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# **Nagana in Zululand.**

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(Photographs illustrating the various aspects of the nagana problem are to be seen at the end of the paper—Figs. 1-36.)

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## I.—INTRODUCTION.

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### 1. PRELIMINARY INQUIRIES.

As a result of the heavy mortality in stock from nagana, following the opening up of the Ntambanana Settlement in 1919, the Union Government decided to establish a veterinary laboratory in the Lower Umfolosi Division for the investigation of the disease. It was considered advisable to commence the investigations as early as possible, and a temporary camp was accordingly erected on farm No. 273, of the Ntambanana Settlement, where the losses had been so serious. In addition to this the Government also agreed to provide and maintain an entomological laboratory in the White Umfolosi Valley, on the lines suggested by the Imperial Bureau of Entomology, London. The latter is part of a scheme whereby investigations into *Glossina* are being carried out in six different localities in Africa, and for their maintenance a common fund has been arranged, and to this the South African Government is also contributing. The veterinary staff arrived on 26th April, 1921, but unfortunately the investigations were greatly delayed at first owing to lack of accommodation. While buildings were being erected, however, inquiries were made with regard to all that pertained to trypanosomiasis and knowledge gained as to local conditions. Information was also sought from further afield, and the following will convey some idea as to the manner in which inquiries were pursued:—

- (A) The study of files belonging to the various Government Departments.
- (B) The circularizing of those who might be *au fait* with the local conditions and their relation to nagana.
- (C) A personal tour throughout the affected areas, and interviews with all those interested in the disease.

(A) The perusal of files unfortunately did not yield the anticipated results. In the first place they were, as a rule, incomplete, and in no instance was information prior to Union obtainable. No one seemed to know where the old records were, and it was impossible even to get a complete set of the reports of the old Natal Government Veterinary Department. The most useful files were those of the Division of Veterinary Education and Research, Pretoria, the Department of Native Affairs, Pretoria, and the Provincial Administration, Maritzburg. The last mentioned also kindly put aside, for study, a complete set of official gazettes dealing with game

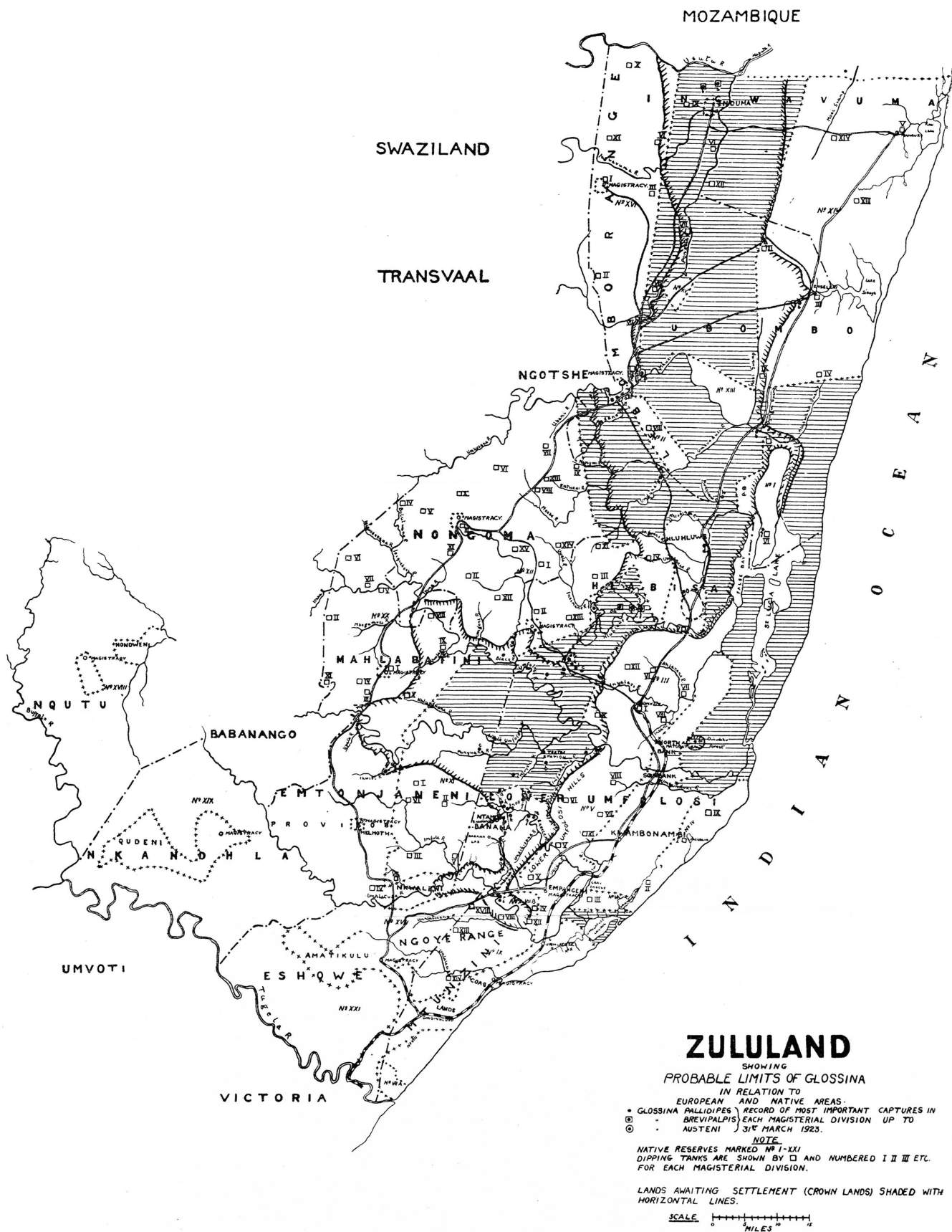
legislation since 1890. The library of the Natal Society, Maritzburg, allowed the use of their many volumes,\* but apart from occasional reference to nagana in the *Natal Agricultural Journal* by veterinary surgeons, little else was noted. It is to be regretted that Bruce's three reports were not available, and it is doubtful whether as many as half a dozen complete sets exist in South Africa.

(B) The sending out of circulars in the past had been of very little value. Montgomery, when Director of Veterinary Research in 1919, distributed 200 circular minutes to residents of Zululand seeking information regarding the distribution of *Glossina*. Of this number half a dozen replies were returned, and in only one instance was any information of value received. With this experience it was realized that to repeat the issue on a large scale would be useless, so it was decided to dispatch the identical minute, edited in 1919, to the magistrates and Sir Charles Saunders, formerly Chief Magistrate and Civil Commissioner. The results were in this case quite satisfactory, and much valuable information was obtained. Acting on the advice of the Magistrate, Lower Umfolosi Division, circulars were also dispatched to the secretaries of the five district farmers' associations and to seven local residents, who, it was hoped, would be in a position to furnish the desired information. Only one reply was received. In addition to the circular-minute, a questionnaire was drawn up in connexion with nagana outbreaks, and in returning the result of positive slides, this list of questions was sent to the sender of the smear with a request that he would complete the form and return it to the Nagana Research Laboratory. This scheme also was not a success, and although many replies were received, the information conveyed was of little value.

(C) Undoubtedly the most valuable method of gaining an insight into all aspects of trypanosomiasis was the personal investigation of local conditions, and then to a less degree a discussion on the spot with those who had been in the country a number of years. With few exceptions all were of the opinion that big game was mainly responsible in that they "carried" the fly, and hardly an outbreak occurred but that some species had been seen in the vicinity, either a few days or a few months previously! Some blamed the rhinoceros, others the kudu or zebra, but most individuals had one species in mind as being particularly harmful. A great deal of confusion hinged around the problem as to whether nagana and muncu† were one and the same disease. All were unanimous regarding the transmission of nagana, in that it was due solely to the tsetse fly, but very few could define the areas occupied by this pest, or much less give an idea as to whether the winter and summer distributions differed in any way. The native opinion, and many Zulus were interrogated during the various journeys made, might be stated more or less as follows:—"During Panda's reign (1840-72) there were many cattle in the land, and they increased satisfactorily until the Zulu War (1879). Game was abundant in those days, but as it was believed that they caused nagana by contaminating the pasture with their saliva, they were hunted whenever possible. At the time of the outbreak of hostilities (Zulu War) game had been so reduced in

\* Thanks to the kindness of Professor Bews, D.Sc., Natal University College, Maritzburg.

† Parasitic gastro-enteritis due chiefly to *Haemonchus contortus*.



MAP 1.—Zululand, showing (1) probable limits of *Glossina* (within feathered line); (2) sites of capture of *Glossina* spp.; (3) magisterial divisions; (4) native reserves; (5) European settlements; (6) situation of dipping-tanks; (7) Crown lands awaiting settlement; (8) rivers, lakes, etc.; (9) main roads and railway.

numbers that they were no longer a danger. After the Zulu War game was protected, with the result that nagana increased in severity until the time of the rinderpest. After this disease game multiplied so quickly that nagana was again prevalent when cattle became as they were before rinderpest. Every year game thrives, and cattle suffer." In the Ubombo District natives were emphatic that the wholesale destruction of game in 1917 was beneficial, and it must be added, several have recently introduced cattle into such areas as the right bank of the Pongolo River and foot of Ubombo Magistracy. It is also often told how, before a kraal was built, in the "good old days," game was driven off in the vicinity of the kraal site, so that they would not "bring" nagana to the cattle that were to be grazed there. In hearing this evidence it must be borne in mind that the old natives naturally still hanker after the old state of affairs. Zulus are the most conservative people in the world, and very much resent the protection of game which they consider their rightful inheritance. They are born hunters, and would destroy game whether they considered it a danger to their cattle or not. As Panda's reign was the most peaceful of all the Zulu kings, it can be easily understood why cattle flourished during his rule. Previous to, and indeed shortly after, his reign, the history of Zululand is one long tale of murder and violence. There were everlasting dynastic feuds and inter-tribal wars, and in these circumstances it can be imagined how few cattle there were left to contract nagana. It is difficult to convince the native that one of the causes of an increased prevalence of the disease is that since the dipping for East Coast fever, cattle have multiplied in thousands, so much so that with continued development of the country by European settlers, they are tempted to take risks such as the grazing of their herds in suspicious localities.

The journeys made with the object of gaining information regarding local conditions were as follows:—

- (a) To the Kwambonambi Settlement, 11th to 13th May, 1921.
- (b) To the fly area in south-eastern and north-eastern portions of the Mahlabatini and Emtongjaneni Divisions, in the vicinity of the White Umfolosi River, 24th to 30th May, 1921.
- (c) To the Ubombo, Ingwavuma, and Hlabisa Divisions, including a visit to Katwana, Portuguese East Africa, 9th July to 20th August, 1921. During this trip "muncu" or "swamp disease" was investigated.
- (d) Through Emtongjaneni Division, 10th to 12th March, 1922.
- (e) To the south bank of the White Umfolosi River, through Native Reserve V, and a visit to the north-eastern portion of the Kwambonambi Settlement, 22nd to 23rd November, 1922.
- (f) Frequent trips to the White Umfolosi River in 1921 and 1922.

In the course of the above journeys, visits were paid to as many officials and residents as opportunity offered and interesting facts were in this way collected.

## 2. NAGANA.

*Synonyms:* Trypanosomiasis.

“Fly disease,” or more often “fly.”  
Tsetsefliesiekte.

*Definition and Use of Term “Nagana.”*

The above is a term used by the Zulus to indicate what is to them a disease of domesticated animals characterized by lack of energy and loss of condition. On investigation this has proved to include the maladies set up by the following trypanosomes:—*T. brucei*, *T. congolense*, and *T. vivax*. Nagana, therefore, is a collective term comprising three forms of trypanosomiasis.

It is the custom among the natives, as a mark of respect, to avoid the use of a name given to an individual of some rank, especially to a person who has died. In this connexion it is stated by Mr. Fynney, Magistrate of Nongoma, that in the Hlabisa Division the word “muncu” came to be used as a synonym, owing to a former chief having been named Nagana. Now “muncu” is a term used by the coastal natives to denote a condition of unthriftiness often observed in ruminants, and on examination this has proved to be due to parasitic infection of the abomasum and small intestines. It can, therefore, be understood how the word “muncu” was adopted in place of “nagana.” Hlabisa is a district consisting of bushveld and coastal sandveld, and both words would be used there. As the term “nagana” was forbidden, it was naturally replaced by “muncu.” Unfortunately, chiefly owing to a misapprehension amongst Europeans, there is a tendency to confuse the words and to use “muncu” as a synonym. As a result of the recent outbreaks of nagana, and the opinion prevailing in many quarters that a report of the disease on a farm would result in a fall in value of the holding, many owners abstain from taking blood smears, and purposely describe the disease their cattle may be suffering from as “muncu,” knowing full well that it is nagana. The same thing is noticeable in the eastern Cape Province, where owners, knowing that anthrax has broken out among their cattle, prefer to describe the disease as “imipunga,”\* and are quite satisfied when anthrax vaccine is issued to them. Muncu will be dealt with in more detail in Section IV. Occasionally it must be remembered nagana and muncu may co-exist, e.g. in the coastal areas which adjoin bushveld, where tsetse may be present. To prevent confusion, it is suggested that the term muncu be dropped unless it is applied to parasitic gastro-enteritis, which disease is rarely met with away from the coastal sandveld.

It was Bruce (1895) who showed that the terms “nagana,” used in Zululand, and “fly disease,” used by Livingstone and others, were identical; and it was because he discovered the trypanosome which bears his name as *the cause* of nagana, that the word nagana was assumed to indicate the affection produced only by *T. brucei*.† Many authors, in fact most workers, now use “nagana” as a

\* Xosa word meaning “lungs.”

† See *South African Journal of Science*, Vol XXI, page 432, 1924.



synonym for the trypanosomiasis due to *T. brucei*, but actually this is incorrect. The term "inyoko," mentioned by Bruce is apparently obsolete, not having been heard once.

*Derivation of word "Nagana."*

No satisfactory explanation has been given regarding the derivation of the word "nagana," but in all probability it is related to the Zulu verb "ku naga," which means "to care," or "to be anxious concerning anything or anybody." Some "nagana" animals appear to walk in a most deliberate manner, as if considering how next they should proceed. The actual cause of this apparent caution is nothing else but sheer weakness. The noun used by natives is "unagana," but Europeans more usually pronounce it as "nagaan." By some the word is spelt "nakane," but the native sound more closely resembles "g" than "k."

## II.—DISTRIBUTION OF NAGANA.

As most of Zululand north of the Umhlatuzi River is occupied by natives, it can be understood that were it not for the examination of blood-slides (collected by the officials in charge of dipping operations), less would be known regarding the occurrence and actual focus of the disease than is the case at present. After the epizootic of East Coast fever, which became disseminated throughout the country after the Zulu Rebellion of 1906, the Government took steps for the erection of dipping tanks, but it was not until 1913 that any real progress was made with dipping. Officials, termed dipping supervisors, have been placed in charge of a number of tanks, and the area from which cattle are dipped at a given centre is known as a tank area. Each dipping supervisor has a number of native assistants, who are responsible for the filling and cleaning of tanks. The Department of Native Affairs is responsible for the working of the system. Should an outbreak of disease occur, the Government veterinary officer of the district directs operations. Spleen smears taken from all beasts that die (for East Coast fever is the disease against which dipping measures are chiefly intended) are sent to the Veterinary Research Laboratory, Maritzburg, or to the Government Veterinary Officer, Eshowe, for examination. There is no compulsion on private individuals regarding the taking of blood-smears, and knowledge regarding outbreaks of nagana depends entirely upon the interest taken by the dipping supervisor in the stock under his control. At times registration of outbreaks is apt to be misleading, for cattle are not dipped strictly according to magisterial divisions, but at the nearest tank, which may be in an adjoining division; then again there are local arrangements regarding the control of certain areas; and finally, all stock shown as native-owned does not mean that they are grazed on so-called native reserves. In many districts land shown as Crown land is occupied by natives entirely, and the policy is to compel all owners within six miles' radius of a tank to dip weekly. There are areas where this is difficult to enforce, as dipping facilities are non-existent. All these details, however, do not in the main alter the general rule that outbreaks, confirmed by microscopic examination, refer to the area served by a tank, according to particulars furnished by the supervisor when dispatching smears. In European communities, e.g. Ntambanana

Settlement, where it is usual for each owner to possess his own tank, information regarding the incidence of nagana has been obtained as follows:—

- (a) By blood-smear examination of sick animals;
- (b) by applications for tartar emetic;
- (c) by reporting of deaths to the Government veterinary officer in charge of the district.

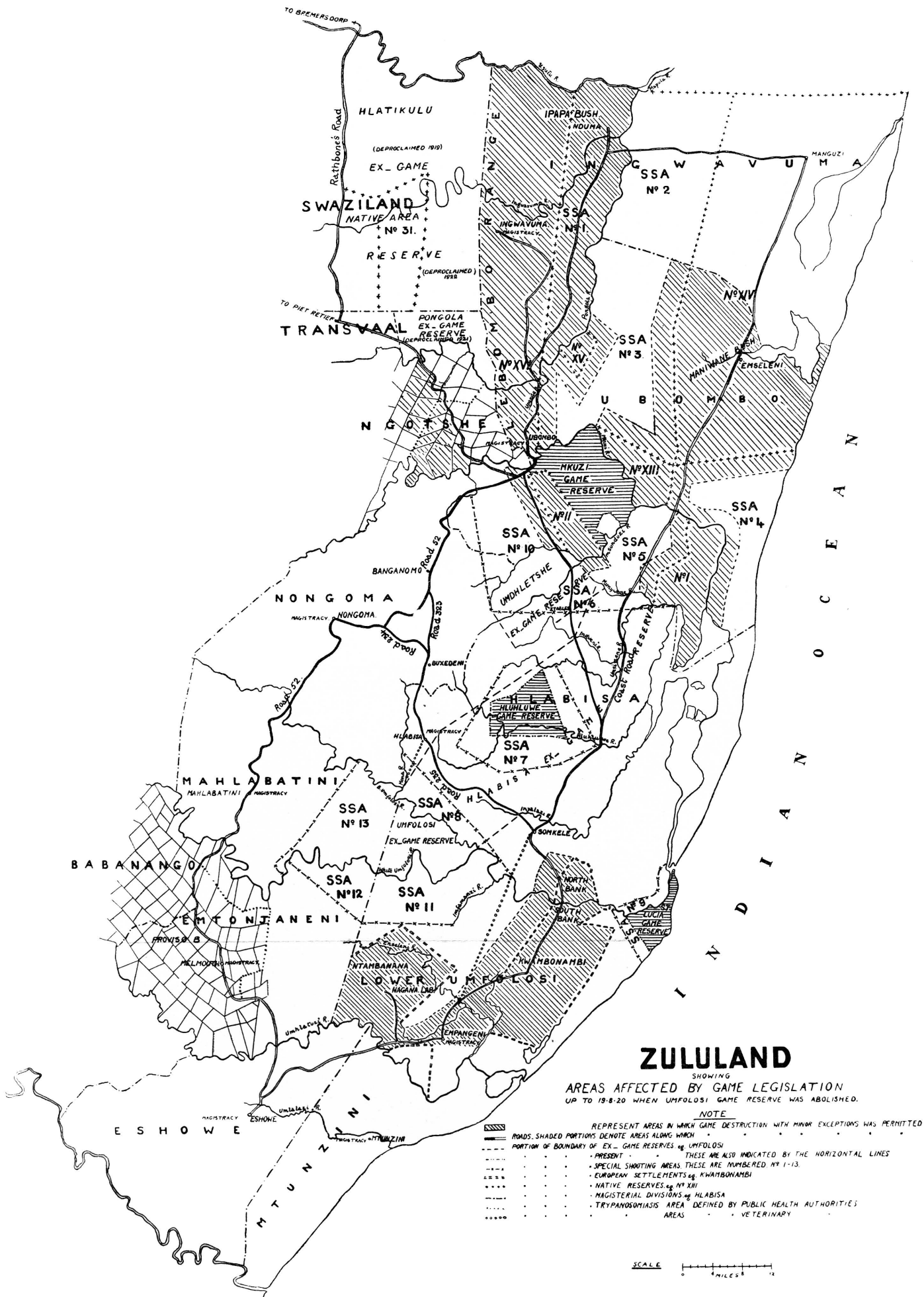
Regarding (a), unfortunately there has been a tendency to take smears only until a positive result has been obtained, when the owner, realizing that the disease has broken out on his farm, does not trouble further. In connexion with (b), there are owners who will not take smears under any circumstances, for it is believed that if there is a record of nagana on a farm, it will, as a consequence, become reduced in value. The issue of tartar emetic is encouraged by the laboratory, not only by free issue of the powder, but also by preparation of material, so that there will be no need to procure material from elsewhere. Unless this were done, records of probable, one might say definite, nagana outbreaks would be incomplete. Regarding (c), under the Stock Diseases Act it is compulsory that all deaths of cattle in East Coast fever areas be reported, but in this district very few owners do this. Only outbreaks of nagana which have been considered to have actually originated in the area referred to have been recognized in this section, for through movement of stock an animal may develop symptoms hundreds of miles from the seat of infection. This was frequently seen in the days before motor transport was so popular, and officials and others who had travelled through dangerous areas in Zululand might lose their horses, or even cattle, in towns as far away as Vryheid, Durban, or Maritzburg. Useful information concerning smear diagnosis is shown in the subjoined table.

TABLE I.

*Table showing the number of cases of Nagana diagnosed by Microscopic Examination the past Ten Years in those Magisterial Divisions in which the disease occurs naturally.*

*Remarks.*—Positive cases have been recorded from Dundee, Vryheid, Ngotshe, etc., but as the disease is not considered to have originated in these districts, it is felt that it is unnecessary to include them hereunder.

Division.	Aug.- Dec., 1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.
Ingwavuma....	—	1	4	1	1	2	4	22	3	—	4
Ubombo.....	—	8	12	12	—	23	4	13	9	6	26
Hlabisa.....	3	10	14	20	3	13	2	53	54	13	29
Nongoma.....	1	13	5	21	4	6	—	2	3	—	—
Mahlabatini...	—	1	—	4	5	14	6	2	27	16	35
Emtonjaneni...	—	3	1	5	—	9	4	14	6	4	14
Lower Umfolosi	—	2	1	26	22	10	1	—	11 <sup>8</sup>	82	131
Mtunzini.....	—	—	—	—	—	1	—	—	1	6	—
Babanango.....	—	—	—	—	—	2	—	—	—	—	3
TOTALS...	4	38	37	89	35	80	21	106	221	127	242 = 1,000



MAP 2.—Zululand, showing areas affected by game legislation, including (1) former game reserves; (2) present game reserves; (3) special shooting areas; (4) areas where game destruction with minor exceptions was authorized; (5) main roads and portions of some along which game destruction with minor exceptions was permitted; (6) portions of boundaries of (a) *Trypanosomiasis* area defined by Public Health Authorities and (b) *Trypanosomiasis* areas defined by Veterinary Authorities; (7) magisterial divisions.

It will be seen that the average number of cases diagnosed by the Veterinary Research Department is 100 per annum. This represents about one seventh of smears actually taken from suspected cases of nagana. There are in addition hundreds of animals from which blood-slides are not obtained. If the number of deaths is put down at the conservative estimate of 1,000 a year (i.e. in a cattle population north of the Umhlatuzi River of approximately 140,000), and each beast valued at £10, it is evident that the disease is responsible for severe losses, both directly and indirectly. The annual direct financial loss is at least £10,000, the more probable estimate being £100,000. Indirect loss, through vast areas being rendered difficult for settlement, is incalculable.

#### *Ingwavuma Division.*

Cases occurred from 1917 to 1920 at Nduma Farm, situated on the Ingwavuma River west of its confluence with the Pongolo River; and in 1919 there were as many as twenty-two positive smears. In Tank Area No. VI (Shemula's) there were two outbreaks in 1922. According to a return received from Dipping Supervisor Mayoss, there had been in one outbreak one death and one of nineteen in-contacts was also ill. The natives did not seem to know the tsetse (which is *G. brevipalpis* in that region), and the chief game are kudu, waterbuck, impala, and inyala. Remarks concerning fly and game apply equally to the area about Nduma Farm. In Tank Area No. VIII (Nondabula's) many cases were diagnosed in the period 1913 to 1915. As is usually the case, as soon as the first cattle were noticed to be ill, infection was put down "to the wildebeest that had made their way on to the Pongolo River on account of the dryness of the country. . . ." There were eight deaths of donkeys at Manguzi in 1911, and *T. pecorum* was stated to have been the type of organism responsible. The donkeys belonged to the Nduma Farm, but it is suggested that the disease was contracted at Manguzi. In 1919 positive slides were obtained from two cows at Manguzi, and it was reported that these animals became infected after grazing with oxen that had been on transport work between this store and the Mkuzi River at the lower drift. Glossina are known to occur at the Mkuzi River, and the oxen probably became infected there, but no tsetse is known at Manguzi.

According to the Department of Native Affairs, nagana existed in Tank Area No. IX (Umsunduzi) in 1919. Apart from the Nduma cattle, which dip at the farm tank, there is no veterinary confirmation of this outbreak. There is, however, no reason why the disease should not exist in the tank area in question, for conditions there are most favourable for *G. brevipalpis*. It is noteworthy that no outbreaks have been recorded from other areas adjacent to the Pongolo River. The Tank Areas No. XII (Mengu Pan), No. III (Mlambomgwenya), and No. VII (Mzinyeni Pan) all border on the densely wooded banks of this river, but owing to the inaccessibility of the area it is seldom visited by a veterinary surgeon.

*Distribution of Domesticated Animals.*—A consideration of this aspect in relation to nagana is worth noting. Not only around the margins of fly areas, but actually within them, cattle are frequently to be found. Goats and sheep occur chiefly on the high veld, but may be seen in large numbers in the bush of the low veld, where cattle are unable to live. About half of the bovines of the division are

grazed on the Lebombo Range and its eastern slopes, where there is little likelihood of infection; 25 per cent. belong to the sandveld-belt along the coast, while the remainder are scattered along the left bank of the Pongolo, between the Lebombo foothills and the bushveld. About 100 head are to be found in Tank Area No. XII (Mengu Pan), on the right bank of the Pongolo River. Between this river and the open country, commencing about six miles west of the Mosi Swamp, there is a huge tract of bushveld, about 300 square miles in extent, where very few natives live and no cattle are to be found except in the vicinity of the Tete Pan.

*Ubombo Division.*

Nagana occurs in all the tank areas with the exception of No. IV (Mbaswana) and No. IX (Nkumbikazana). The position at No. III (Enseleni) is rather difficult to understand, for while outbreaks have occurred there as recently as September, 1922, it is believed locally that fly is non-existent and that infection originates with animals that have been in the vicinity of the Lower Mkuzi Drift on transport. Area No. I (Ubombo Magistracy) in the neighbourhood of the tank is actually healthy, but cattle which graze in the bush along the foothills are often affected with the disease. In Ubombo the bushveld approaches much more closely to the mountain range than is the case in Ingwavuma, with the result that infection is more easily contracted. In winter also the water supply on Ubombo usually gives out, which necessitates the driving of some herds to danger areas such as the Mkuzi Valley. The conditions just described apply also to Tank No. VIII (Madhlaka's), only that the risk is greater owing to the lower elevation of the latter. In some years, especially 1915, there was a serious mortality in Native Reserve No. II, which is partly served by Tank No. VIII, but outbreaks occur annually in that area. In Native Reserve No. XV cattle are to be found along the Pongolo River, but there are deaths each year, as *Glossina* occur in the locality. Cattle also are kept between this reserve and the Tete Pan, but owing to the distance from No. VII (Pongolo) Tank, little is known about them. There are no cattle in Native Reserve No. XIII, on the north bank of the Mkuzi River. Some individuals who attribute the so-called spread of nagana solely to protection of game since the time of the annexation in 1887, state that this area carried cattle before that date, and that their removal was due to disease. Confirmation of this statement was sought from Mr. Braatvedt, the Special Justice of the Peace of Ubombo Division. Mr. Braatvedt has kindly furnished the following information:—“With reference to cattle having been placed by Zibepu \* in Reserve No. XIII, I cannot get any evidence to that effect. I think history has been mixed up. The facts I have ascertained are these: The Manukuza tribe, which now occupies Native Reserve No. XIII, on the left bank of the Mkuzi, was conquered by Zibepu when he took over Hamu's section after the Zulu War. To show that the tribe was under him he placed his cattle there and told the tribe to herd them. At that time the tribe occupied a great portion of the right bank

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\* Zibepu or Usibebu was a powerful chief who had his headquarters in the north-east of Nongoma Division. He was friendly towards the British after the Zulu war, but was continually at loggerheads with the Royal Zulu House, which was supported by the Usutu tribe.

of the Mkuzi River, as far as the Ubombo Ridge, towards the Umsunduzi River. The tribal lands extended almost to the top of the Ubombo Range. In this area is a hill called the Mpila Hill. It runs well into the game reserve. There are a few cattle on this hill even to-day. All Zibepu's cattle were kept in this locality, i.e. on the northern foothills of the Ubombo, and particularly on the Mpila Hill. When Zibepu was defeated at Tshaneni (1884) the Manukuza tribe reverted to their first love, the Usutu party, and naturally all Zibepu's cattle were removed. The removal of Zibepu's cattle had nothing whatever to do with nagana or any other cattle disease." There are no cattle in the Mkuzi Game Reserve, which is immediately opposite the native reserve mentioned above, nor in the bushveld between the foothills of the Lebombo and west of the Enseleni and Manaba Tank Areas.

*Distribution of Domesticated Animals.*—Approximately 50 per cent. of the cattle are kept along the sandveld in the neighbourhood of the Manaba, Enseleni, Mbaswana, and Nkumbikazana tanks. At Manaba and Nkumbikazana, owing to the thick bush near the tanks, cattle are grazed away from them in the open veld, where palms (*Hyphaene crinita*) are dominant. Roughly, 25 per cent. of the bovines are grazed on the Lebombo Range, and the remaining 25 per cent. are scattered throughout the bushveld, many herds being in fly areas. Along the south bank of the Pongolo River there are over 200 head between Otobotini Drift and the Tete Pan; and west of the Enseleni Tank Area, in the bush country known as Kutshongwe, are 300 to 400 head, which, owing to lack of facilities, are not dipped at all. As a result, little is known regarding the incidence of nagana among these cattle. On the Crown lands east of the Umsunduzi River are 200 to 300 head, and even on the foothills of Ubombo Mountain a few head are to be met with in the neighbourhood of the Makatini and the Qokolwane. Except for these herds, the whole of the bush country between the Lebombo and the Mosi Swamp, an area of roughly 400 square miles, may be said to be devoid of cattle. Goats and sheep, however, occur in fairly large numbers, there being probably 5,000 to 10,000 goats and 1,000 to 2,000 sheep in the area without cattle. In Native Reserve No. XIII, according to Braatvedt,\* there were licences taken out for 60 dogs during 1922, but there are probably twice that number of canines. The open country east of the Mosi Swamp, especially towards the coast, is unhealthy for the smaller ruminants owing to the ravages of internal parasites.

In Native Reserve No. I, which contains bushveld in the western portion in the vicinity of the Muniwane River, nagana, ten years ago, seemed to be a greater menace than it is at the present day. According to Toppin, 202 cattle died in this area in the winter of 1913, and 48 in the winter of 1914. Toppin, who was at Ngxwala, just south of the Mkuzi Game Reserve, estimated that the losses at the estate for the period 1910-15 amounted to 17 bovines, 9 horses, 78 donkeys, 6 mules and 38 dogs. Tank Areas No. V (Lower Mkuzi), No. X (Upper Mkuzi), and No. VII (Pongolo) are all centres where annual outbreaks occur, while cases at No. VI (Nibebe) and No. II (Manaba) are occasional.

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\* In a conversation.

*Hlabisa Division.*

Of the dozen tanks in use, annual outbreaks are to be expected from nine centres, while only at one, namely, No. VIII (Insane), is nagana unknown. At No. I (Somkele) and No. VII (Inyalazi), which are both in country which is mainly open, and consists of sandveld, the disease is comparatively rare, an outbreak occurring in the former in 1920, and at the latter in 1921. No. IX (Umfolosi) Tank is no longer in use. Of the remaining nine tanks, eight are built in valleys which lead either directly or indirectly into the low veld between the Hlabisa Hills and False Bay. As these are lined with bush, it is easy to picture how infection is carried westwards. The high hills themselves between these valleys are fairly steep and do not afford much protection, in the shape of cover, to fly-life. The following tank areas are also liable to annual outbreaks:—No. II (Gwegweda), No. III (Nhlwati), No. IV (Umsinene), No. V (Hluhluwe), No. VI (Hlazane), No. X (Hoho), No. XI (Dabedabe), XII (Gunjaneni), and No. XIII (Mpembeni). Tank Area No. X (Hoho) is situated on the north bank of the junction of the Black and White Umfolosi Rivers, and is, therefore, close to the Umfolosi fly-belt. As will be seen from Map I, all the Crown land west of False Bay is nagana country, and infection travels west up the river valleys which lie for the most part in the eastern portion of Native Reserve No. XII. The Hluhluwe Game Reserve is uninhabitable for cattle, while the western half of Native Reserve No. III and the strip of Crown land stretching from the Hluhluwe Game Reserve to the Umfolosi basin are dangerous. The country east of the low range of hills, of which the highest point is Ntondweni, is comparatively open and towards the coast is sandy. Nagana, however, is common in the neighbourhood of the Ntondweni Store, while towards the coast it is not known.

*Distribution of Native Stock.*—No high veld is seen in Hlabisa such as is met with in the western portions of the Nongoma and Mahlabatini Divisions. The higher ground is what may be termed middle veld, for actually the Hlabisa Hills are the easterly continuation of the Nongoma System, and are, therefore, lower. Quite 66 per cent. of cattle are grazed in this middle veld, which is excellent stock country if something could be done to clear the valleys of bush. In many cases timber on the adjacent slopes seems to extend from this central line of valley scrub. In the lower lying country, especially the open sandveld about Somkele, is to be found approximately one-third of the cattle population of Hlabisa.

In some years the losses from nagana have been exceptionally heavy; for example, in 1920 over 150 deaths were reported from the Gwegweda and Dabedabe Tank Areas alone. Transport-riders are big losers as a rule, and one storekeeper in 1920 estimated his losses at 42 donkeys. Generally, however, the prevalence of nagana in this district has been somewhat erratic, there being usually a heavy death-rate, although in some years an outbreak of unusual severity is experienced.

The European areas are—

- (a) north bank Umfolosi River farms;
- (b) the new Hluhluwe Settlement.