhoane, a small river beyond the Pilaansberge.

3. *Pylkop*.—There are two conical hills west of Ramakoksstad which are called Pylkop. The old men say that the Griquas never came into this district, and so they could not be slaughtered by the impies of Mosilikats. Fighting, they tell me, took place only in the Free State, at Vegkop or Alleenkop.

4. *Vliegkop*.—No one appears to know Vliegkop. However, a native says there is such a kop near Rasai's Kraal, which is between the junction of the Aapies and the Crocodile and the junction of the Aapies and the Pienaars. [This is the Vlieg Kop shown on Wylde's Jeppe's, and Troye's maps, in the neighbourhood of Flink zyn Drift No. 119.—C.F.]

5. *Vlieg Poort*.—My cousin, Kommandant George Behrens, tells me that, after traversing a stretch of wide flat country, the Crocodile breaks through a mountain range. This is the first Vlieg Poort. Then you travel about one outspan and come to a second range of mountains through which the river again breaks. This is the second Vlieg Poort. But the two, so to speak, are one. Our old men say that in the years 1870-1880, when they went down to hunt on the Motlhabatse, tsetse sti<sup>h</sup> abounded at Vlieg Poort, and they had to trek the night long through to get through the belt. At that time the flies were also on the Mokòlò hills.

*Mural Mountains*.—The Moralo Mountains do exist. My old native says he was at those mountains, and the range gets its name from a tree which bears a fruit quite like an orange and as large. [*Strychnos* spp.—C.F.]. This moralo fruit grows nowhere but on the Moralo Mountains. My old native adds that it would have been quite impossible for Harris to have seen these mountains from Commando Nek, as they are too far away. From Commando Nek one can only see Ramakoksberge, Pilaansberge, and but one outstanding and highest peak of the Rooiberg.

*Mosilikatse's Kraal*.—The old natives state that the chief's kraal was here at Bethanie (Tsopane). He also had one at Mosilikatsnek

and another on the Elands or Kgetlheng. Mosilikats, they say, fled from Bethanie on hearing of the coming of Dingaan, whose regiments passed through this district and followed Mosilikatse to the Marico. Many of the subjugated natives also fled. The great sub-chief, Mandabole, was in charge here at Bethanie before my father arrived in 1864. The eastern part of Bethanie still goes under that name.

*Copaine.*—Maybe Harris called this place by this name. The little stream to the north of Bethanie still goes by the name Letsopane or Tsopane. [The original Kapain or Copaine still finds its place on the maps. The name may have been transferred when Mzilikatze moved to Rustenburg.—C.F.]

*Game and Fly.*—According to my old native, when Mosilikatze's kraal was here at Tsopane, giraffe, koedoe, buffalo, wildebeeste, rhinoceros, etc., were still hereabouts, and on the Crocodile (Oli) River there may have been a few tsetses, but none worth mentioning. Tsetse, however, existed where the Aapies joins the Crocodile. When the Boers took possession they decimated the large game, and it disappeared, moving farther and farther to the north, and the tsetse with it, always following.

When I came here first (1869-70) men of our congregation used to trek down to the Motlhabatse (Matlabase of maps) River and flats with their wagons on hunting trips. They would stay away about two months and bring back horns, hides, biltong, and tallow. From the last we used to make our candles for home, school, and church. Sometimes, I remember, they came back with several oxen struck by fly. These would get poorer and poorer, and die after the first rain fell on them.

The fact is that tsetse disappeared with the large game. When I came here first (1896) I only saw a few koedoe, nothing else, not even ostriches. These are coming back now. I have sixty on my farm and about fourteen phala buck.

*Tsetse.*—As far as this word is concerned, I can say from my knowledge of the language that it is the real and generally known name for that fly. The "e" is pronounced like the "a" in "name."

*Place names, etc.*—

Limpopo or Crocodile River: Oli.  
 Hex River: Matsukubyane.  
 Elands River: Kgetlheng.  
 Pienaars River: Moretele.  
 Aapies River: Choane.  
 Marico River: Malikoe.  
 Pretoria: Choane.  
 Rustenburg: Tlhabane.\*  
 Magaliesberge: Named after Chief Mogale.

There are many corruptions of native names; for instance, Magaliesberg should be Mogalesberg. Then there is the case of the Selons River to the west of Rustenburg. The Boers called the chief Selon, whereas his name was Seloane or Maseloane, and so it goes on.

\* In the word "Tlhabane" is probably to be found the origin of "Cashan" as applied to the Magaliesberge by Harris.—C. F.

## APPENDIX D.

## TSETSE IN ZULULAND.

By SIR CHARLES SAUNDERS, K.C.M.G., Melmoth, Zululand.

The attached copy of an extract from a letter written by myself in June, 1915, on the subject of tsetse in Zululand, seems to answer your questions so far as my own experience and observations are concerned. I have no reason to alter the opinion then expressed, which was arrived at after years of mature and careful consideration.

I was not aware of what you say about the western Transvaal, and it would be interesting to know whether the disappearance of tsetse in that region followed that of the large game, as, if so, conditions there and in Zululand would appear to be similar.

*Extract.*—The history of nagana since what is known as Zululand became a British possession in 1887 can, without fear of reasonable contradiction, be summed up as follows:—Previous to this, natives were in an unsettled state. They were dependent to a large extent on game for food, then protected by no law. In consequence of this, at the annexation, but little large game existed in this country (excepting in uninhabited localities like the junction of the two Umfolozi Rivers, the Hluhluwe and Mkusi Rivers). So far as is known, nagana and the tsetse fly existed nowhere except in these small areas.

One of the first measures adopted after the annexation was the law for the preservation of game, particularly the larger varieties. Rapid increases naturally followed, and game animals spread to parts where they were not found when the country was taken over. With the large game, nagana and tsetse fly spread and increased in a corresponding degree. In a few years it was realized that measures must be taken to counteract the evil. Then followed the exhaustive investigations of Sir David Bruce. These were ably conducted with every facility in the way of funds and means; they extended over two years. What was the result? It was proved beyond question that nagana was to be found only where tsetse fly existed, and that the latter was only traced to parts frequented by large game.

The British Government then placed this valuable report in the hands of that world-famous African authority on everything appertaining to game, viz., F. C. Selous, and invited his criticism. His response was much to the point, and in effect, that the Zululand Government had spent some thousands of pounds and much labour to ascertain what every old hunter and trader in Africa knew long ago, i.e. "that nagana was produced by tsetse fly, which was only found where large game existed."

Following this, steps were taken by the Government to reduce the large game, at least along routes that had to be traversed by domestic animals. Whether the measures adopted were the best and likely to be effectual is hardly a point, but the necessity for combating the evil and facing it is undoubtedly one. About this time (1896) the invasion of rinderpest occurred, and in less than a year swept off all but a very few specimens of the several varieties of large game, notably buffalo and koedoe, so much so that the number remaining could easily be

located in a few isolated localities. What was the result? Nagana absolutely disappeared and tsetse could only be found in very small numbers where the few surviving buffalo and other large game existed. This assertion is made with absolute assurance, as from the year 1897 to about 1904 I traversed what used to be the worst districts infested by nagana and tsetse fly, over and over again, spending days and weeks in those parts with large numbers of animals, including cattle, horses, and dogs, and never had a single animal affected. Moreover, during the whole of that period I only saw one tsetse fly, and that was above the junction of the two Umfolozi Rivers, to which place I had gone for the special purpose of procuring specimens of the fly for Sir David Bruce, who was then continuing his investigations into the subject in England. Although several natives accompanied me on this occasion, and were daily in search of the insect, not a single specimen was procured. The only one I saw escaped, and it may be of interest to mention that this specimen was found in the lair of a buffalo just disturbed.

After the invasion of the rinderpest, stringent measures were revived for the preservation of the remaining game, with the result that it soon began to increase again. At first slowly until about the year 1905, but from that year more rapidly, and nagana once more made its appearance, spreading from one locality to another, outside the game reserves with the large game, and has gone on spreading until the present critical position has been reached.

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#### APPENDIX E.

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#### THE FLY-BELTS OF ZULULAND.

(Regarding a letter and map by the late F. Toppin relating to *Glossina pallidipes* in Zululand.)

Up to the outbreak of the late war, the late Mr. F. Toppin lived at Ngxwala Hill, in the heart of the fly-country of Zululand. He was well known as a field naturalist and as one who came almost daily in contact with the native fauna and tsetse.

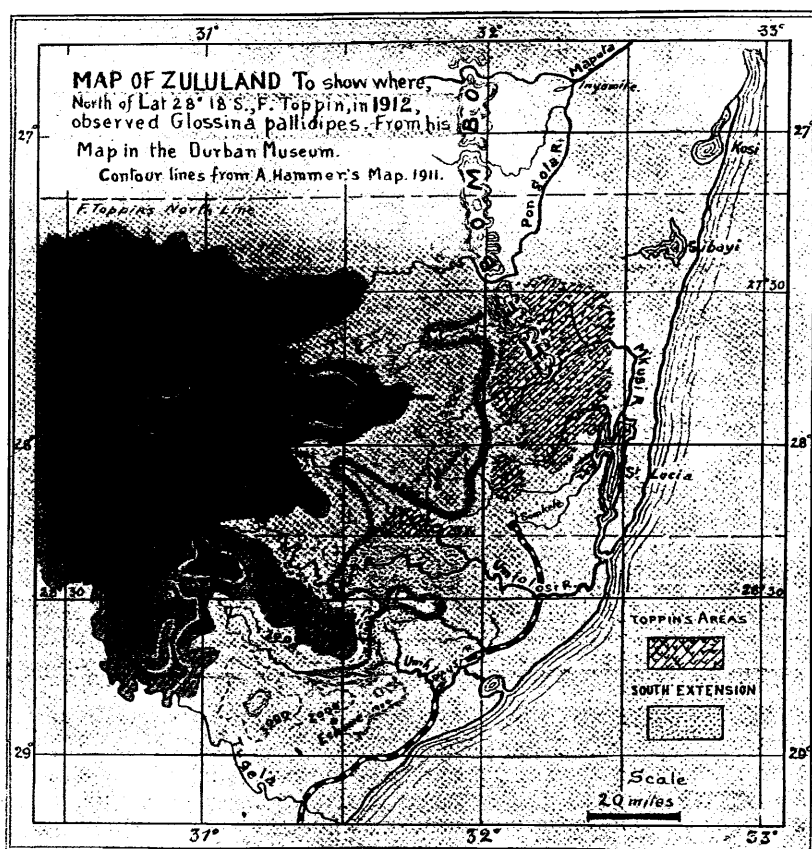
Toppin's map is drawn to a very large scale, and is at present preserved in the Durban Museum. The main features of this map are to be found depicted upon the composite map which accompanies this note, the north and south boundaries being indicated by the interrupted lines marked "F. Toppin's North Line" and "F. Toppin's South Line."

As regards the distribution of tsetse in that part of Zululand to which Toppin's map relates, I believe the demarcation of the areas to be accurate in the sense in which the author meant them to be; that is, they represent the areas wherein he actually saw fly. They are, if anything, on a conservative basis, as Toppin did not make any intensive search for the insect, by the aid of living bait for example.

The map bears the following legend: "Showing localities in Ubombo and Hlabisa Districts where *Glossina pallidipes* has been observed to exist by F. Toppin, 1912," and in the fly-country the faunal associations of the different localities are set out in a very



meticulous manner. From these we find the fly-country covering the valleys of the Mkusi and its main affluent, the Msundusi, as apart from four or five species of small antelope, shown as inhabited by impala, inyala, waterbuck wildebeest, warthog, zebra, and black rhinoceros. The valley of the Hluhluwe River is shown as inhabited by waterbuck, koedoe, buffalo, and black rhinoceros. The valleys of the Black and White Umfolosi Rivers are shown as inhabited by waterbuck, koedoe, wildebeest, buffalo, zebra, and black and white rhinoceros.



## IX.

*The Fly-belts of Zululand.*

The densely shaded area represents that part of Zululand which lies over 3,000 feet above sea-level. All the fly-country is below 1,000 feet in elevation. The dotted area shown as the south extension was not charted on Toppin's map.

Among Toppin's correspondence is a paper with his replies to the fifteen original questions propounded by the British Museum. This is dated 12th April, 1912. The following is a synopsis:—

“Only *Glossina pallidipes* has been collected, and no other species has been observed. The bite of this tsetse is very painful. It is exceedingly voracious and fills itself to such an extent with blood that it is unable to fly. When knocked off, it falls to the ground and clings to the grass. I have never found tsetse in quantity near to

water. I have often searched the banks of the Mkusi River, but have never come across more than an odd specimen or two in one place. To catch tsetse I take natives and wander about until I come upon a herd of wildebeest standing in the shade; we frighten the wildebeest away, and then go and stand under the same tree they have left. No sooner do we arrive than the flies come and settle on the natives and my khaki trousers. I have sent you sixty-five flies; all these were caught in under twenty minutes. The tsetse prefers shade to direct sun."

*Extracts from a letter addressed by F. Toppin, Ngxwala Hill, Ubombo District, to E. C. Chubb, Durban Museum, 31st March, 1912.*

"I shall be pleased to get you all the flies that I can. I regret to say at present that I have none on hand, having sent the last lot away to Mr. Wager, of the Transvaal University College, just the other day.\*

"Nagana is very bad around here at present, over seventy transport animals having died since the new year. I tell you candidly that in my opinion the sole cause is the great increase of big game, which is now migrating to fresh pastures. Since I can remember, the coast road in northern Zululand was absolutely free from nagana, as was also the middle (stables) road to Ubombo. The middle road has now been closed owing to nagana.

"I have been collecting tsetse since 1904, and I find that the fly is only active during the hottest parts of the day, and as a rule stops feeding in the early afternoon. It is found in all sorts of places; my labourers often catch them in the open fields, at least a mile from the nearest water.

"On this estate there are quite a large number of the small black rhino. Often I will find tsetse in my house, and sure enough should I take a walk around I will put up a cow and calf rhino, quite close to the house. When a rhino is not about then there are no tsetses.

"Personally, I think game preservation in Zululand is becoming a mania instead of a science. I am sure that the new Game Ordinance is not conducive to the preservation of game. Formerly, there were two large game reserves in Zululand—one between the Black and White Mfolozi Rivers and one at the Amanzimbomvu—now a third has been proclaimed in the Ubombo Division. Has it ever occurred to you at what a rate the vermin, viz., jackals, hunting dogs, mongooses, porcupines, etc., are increasing in these large uninhabited game reserves, and at what an alarming rate the smaller antelopes and game birds are disappearing?"

"During the whole of my time in Zululand I have never known any attempt being made in the reserves to get the upper hand of the vermin which preys upon the smaller antelopes and game birds.

"My life for the last eight years in Zululand has been mostly spent in collecting natural history specimens for various institutions in Europe, consequently I have wandered a great deal about Zululand, and have spent lots of time in the wildest spots. Being a keen observer and a naturalist, I have had an opportunity of studying the game problem thoroughly. I take it that game preservation means preserving game on a scientific principle in large park-like reserves people can visit and see the animals in a natural state.

\* One of these is now in the collection of the Division of Entomology, Pretoria.

"Game is allowed to wander outside the reserves at will. I heard a short time ago that two rhino. were seen near to the Dukuduku Bush. These were then over 20 miles from their home. . . ."

"Too much is taken for granted. Game preservation is a mania with a lot of people, and I find that those that do all the shouting know the least possible about the subject. No thought whatsoever is given to game preservation as it relates to eradication of disease or to economic entomology. . . ."

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APPENDIX F.

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NOTES AND EXTRACTS FROM CORRESPONDENCE.

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1.—*E. W. Lowe, Esquire, Sub-Native Commissioner, Blaauwberg.*

"The one place the old natives definitely recognize is the Madlala Pan. They say it is the 'Letshe la Madale' (pan of Madale), about half-a-day's journey east of the present location of Selika, in the Waterberg District. This would place the pan about fifteen miles from Selika's. None were able to locate the Madzalana River nor knew the name 'Siloquana.' There is a river called the Matatjoe, between Schimmelpaard Pan and the Magalakwin, running through the Mojola Hills; here they say tsetse used to exist. The Mojola Hills run west from the Magalakwin over the farms Oatlands, Zoetendalsvlei, and Boston.

"There is also a hill called Matshu, and near the junction of the Palala and the Limpopo, where tsetse is said to have existed. This is to-day the hill of Selika, but previously, twenty-five and thirty-five years ago, Selika lived under the Mapa Mountains, on the west of the Limpopo. The Mapa were known as the Mountains of Selika.

"It appears from the statements that tsetse and buffalo went together, and that the fly was known about the Malaboch Mountains. Mention of tsetse immediately caused them to speak of buffalo; they apparently considered that tsetse existed where buffalo lived and went when the buffalo moved to the north-west.

"The old men speak of the fly in a very general way; none of them has been able to name definitely any particular locality where he knew fly to exist. They say that the fly was known along the Magalakwin River and down the Limpopo Valley. When I asked which particular part of the Magalakwin, they replied in a general way, saying to the north and west of the Blauwberg Mountains. Apparently the fly did exist along the river valley itself, but it is doubtful if it came up as far as the mountain range, at any rate in the lifetime of these old people. Some say that it lived where the buffalo and rhinoceros were to be found; others, wherever big game existed, naming also the elephant and the giraffe; all, however, name the buffalo.

"One old man who recollected events which occurred in the northern Transvaal in 1862, said the fly was found only by hunting parties; that it did not exist on or to the south of the Blauwberg Mountains. He had seen the fly and was able to describe it. He related that the fly did not attack native stock, but only the oxen of European hunters; this is probably to be explained by the fact that native stock was not used to go into the fly-belts on hunting expeditions. He said the disappearance of the fly was a gradual one; that

it moved with the game as the latter went northwards away from the hunters, armed with rifle and powder. He thought that it was the fear of the rifle which really caused the big game, and with it the fly, to disappear.

"Another explanation of the gradual disappearance was one I have not heard before. This man said that some years after the 'Aman-debele' invasions, those under Moselekatze, the natives abandoned the practice of living in large villages, in which they had up to then congregated for protection against invading tribes. They settled in smaller communities, spread over wide tracts of country, as they live to-day, as the fear of invasion had passed; or because, as I think, the coming of the white man had brought security against such invasions, so that they could safely live in smaller and more dispersed communities. This spreading of the people disturbed the game, which, becoming timid of the presence of man, moved away, and with the game the tsetse went. This explanation is really very sound and reasonable; probably the two causes, the coming of the guns and the diffusion of the natives, will give the real reason for the disappearance of the tsetse.

"I fear this information is not of scientific value. The younger generation of natives hardly know of the tsetse. Many of the older ones are confused in their memories and recollections, so that information of this nature can only be of a general kind. The tsetse as a rule brings up the recollection of the herds of game, and from that it is an easy step for the old warrior to recall his hunting exploits, forgetting the main point of the questioning." (13th April, 1923.)

2.—*E. Tamson, Esquire, Nylstroom.*

"In 1880 there seems to have been fly in the (mopani) bushveld beyond Zandrivierpoort down to the Limpopo. I do not remember hearing of much loss of cattle. The farmers, knowing where the fly was, never trekked till they shot all the game away. When, in 1882, I trekked into Rhodesia I struck the fly only near Zimbabwe Ruins and had to turn back; thus Waterberg and Zoutpansberg must have been clear in those days.

"If you had asked me these questions last year I might have got some information from old Pretorius, who died lately, over 100 years old." (15th July, 1923.)

3.—*John Jack, Esquire, Pretoria.*

"I have learned that a fly-belt was found on the lower Steelpoort Valley where that river joins the Olifant. Another patch of fly occurred at Flypoort, where Berspruit joins the Crocodile, about 80 miles from Rustenburg." (20th June, 1922.)

4.—*Granville Nicholson, Esquire, Zoutpansberg.*

"There was a fly-belt along the Letaba from the Tsama to the Tinde (Tzende), five hours on horseback (30 miles). Beyond the Tinde black turf and open country is met with to the Rooirand (Lebombo). Fly was last seen here in 1894. The fly disappeared with the buffalo." (June, 1922.)

5.—*Commandant Geysler, Nylstroom.*

"Tsetse was last noticed (in the Waterberg) in 1888. The flies probably disappeared because their hosts, the buffaloes, went north." (8th March, 1923.)

6.—*Mnr. G. A. du Plessis, Zoutpansdrift, Rustenburg District.*

"I first met fly at Buffelsdraai No. 48 (Donkerhoek, Zwarthoek), where the Aapies River joins the Crocodile. This was in 1870. I never heard of the fly on Zoutpansdrift No. 359. As far as I can remember, I met with fly at Vliegpoort and three farms up the Crocodile from Zwarthoek. The reason why fly disappeared was, in my opinion, due to it being a game (i.e. buffalo and giraffe) fly, and from the moment these animals moved north the fly disappeared. The big game constituted the daily food of the voortrekkers and moved off because it was hunted." (23rd March, 1923.)

7.—*B. H. Dicke, Esquire, Pietersburg.*

"There was up to 1892, with certainty, a tsetse-belt near the Singwidsi River, more or less on the boundary of the Game Reserve. The Messouw, or Masjoe, River must be the Klein Letaba, because Masaokop is near that river. As the kop has the name of a native chief, it may be accepted that the river had the same name in 1837. If Trigardt wanted to go east from Pietersburg to get to Delagoa Bay he would have to take the now old hunting road which crosses the Klein Letaba near Masaokop." (Pietersburg, April, 1923.)

8.—*Major F. C. Garbutt, Resident Magistrate, Selika.*

"The mountains of Selika are named Nwapa, pronounced Gaupa. There are two small koppies practically on the north banks of the Limpopo, between Everitts Drift and the junction of the Lotsani, named Ramabelebele. The Bamangwato Mountains are undoubtedly Shoshong Mountains, Chief Khama's village prior to going to Palapye about forty years ago. The Matchohong are a tribe who formerly inhabited the country north of Shoshong, and originally came from the northern Transvaal. They now live in the Districts of Sofala and Lerala, shown on the map as the Chopong (pl. Matchopong Hills).

"I have been through numerous fly-belts in N'Gamiland, where I spent twelve years, and I had to travel through one of twenty miles, almost every month for two years, between N'Gamiland and Kazungula on the Zambesi. Strange to relate the fly only appeared in this area after the extremely heavy rains experienced in 1909, which filled up the dry beds of rivers that had ceased to flow. The belt increased from five miles the first year to twenty miles in 1918, and I was told recently that it now extends right into the Mababe Flats (Selous' old hunting ground). In all the fly-belts in N'Gamiland, buffalo are to be found, but there are also several parts of the country where buffalo are numerous and no tsetse occurs. In the Caprivi strip, for instance, there are several herds of buffalo, and the tsetse is unknown. On one occasion infected cattle were brought out of a fly-belt and placed in a clean area on the south bank of Lake N'Gami. The following year cattle in this locality commenced to die of fly disease. There were no *morsitans* in this district, but a species of biting flies conveyed the disease.

"The climate of the Limpopo, in my opinion, would be too cold to be a serious menace, but there is ample undergrowth, ideal places for the *morsitans*. I think it very unlikely that Gordon Cumming found tsetse at Nwapa, as Selika had cattle-posts in the neighbourhood at that time. It is possible Gordon Cumming purchased his oxen from natives, and they were already infected. Natives are very fond of getting rid of cattle that have become infected before the

symptoms became too noticeable, and I have known Europeans do the same thing. The symptoms are swelling under the dewlap, and the blood becomes watery and the animals fall away in condition. Perhaps the range of hills named 'Morati Berg,' near the Seruruame Valley, which runs into the Limpopo near Sass's Post, is the Massama Hill on the border of the Bamangwato and the Bakhatla Reserves, and about ten miles from the river." (12th April, 1923.)

9.—A. L. Hall, Esquire, M.A., F.G.S., Geological Survey, Pretoria.

Mr. Hall, to whom I owe the loan of most of the photographs appearing in this article, has kindly furnished me with the following description of the eastern low country, through which Trigardt trekked after crossing the Drakensberge:—

"When not relieved by isolated kopjes or ranges, of which the peculiar rugged slopes strewn with huge spheroidal boulders of granite are highly characteristic, the eastern low country presents a monotonous aspect over a vast and thinly settled expanse of bush country. Nearly the whole is covered by a practically continuous mantle of vegetation, characterized by low trees. Distinctive features are the prominent undergrowth, the uniform distribution of the trees and the markedly more luxuriant vegetation along the river-courses. Along the banks of the larger rivers like the Olifants, Selati, and Macoutsie an extremely dense undergrowth of reeds sometimes renders the edge of the water almost inaccessible. Close to the foot of the Drakensberge the vegetation is still more or less like that of the bushveld proper in the central Transvaal (e.g. abundant in species of *Acacia*), but farther towards the east, wild palms begin to appear; still farther east, the *Acacia* facing is gradually replaced by Mopane forest. Apart from the very few more or less permanent water-courses like the Olifants and Selati Rivers, there is hardly any surface supply; east of the Selati railway the country, especially beyond the Palabora, is very dry and practically uninhabited." (May, 1923.)

10.—Dr. Percy A. Wagner, Geological Survey, Pretoria.

Concerning the two photographs illustrating "The Vliegpoort Mountains," Dr. Wagner, who supplied them, has kindly furnished me with the following remarks:—

"The upper is the view looking westward along the southern barrier range athwart the Vliegpoort area, with portion of the Vliegpoort range showing in the background. The Crocodile River is seen in the middle distance near the point where it pierces the range in Buffelspoort. The southern slopes of the range, here shown, support but a scanty growth of trees and scrub. The northern slopes, on the other hand, are in their upper portions covered with a dense growth of almost impenetrable scrub, to which numerous lianas impart a jungle-like character. This scrub descends to the river level in the poort. The same applies to the northern range, which is somewhat higher, attaining in Sovereign Hill an elevation of 4950 feet, whereas the southern range at its highest point has an elevation of 4460 feet. The level of the bed of the Crocodile River in Buffelspoort is 3024 feet.

"The lower is the view looking north from the crest of the southern range (on Wachtenbietjesdraai No. 829). It shows the northern or Vliegpoort range in the background. The park-like country between the northern and southern ranges, shown in this

photograph, according to the testimony of an old resident, Van Rensburg, at one time teemed with big game, including buffalo and quagga. Except for koedoe, which are still fairly numerous, the big game has been exterminated. The dominant features in the vegetation of the park-like country are the fine examples of aapiendoorn (*Acacia Burkei*). These are also found on the terraces bordering the river, together with *Acacia karroo*, *Combretum riparium*, and *Ziziphus mucronata*." (May, 1923.)

11.—*Major T. G. Trevor, the Inspector of Mines.*

"In the year 1887 tsetse was still to be found at Schimmel Paard Pan, in Koedoes Rand Ward; but, speaking generally, there was none between the Zoutpansberg and the Blauwberg, or along Brak River (cf. Appendix A). One could trek right through to the Limpopo River. In that year, however, I saw fly-struck cattle from north of the Limpopo, and both fly and buffalo were to be met with behind the Zoutpansberg, east of where the railway runs from Zandrivierpoort to Messina. In the far north-eastern corner of the Transvaal, where there is some wide open grassy country, there was no fly, and many natives with cattle lived there. I remember that up to 1890 fly was abundant at Louw's Creek, and buffalo also inhabited that area. In 1891 I saw nothing of fly at Pongolapoort, Zululand, just south of the river, nor was there any fly at Mohashes, on the Lebombo, lat. 26° S. But there was a point between Mohashes and Pretorius Kop which I can remember passing at night on account of fly, though I do not remember the exact spot. In 1893 I did not encounter any fly on the road to Victoria, via Middeldrift, nor from Gondoque to Belingwe. Lower down the Buby River, however, fly was said to be, so we went there without cattle. On that occasion, I went some fifty miles down-stream from Zimbabwe, but again without cattle. The connection between fly and buffalo was regarded as certain and unassailable by all old hunters and travellers whom I met there, and from my own experience I should say that it was an intimate one, as so far as I know, where there were no buffalo there were no fly. Wherever I found fly it was always in the neighbourhood of dense tangle bush such as is only frequented by buffalo among the bigger game." (27th April, 1923.)

12.—*L. C. von Wissel, Esquire, Hluti, Swaziland.*

I should not be at all surprised to hear there was fly along the Maputa to the north-east of Nduma, as I have lost cattle through shifting them from one part to another. There are parts, too, where the natives never keep their own cattle owing to them dying. Before rinderpest, Mr. John A. Major, living near Stege (lat. 26° 25', long. 31° 55'), on the Lebombo, in Swaziland, complained of nagana gradually working up the eastern slopes of the Lebombo, to my distinct recollection. From the oldest resident in this district, Mr. M. van Staaden, Vlakhoek, Dwaleni, I have heard that, in the old days, there used to be nagana below Hluti, on the little Isitilo River (lat. 27° 15', long. 31° 42'); but it disappeared with the shooting of the game by the Boers. To my own knowledge, tsetse used to be prevalent along the Silati railway line close to Komatipoort upwards. Since rinderpest, I hear nagana has disappeared from there. (17th May, 1923.)

13.—*Trigardt's Trek from the Drakensberge to Delagoa Bay, 1838.*

The interest attached to an understanding of the route taken by Trigardt lies not only in an attempt to locate the fly-country he passed through, but also that which he avoided. His diary makes it quite clear that fly was encountered to the immediate east of the mountain range, and, for the rest of the way, was generally avoided except at the kraal of Halowaan in Portuguese territory.

My sketch-maps are based upon Mr. Preller's interpretation; but it is possible that the section of the route from the Drakensberg to the bank of the Incomati was quite different from that indicated. Admittedly, the route must always remain problematical. For a variety of reasons, however, I am inclined to think that the expedition forded the Olifants west of the junction of the Blyde River, and, after crossing the Blyde, arrived at the headwaters of the Klasarie and Umbabat. From hereabouts the course shaped north-east by east, crossing the low Lebombo hills not far south of the Olifants; then on towards the meeting of the waters of this river with those of the Limpopo. From some indefinite point hereabouts it turned south and followed along the Manzinchope to the Incomati. This is a very different route from that shown in the sketch-maps, and calls for some explanation.

Although Trigardt was careful to set down in his diary the names of the native chiefs he met and the native names of rivers and rivulets crossed, he nowhere tells the direction being travelled. The words north, east, south, and west are conspicuously absent from the record. Of the three dozen or more native names so given, it is hopeless—as far as both old and recent maps are concerned—to recognize more than several with any degree of assurance. These are Sekororo, Comati, and Maratkwiin. That this should be so is not at all remarkable. In the first place, it is inconceivable that Trigardt conversed directly with all the natives he met, but rather through his own native attendants speaking Sesutu. Thus a name would often reach him already perverted in the mouth of an interpreter, and then be set down in a corrupted form. Therefore a generous allowance must be made for permutations and corrupt renderings. Since 1838 there have been many migrations by the natives of the region Trigardt passed through. These migrations began well before the period of the trek with the advent of Manukosi and his Zulu hordes; and, in Trigardt's day, two languages were commonly spoken: the mother tongue—in five or six dialects—of the conquered and the Zulu of the conqueror. In later days Maguamba migrations became very general, especially during the six years' war of succession that followed Manukosi's death. So it comes about that, even if the name of the erstwhile chief be recognized in that of a descendant, it does not follow that the kraal-site is now the same.

Equally, little dependence can be placed upon the names of rivers as Trigardt obtained them. That of the Chobe River in Rhodesia furnishes a good example, for Selous tells us this was acquired from the simple fact that where Livingstone happened to strike the river a chief named Chobe lived. At that particular point it was "Chobe's River." Every river of any length had many names, or names that sounded quite different owing to permutations.

As the three names—cited as readily recognizable—mark the beginning and the end of the trek, one is inclined to make the route more or less direct from point to point. But it could have been only



indirect, as all progress was governed first by the necessity of giving the widest possible berth to all the fly-country known by the native guides, and second by opportunities for grazing and watering the horses, cattle, and sheep.

Chief reliance has to be placed upon the number of treks recorded from day to day in the diary. This brings us to the consideration of the length of a trek and to the fixing of an average trek—in the light of the nature of the country passed through, together with attendant circumstances. Among the latter come some consideration for the women and children; the preparation of food for fifty or more individuals; the feeding and watering of flocks and herds; the clearance of obstructions; and the influence of many another factor involved in the progress of so large and heavily laden a caravan through a wilderness. The average trek would not therefore be more than one of seven to eight miles.

Without question, the passage over the Drakensberge was accompanied somewhere in the neighbourhood of the present Sekororo location, although in those days this was upon the mountain tops. From the east of the great escarpment the expedition made a fresh start, and in three treks, on three successive days, the "Kaffir's Drift" on the Olifants River was reached. It is hardly credible that these three treks covered much country. It was on the 9th November, 1837, that the whole party set to work to make a road up the western slope of the mountain range; it was not till the 7th December that a beginning was made to get the dismantled wagons down the first steep declivity of the eastern face. This alone took three weeks, and it was not until about the 14th January that attention was paid to the making of a road down the rest of the slope. As this took the best part of a fortnight, it follows that when a new start was made on the 5th February the first trek, at least, was down a track already cleared.

After fording the Olifants, the expedition reached another river at the end of a short trek. This Trigardt named the "Bergen." He tells us the native name was "Omtate," that of the hill beyond "Omsana," and that of the mountains "Rammakoote." When this river was reached, a fordable place was sought, and then the trek waited for the waters to subside. There are only two rivers to be considered. One is the Blyde, the other the Klasarie. For the trek to come to the Klasarie at half a day's trek after crossing the Olifants, it would first have to travel about fifty miles, as the crow flies, over none too even nor open country before it crossed the Olifants. As in the circumstances one cannot possibly imagine so rapid a progress, the Klasarie is eliminated. Nor is it at all likely that Trigardt would name this the Bergen River, whereas that name would be singularly appropriate for the Blyde. These considerations lead one to the conclusion that the Olifants was crossed west of the junction of the Blyde; therefore it is not at all unlikely that the drift forded was that shown on the boundary of farms Finale No. 163 and Portsmouth No. 173. This being the case, the Blyde was probably crossed at the drift shown on Moriah No. 1032; so hereabouts the latter-day track from Pretorius Kop through Acornhoek to Leydsdorp probably went over the same ground.

By following this course, the expedition would arrive at the headwaters of the Klasarie and the Umbabat, below Mariep's Mountain. If the direction taken from here had been south-east to

where the Massintonto breaks through the Lebombo, then, in a bee-line, the forward movement of about 80 miles to the Lebombo was accomplished (during ten days) in eight treks. And it follows that half this distance, through the easier country beyond the hills, was only accomplished in the following eighteen days, and took twelve or more treks. Moreover, practically the whole of the route down the Massintonto would be through fly-country.

It is for this reason that I think the trek went east by north from below Mariep's Mountain, and crossed the Lebombo hills but a little south of the Olifants and then went on towards the Limpopo. The mention of the Lōasi (? Suazi) two treks east of the hills suggests this; but what leads to confusion is an entry in the diary (10th March) to the effect that a great river, the Motamhari, was flowing on the right hand, and that this river entered the sea on the right of the fort at Delagoa Bay. But the probability must always remain that this river was either the Olifants—in its lower course—or actually the Limpopo, and that the entry was made on native testimony and the native manner of speaking, in which case the river would be on Trigardt's left.

At the end of the fifth (or sixth) trek, after crossing the Lebombo, the kraal of Halowaan was reached on the 10th March, 1838. Unfortunately, the diary contains no entries, or these were torn out, as regards the four subsequent days (11th to 14th March). On the 15th the Wiensaana River was reached, and along the course of this seven treks were made to the "Comati." All the circumstances point to this being the present-day Manzinchope, a name corrupted from Amanzi Inhlope (white water). This being so, the kraal of Halowaan might easily have been that of "Umlanjane" (Garman-guana, Comajugane, etc.), near the Manzinchope, and about 40 miles north of the Incomati. On these premises we may recognize Cuene or Tcheguene in "Clewaan," Massuducana in "Macodelana," Xinavane in "Slawaana," Macia in "Massaasie."—C. F.

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#### APPENDIX G.

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### TSETSE IN THE LETABA-SINGWEDSI BASIN. NORTH-EAST TRANSVAAL.

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By B. H. DICKE, Esquire, Pietersburg.

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NOTE.—The region to which this account relates lies mainly along the Tropic of Capricorn or north thereof, between longitudes 36° and 32° East.

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As regards place-names, the early Dutch settlers were very careless, and different hunters or hunting clans went so far as to give different names to the same localities. "Dooop zoo maar zelf." If a native name was employed, it usually became corrupted out of all recognition, especially if the word happened to belong to an unfamiliar native language such as Siwenda and Siguamba. The same river might be referred to by several names. The Groot Letaba, for example, changed its name three times in a score of miles. This, considering the topographical and wild conditions, is not surprising:

and it was not until well in the 'nineties of the last century that it became generally recognized that the three names related to the same river. Then, again, a river, already named, will be given the name of a native chief. Thus the Limvubu is called the Parfuri after the chief M'pafuri.

Beyond Mashaokop, after crossing the Mashao River (upper Klein Letaba), there were no natives living on the flats in the time of Louis Trigardt. The country was uninhabited, except for a few Bawenda outposts on isolated, steep, and inaccessible koppies, such as Massia, Magor, Marapoen (now Jachtdrift No. 1821), and a couple more. Any rand that was not easily defended was not occupied. The Mavenda chiefs (Mamahila, Zuali, Mashao) hugged the mountains on the west. The basin was a great game country, and must have been ideal for fly: full of game, full of bush, and, in the rainy season, partly swampy. Even as late as 1890 I have seen an occasional koedoe and hartebeest on Mahone, waterbuck on Jacob No. 1804, and eland on Lebanga (not Lepka, as on the map).

But the general condition became altered about the late 'sixties of the last century when the Shangaans (Maguambas) came in under Albasini, occupied the flats, and exterminated the game.

In 1890 the fly had been cleared away to beyond Mosinzi, just east of the Tsama River (about long. 31° E.). The last natives to be met with thereabouts, when travelling east, were to be found just this side of the Ellerton Mine (long. 30° 30'). But in November and December of that year, owing to the first Modjadje war, there was a great exodus of Maguambas from Modjadje's territory. These were settled along the Klein Letaba towards the Birthday Mine and eastwards thereof (long. 31°). Among them was the powerful induna Ingobi. Ingobi was very enterprising, and his tribe contained a lot of good hunters. He supplied the Banyan smugglers with carriers, and smuggled on his own, not only soft goods, wire, and beads, but also guns and gunpowder. I think it was due to these circumstances that, by 1892, fly had been cleared away from Mosinzi and the Byasis Rivers—where it had been very bad—to as far as the lower Singwedji and Tsende Rivers (long. 31° 30').

In 1893 I left those parts, so I cannot say what happened since. I have stated the dates and the localities most carefully.

I paid no particular attention to the nature of the fly-belts, but, from memory, I should say that alternating and thick rough thorn-scrub would be the ideal. I somehow fancy the fly wants scrub for sleeping and breeding, and trees shading open spaces to fly about in; also moist ground. I would not describe the fly-belts as bosrande, but on the contrary as bosveld. The impression may be created that bosrande are identical with fly-belts, but I think, where fly is driven back to bosrande, these are just remnants of fly-country; the reason being that the last big game of such parts have taken refuge in the rande because there they are safer from pursuit. It is to be remembered that, whenever possible, the Dutch did their big-game hunting on horseback, and horses cannot follow game into rande so readily—especially when these are covered with stone and thick bush.

The game to be found in that fly-country comprised sable, koedoe, hartebeest, wildebeest, bastard hartebeeste, and a lot of eland. There were some buffalo in the thicker bush. I never heard of any rhinoceros

being shot in the years I mention. Elephant and giraffe were mostly driven off into Portuguese territory. On the west of the Lebombo I once saw giraffe, and once came across the fresh spoor of elephant.

It is my opinion that, in the Sabie Game Reserve, the fly had been driven to its last trenches before the rinderpest. It must be remembered that the game is more plentiful there now than it was before the Anglo-Boer war, when the natives all had guns and all went hunting.

The Kruger Government let out a contract for a road through what is now the Sabie Game Reserve, from Leydsdorp or thereabouts to Delagoa Bay. That was in the late 'eighties or early 'nineties. I forget who got the contract, but the party, a practical Dutchman, simply went to and fro with his wagon with heavy brushwork tied on behind it. The wagon was drawn by oxen, so far as I have heard; so, evidently that part was not so badly infested as the more northerly territory. I know also that, about 1895, a certain Conrad Planje went from Tzaneen to Delagoa Bay through the Sabie Reserve with oxen; he did not complain about fly at all, nor did he lose any oxen. He came back by the same route.

It was different in the country that is now the Singwedsi Reserve. Here, as far as I am aware, it was all fly-country east of Mosinzi, south of the Limvubu (Pafuri) River, just east of Sikundo Kop, and down to the Byasis River. Farther than this I do not know the boundaries of the fly in 1890-92. But this country was so badly infested that only a few went hunting there, even donkeys not being safe. When I had a trading station at Koedoes River I had a lot of sickly donkeys, left behind by hunters, to look after. All these donkeys died when the first rains came; if I remember rightly, cold rains in September. The post-mortems showed yellow jelly patches under the skin where they had been bitten by fly.

There was no such thing as trekking through that part, and no one ventured in except with donkeys, leaving the oxen behind where they were still safe. There were the Duvenage crowd who went yearly into camp east of Modjadje Range, either at the Molondotsi (Molototsi) River or at Patata Spruit, to saw kujat wood in the stony ridges, and who went in farther with donkeys to hunt. They usually avoided the country east of Mosinzi and at the Byasis. Most hunters went farther down the Groot Letaba, or those from the Spelonken (Kelly, Kloppers, Oelofse, and others) went into Portuguese territory by way of Sikundodop (lat. 22° 46', long. 30° 46'), Tsaulo, Minga, Makuleke. The Lebombo hills, where the Singwedsi goes through and thereabouts, being higher country, seemed to be fairly clean, but still unsafe. There were a few natives living there, but they had no cattle, neither had the kraals near the border and the Limpopo. I understood that Gungunyana had some cattle in the Bilene district. But those natives bartered their women, as originally did all the Maguambas, for kaffir picks. They only learned to lobola for women with cattle when they came and settled in the Spelonken. In the 'eighties a large portion of the old traders' turnover still consisted of bartering native-made picks shaped almost like a lotus blossom. The natives' hard-earned and long-boarded cash all went in kaffir picks; cash earned at "Fillis" (Kimberley Diamond Fields) and "Camp" (Johannesburg Mining Camp) turned to picks to discharge their lobola. Fly was the reason for this.

The kaffir picks had a recognized standard value of 5s. each, and, at this value, traders accepted them for goods supplied. Then, when a native had earned the money to discharge his lobola obligations, instead of collecting single picks among his own people, he went to the trader and bought his requirements (often up to fifty picks) with cash that otherwise would not have left its hoarding-place.

As regards the country north of the Zoutpansberg, I can give a little information. In the autumn of 1890 I went with oxen from the Zoutpan, beyond Mara, to where Messina is to-day, and as far as the N'Gilele (Sterkstroom). There the natives had nice long water-furrows, and I heard nothing of fly. Nearer the Limpopo then, and years later, the Strydoms chased and killed wild ostriches and giraffe.

About 1892 the Reverend Mr. Beuster, of Sibasa Mission, went by a road which he made himself through Tengwe's to Victoria and Zimbabwye, crossing the Limpopo at Malala Drift. As far as I know he went with oxen.

All through the late 'eighties and early 'nineties, natives went about in the same direction bartering cattle in Manyai country north of the Limpopo, and came back with them the same way. That does not look like much fly being thereabouts. There may have been fly lower down the Limpopo, but there, again, there was a heavy native traffic passing through Makuleke from Manicaland, to and from the diamond and gold fields.

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#### EXPLANATIONS.

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The bearings (latitude and longitude) cited are readings from the smaller maps issued by the Surveyor-General's Office, and are more approximate than exact.

The elevations are from the more recent degree sheets or from the Geological Memoirs of the Mines Department. Many are aneroid.

The names of rivers are, generally speaking, those to be found on the official maps. The term Nylstroom is applied to the whole course of the Maghaliqain or Magalakeen, or Magalakwin, as I have not been able to decide which of the three to adopt for the lower reaches of river. Of the hundred and one "Zandrivers" adorning the maps, only that which flows north from Pietersburg through the Zoutpansberge comes under special reference. The Crocodile River of the Barberton District I have ventured to call the Eastern Crocodile owing to the confusion that arises between it and the upper reaches of the Limpopo that bear the same name in the Rustenburg District.

Farm names are given as they appear on the district maps. The orthography, however shocking, stands good, as these are registered names.

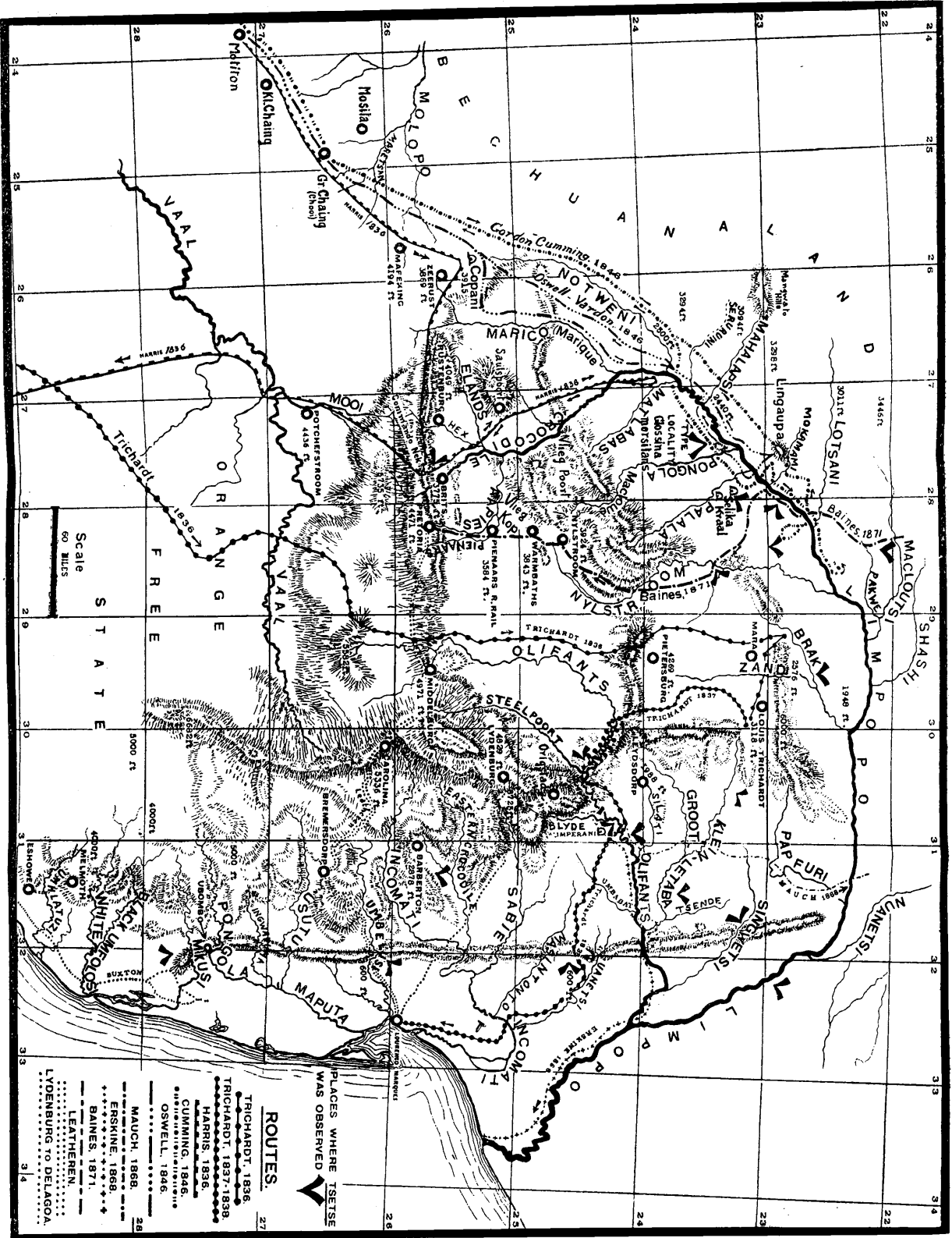
In the narrative, the name of Louis Trigardt is so spelled because it represents the signature of the first pioneer. It embalms his personality, and should be retained even for the northern township. The common, and so often expressive, Afrikander terms employed have been modernized as far as practicable.

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The Trausraai and its Surroundings. Showing the approximate Routes of Pioneers and Hunters who recorded their encounters with Tsetse



## ADDENDUM.

## THE SABIE GAME RESERVE.

Among much literature that must have escaped my notice and bearing more or less upon the disappearance of tsetse from the Transvaal is one of importance published by Major J. Stevenson Hamilton in the *Transvaal Agricultural Journal*, Vol. V., 1906-7, pp. 603-617. The title of this paper is "Notes on the Sabie Game Reserve." The story "of the reincarnation of the old Sabie Reserve, originally established in 1898," is delightfully told. The date of the reincarnation is given as July, 1902. In the following year came the extension of the reserve up to the Olifants River, and "about the same time another reserve was declared between the Letaba and Limpopo Rivers, an area . . . seldom in the past visited by any except hunters and a few prospectors. . . . It had been very considerably, in some places entirely, denuded of game by white hunters as well as by the native population living in or close to it. . . ."

The area embraced was that which has already been described as the eastern low country, "rising from an elevation of 400 feet, just underneath the Lebombo Hills, to from 900 to 1,000 feet on the western borders."

Major Hamilton tells the faunal history of this country in the following words:—

"The native population is few and scattered; in recent years, partly owing to the gradual desiccation of the country and partly owing to the hunting being stopped, many have removed their habitations to the more productive portions of the low veld. . . . Previous to the inauguration of the reserves, these people contented themselves with planting mere patches of grain and were, in fact, to a great extent independent of what they themselves were able to grow, as they lived on and by the game, trading the meat which they did not require, together with skins, in exchange for various foodstuffs. . . . Before 1899, the country under discussion was a little known wilderness which white men never entered except during the four healthy months, when hunters came down to lay in their summer store of biltong and supply of skins and horns. . . . During the rest of the year the land was given over to nature and the kaffir. Swarms of natives from Portuguese territory would then come in and, secure from interference, hunt to their heart's content. . . . The game was being rapidly killed out. . . . This had been going on in an increasing degree for a matter of twenty-five years, or since the cessation of the Swazi raids.

"At first the game was found to be in a far from satisfactory condition; it was scarce, timid, and constantly on the move; a state of things not conducive to an adequate increase of the species. Some kinds of animals were on the verge of disappearance, and it was possible to cover very large tracts of country . . . without seeing a sign of life, not even a solitary spoor. The bush in such places seemed 'dead.' Moreover, the carnivorous animals had not suffered relatively to the game. . . . Consequently, the little disturbed beasts of prey were found congregated in considerable numbers wherever the game had collected in remote corners in order to be immune from the hunters' rifles—and, no doubt, a larger percentage of game was being killed by them than would have been the case under ordinary conditions. . . ."



"At first there was a good deal of native poaching to contend with, which was gradually suppressed so far as the Transvaal natives were concerned; but the Portuguese border has still to be carefully watched, as most of the natives there have guns. . . .

"The natives actually resident in the reserve do little, if any, damage now. Game is found grazing with confidence close up to the kraals; the people, in fact, are getting accustomed to the habit of not hunting. The effects of the early steps taken were not long in becoming apparent. The game in a short time became more settled in its habits, finding it could graze undisturbed. Animals accustomed to seek the shelter of the densest cover from dawn to darkness began to come freely into the open. Water-loving animals, instead of retiring far up the dry ridges during the day, as had been their wont under persecution, were soon found resting under the trees by the river-bank. The game began to return to its natural habitat.

"At the present time, the really marvellous tameness and confidence in man shown by the majority of the animals, both great and small, is remarked by every observant visitor. . . .

"All species of game within the reserves have increased and done well in the last four years. Of course, several decades of ruthless destruction cannot have their effects nullified in so short a time, and many rarer kinds of animals are still extremely scarce. . . . Elephants have very tentatively begun to make their appearance in some of their old haunts, but are evidently as yet by no means sure of their welcome."

This drawing-to-life, presented by so keen an observer as its author, cannot fail to impress one. It shows very clearly how the man armed with a gun, be he white or black, may profoundly alter the habit of the wild fauna. In short, by a change of habit on the part of the animal, the tsetse may be deprived of its food supply. The parasite remains diurnal. The host becomes nocturnal in its visits to or passage through the haunts of the fly, and the parasite is starved.

Speaking more recent of destruction of game by natives, Major Hamilton remarks, *inter alia*: ". . . I am far from saying the native would not do his best had he the means and opportunity; but, deprived to a great extent of arms as he is and unable to organize the big drives of game, by means of which, previous to the advent of the white man, most of the slaughter was done, he can never exterminate nor greatly reduce the game. The only places where game could and would be exterminated by natives are the present game reserves bordering on Portuguese territory, in which latter nearly every native has a gun and are fast exterminating all the game on that side of the border."