

Nagana, big-game drives and the Zululand game reserves (1890s-1950s)*

A.de V. Minnaar

Institute for Historical Research
Human Sciences Research Council

THE DISEASE NAGANA may be described as a chronic wasting disease of domestic animals which is caused by a minute blood parasite known as a *trypanosome*. The parasite is transmitted from infected game to domestic animals by various species of *Glossina* (tsetse fly). The term *trypanosomiasis* applies to the disease as observed both in domestic animals as well as the notorious sleeping sickness in man. In South Africa nagana was first called the 'Fly Disease' by the white travellers and hunters, and nagana (*uNkane* or *unakane*) by the indigenous black tribesmen. The latter term was later adopted by the white settlers in Zululand. The term 'Fly Disease' was given on the supposition that the disease was caused by the bite of the tsetse fly, while the term nagana came from the symptoms presented by animals suffering from the disease. These symptoms were typically anaemia, a loss of condition, listlessness and swelling of the dewlap. In advanced stages cattle go blind, break out in hoof sores and become lame. In Zulu the word nagana meant to be low or depressed in spirits. The inhabitants of the Black Mfolozi River valley also called it *munca* or *ummunca* from the emaciated appearance of infected cattle in the advanced stages of the disease.¹

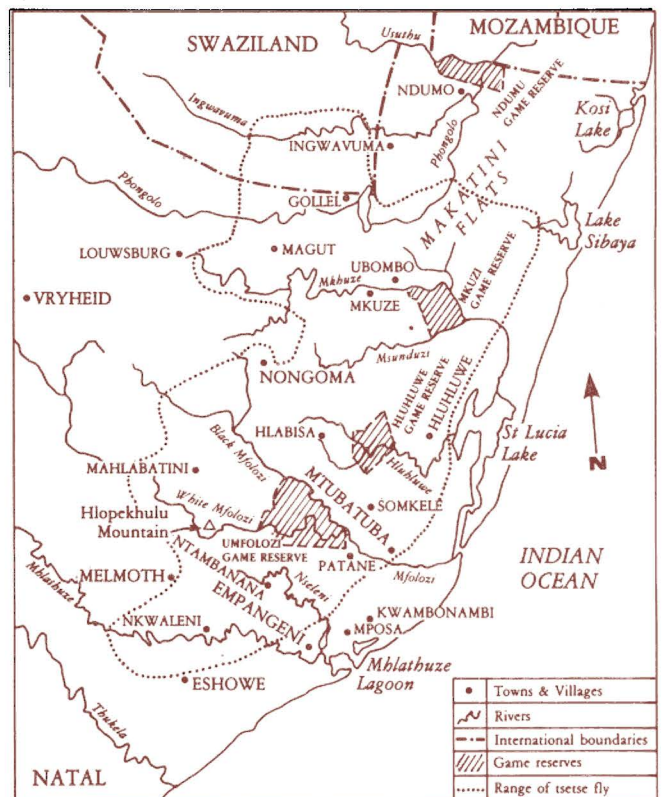
This article traces not only the fight against the tsetse fly and nagana but also the struggle by conservationists to preserve the existence of the Zululand game reserves in the face of demands by farmers for the abolition of these reserves. Central to this struggle were the various campaigns to eradicate the tsetse fly, the efforts of farmers to obtain a livelihood in the face of the nagana threat and the endeavours of the conservationists to ensure the survival of game in their natural habitat. This study highlights the interaction between man and nature which forms such an integral part of man's historical development.

THE TSETSE FLY IN ZULULAND

In Zululand the tsetse fly inhabited the river valleys and low-lying areas stretching for 200 kilometres from the Mhlathuze River in the south to the Phongolo River in the north. In this region only three species of tsetse fly occurred: *brevipalpis*, limited to the forest clad valleys of the Hluhluwe Game Reserve and the riverine thickets of the lower Phongolo River; *pallidipes*, which occurred over a wide area in Zululand including the Umfolozi, Hluhluwe and Mkuzi game reserves; and *austeni*, which was confined to certain localized areas of very dense thicket near the Mkhuze River. Fortunately the species *morsitans*, which was responsible for sleeping sickness in man and prior to the 1897 rinderpest epidemic had predominated in the Transvaal, was not present in Zululand.²

During the reign of the Zulu chief Mpande (1840-1872) the disease was well known to the black inhabitants of Zululand. But game was actively hunted by the Zulu and their numbers were consequently considerably reduced. The result was that the disturbances of the feeding habits of the tsetse fly and its probable reduction in numbers permitted the maintenance of numerous cattle. The annexation of Zululand by the British government in 1887 marked the commencement of a period of game protection during which game increased rapidly and the disease again spread alarmingly. Although the Zulu inhabitants suffered periodic losses from nagana they had learnt to avoid those areas where nagana was endemic. Their cattle had also over the years built up a certain amount of tolerance to the disease. The impor-

THE TSETSE-FLY BELT IN ZULULAND



¹ D. Bruce, *Preliminary report on the tsetse fly disease or nagana in Zululand* (Durban, December 1895), p. 1; E.B. Kluge and R. du Toit, 'Nagana in Zululand', *Farming in South Africa*, July 1944, p. 437; *Zululand Times*, 14.7.1921; information from W.R.B. Somerville, (Ntambanana farmer, 1922-1925), Mtunzini, 20.10.1988.

² R. du Toit, 'The problems presented by the control of tsetse flies in the Union of South Africa', *South African Journal of Science*, 43, July 1947, p. 262, and 'Trypanosomiasis in Zululand and the control of tsetse flies by chemical means', *Onderstepoort Journal of Veterinary Research*, 26(3), June 1954, p. 321. For accounts of the presence of the tsetse fly in the Transvaal and the effect of rinderpest on it see C. Fuller, *Tsetse in the Transvaal and surrounding territories: an historical review* (Department of Agriculture, Entomology memoirs 1, Pretoria, 1923), pp. 8-11 and 16; C. Fuller and L. Fouche (eds), *Louis Trigardi's trek across the Drakensberg* (Van Riebeeck Society series 13, Cape Town, 1932), pp. 58-59; R.G. Cumming, *A hunter's life in South Africa*, II (African hunting reprint series, Bulawayo, 1980), pp. 224-225; J.J. McKelvey, *Man against tsetse: struggle for Africa* (Ithaca, 1973), pp. 15-18; I. Schapera (ed.), *Livingstone's private journals, 1851-1853* (London, 1960), pp. 63-66.

*A shortened version of this article was presented to a Natal History Workshop at the University of Natal, Pietermaritzburg, on 28 October 1988.

ted cattle of the white settlers were not so resistant and nagana outbreaks were particularly virulent amongst their herds of cattle.

Hence it was only when white farmers began moving into Zululand and occupied areas along the White Mfolozi, Hluhluwe, Mkhuze, Mhlatuze and Nseleni rivers that sustained attention was focused on cattle losses from nagana. It was these white farmers who pressurized the authorities to permit the eradication of game. Accordingly the emphasis of this article is on their efforts to achieve the total elimination of game from their farming areas. Black inhabitants of Zululand continued to suffer cattle losses from nagana. But their losses were only taken note of during the exceptionally severe outbreak of nagana during the 1940s when large numbers of cattle succumbed to nagana in the Native Reserves, i.e. outside of the accepted endemic nagana areas.

Nagana had a tremendous impact upon Zululand, not only economically but also with regard to game conservation. The popular, world-renowned game reserves of Zululand, in particular those of Hluhluwe and Umfolozi, are today an established part of the Zululand economy, a fact attested to by the many overseas tourists that visit them every year. But their existence was not always assured. In the struggle to establish and keep them, one of the main obstacles was nagana and the accompanying use of big-game drives (or large-scale hunting of game) as a preventative measure to combat the tsetse fly. The game reserves were in fact blamed for harbouring game which carried the nagana parasite, and were regarded as a food source and infection pool for the tsetse fly. It was therefore not surprising that the conservationists clashed with the Zululand cattle farmers who regarded the Zululand game reserves as a threat to their livelihood.

The controversy between preserving the game of Zululand and the total destruction of this game as advocated by the cattle farmers raged for more than 50 years. The existence of the Zululand game reserves hung in the balance and their permanency was only confirmed in the 1950s when the presence of the tsetse fly had been finally eradicated by the use of chemical spraying of their breeding haunts.

Although from the earliest times the presence of the tsetse fly and the accompanying cattle disease nagana had been known to the white hunters and traders in Zululand, the first published account of its presence was that of E.C. Buxton in 1871. He reported that in his travels through Zululand he had encountered the tsetse fly on the plains on the southern and eastern side of the Lebombo Mountains towards Delagoa Bay, i.e. the Makatini Flats. In addition, he mentioned that there was a general opinion, especially amongst the many white hunters who frequented Zululand, that the tsetse fly was somehow connected with the presence of the larger kinds of game.³

Sir Charles Saunders (magistrate of Eshowe, 1888-1896, and Ubombo, August 1890-August 1891, and also chief magistrate and civil commissioner of Zululand, 1897-1908) had written to C. Fuller, the government entomologist, in 1923 saying that the furthest south he had ever experienced the tsetse fly in all his years in Zululand was the old wagon-drift across the Mhlatuze River between Melmoth and Eshowe. Since conditions were unstable in Zululand at the time of the British annexation in 1887 (civil war etc.), many of the Zulu inhabitants had become dependent upon game for food. Hence very little big game existed in the country except in uninhabited areas (for example the confluence of the two Mfolozi rivers, the Hluhluwe River and the Mkhuze River) and by 1887 it was only in these areas that the tsetse fly and nagana had existed. The British government had immediately instituted a law for the preservation of game,

particularly the larger species. Rapid increase of game followed, and coincidentally so did the incidence of tsetse fly and nagana. The view that nagana was only found where the tsetse fly existed and that the latter was only traced to parts frequented by large game, was firmly fixed in the minds of the inhabitants. In a report in 1893 the magistrate of Mthonjaneni, A.J. Shepstone, had reported that the locals felt the increase in nagana to be due to the increase in the game, resulting from the protection afforded to game by the government.⁴

FIRST PREVENTATIVE MEASURES AND THE RINDERPEST EPIDEMIC OF 1897

The increasing loss of cattle to nagana in Zululand during the 1890s forced the British government to take active steps to combat the disease. In 1894 Sir Walter Hely-Hutchinson, governor of Natal and Zululand, assigned Dr David Bruce to the task of determining the cause and cure for nagana. In a series of experiments during 1895 at the Ubombo magistracy in northern Zululand Bruce showed that the tsetse fly itself did not cause nagana but readily carried it from infected to healthy animals and that usually domestic animals bitten by the tsetse fly in a fly-infested area came down with the disease. He concluded that the tsetse fly transmitted nagana in nature. Even more important was Bruce's discovery of the organism that caused nagana viz. the parasite named *trypanosoma brucei*.⁵



Dr David Bruce.

PHOTOGRAPH: From J.A. Pringle, *The conservationists and the killers ...* (Cape Town, 1982)

Bruce's investigations tended to support the popular belief (amongst farmers and authorities alike) that large game (especially kudu, zebra, wildebeest and buffalo) were carriers of the disease and to ensure nagana-free cattle these big game should be kept away from farming areas. One method advocated for the creation of nagana-free areas was to hold hunts with their concomitant slaughter of big game. Even prior to Bruce's investigations the only white farmers allowed in British Zululand, the Boer farmers in the Proviso 'B' area of

the Mthonjaneni district, had been able to induce the authorities to grant permission for the holding of the first official big-game drive in Zululand. This was held during March 1894. However, in 1896 when the spread of nagana reached crisis proportions the Mthonjaneni district magistrate A.J. Shepstone was authorized to 'organise hunts to

³ TV. Bulpin, *Shaka's country: a book of Zululand* (Cape Town, 1952), p. 290; E.C. Buxton, 'The tsetse', *The Entomologist*, 5, April 1871, pp. 283-284; Fuller, *Tsetse in Transvaal*, p. 27.

⁴ J.A. Pringle, *The conservationists and the killers: the story of game protection and the Wildlife Society of Southern Africa* (Cape Town, 1982), p. 11; Fuller, *Tsetse in Transvaal*, pp. 33, 44 and 49.

⁵ Bruce, *Preliminary report on tsetse*, pp. 1-2; McKelvey, *Man against tsetse*, p. 64.

drive the large game from the crown lands in the neighbourhood of farms or inhabited kraals'.⁶

Accordingly on 19 and 20 October 1896 a large game hunt, for the purpose of destroying big game supposedly responsible for the spread of nagana, was held in the Mthonjaneni area. On 25 October another hunt was held in the Nhlazatshe Valley. But at a public meeting, held in the village of Melmoth on 29 October and attended by farmers from the district, demands for more big-game hunts were made. As a result on 20 November a further hunting drive was made along the White Mfolozi River near Hlopekulu Mountain. At the same time the magistrate of Eshowe had reported that the incidence of nagana was on the increase in the valley of the Mhlatuze River where 'the natives attribute the outbreak to the presence of a number of koodoo which frequent the district'. The magistrates of Eshowe and the Lower Umfolozi were authorized to organize a joint hunt to eradicate the kudu from the area.⁷

The problem of nagana had receded in Zululand with the onset of the rinderpest epidemic which by July 1897 had spread throughout Zululand. Sir Charles Saunders had estimated that 80% of the game and cattle in Zululand were destroyed by the rinderpest epidemic. Rightly or wrongly, rinderpest destruction of game was held responsible for the dramatic decrease in the incidence of nagana throughout Zululand.⁸

After the rinderpest epidemic, nagana all but disappeared and the tsetse fly could only be found in very small numbers where the few surviving buffalo and other large game existed. Saunders, in his capacity as chief magistrate and civil commissioner of Zululand, had between 1897 and 1904 personally traversed areas which were previously some of the worst nagana and tsetse fly-infested districts in Zululand. In his travels he had been accompanied by domestic animals, none of which he lost to nagana. The magistrate of Ubombo, F.B. Fynney, was also able to make a direct road from Somkele to Ubombo through the flybelt without any of his transport animals ever dying of nagana. In addition, in 1902 the Zululand Land Delimitation Commission had travelled all over Zululand and had not been troubled by the tsetse fly or nagana. But after the rinderpest epidemic, stringent regulations for game conservation were revived and resulted in an increase in game.⁹

In addition, after the Bambatha Rebellion (1905-1906) the Zulus were disarmed. As a result there were very few rifles present amongst the black population, reducing the incidence of poaching considerably. The increase in game had at first been slow but after 1905 was more rapid. Nagana once more made its appearance, spreading from one locality to another. The Ubombo district had after the rinderpest epidemic become habitable to cattle but by 1907 the district was once again closed to cattle while cases of nagana were being reported along Fynney's Road from Somkele to Ubombo. In March 1907 W.J. Clarke was sent to clear this road to Ubombo of game in an attempt to create a fly-free corridor for travelling purposes. To make the area further inland more suitable for stock farming, the magistrates of Mthonjaneni (Melmoth) and the Lower Umfolozi (Empangeni) districts were instructed to organize a joint big-game drive. This was duly held on 17 June 1907 and endeavoured to drive all the game away from the main wagon-roads. But with the increase of game, especially large game such as kudu, wildebeest, buffalo and zebra, nagana became prevalent and the flybelt, mainly the low-lying areas and river valleys, once again became devoid of people and cattle.¹⁰ However, since the opening up of Zululand to white settlers in 1905 increased pressure was brought to bear by these settlers on the

government to find a solution to the problem of nagana. As a result the antagonism between the game destructionists and the conservationists flared up.

PRESERVATION vs DESTRUCTION

Game preservation had commenced in Zululand soon after this territory's annexation by Britain in 1887. Under the provisions of Proclamation No. 3 of 1890 the closed season for hunting was fixed, while the special permission of the governor or resident commissioner was necessary before royal game (elephants, hippopotami and rhinoceroses) could be shot.¹¹

Eventually in 1895, by Zululand Government Notice No. 12 of 1895, five areas were demarcated and set aside as game sanctuaries where hunting was prohibited. Finally, Proclamation No. 2 of 1897 had provided for the establishment of the first official game reserves in Zululand — those at Umdhletse, Hluhluwe, St Lucia and Umfolozi. Subsequently a fifth reserve, known as Hlabisa Reserve No. 5, was added by Government Notice No. 93 of 1905. However, both Hlabisa and Umdhletse were abolished in 1907 by Government Notice No. 192 of 1907 because of pressure by farmers and settlers due to a renewed upsurge in the incidence of nagana.¹²

At this time the official attitude was still that 'generally big game, tsetse fly and fever seem to have great affinity'.¹³ Accordingly in March 1910, the government sanctioned a big-game drive in the Hlabisa and Ubombo districts. The respective magistrates of these districts were given orders to 'destroy everything within three miles of the wagon road'. Another big-game drive was held on 23 September 1910 and during the following days was extended to the Makatini Flats. The expressed object of these drives was to keep the tsetse fly away from the travelled main routes.¹⁴

In turn, to try and do something for the game conservationists, the government in August 1911 appointed the first Union government game warden for Zululand, F. Vaughan-Kirby. In addition, in 1912 another reserve, the Mkuzi Game Reserve, was added to the number of Zululand reserves.¹⁵ But unfortunately the conservationists were put under greater pressure as a result of the nagana epidemic. F. Toppin, a field naturalist living at Ngxwala Hill in the Ubombo district, had written in 1912 that the nagana was so bad that year that, for the first time since 1904, it had closed the middle road from Somkele to Ubombo, causing large numbers of transport animals to die. In his opinion

⁶ Natal Archives Depot, Pietermaritzburg (NA), Magisterial records of the Mthonjaneni district, 1/Mel 5/1/2 Melmoth, Correspondence and other papers, 1894-1899: PB 556/1896, 4.11.1896.

⁷ *Ibid.*: PB 532/1896, 19.10.1896 and 20.10.1896; 1/Mel 5/1/7 Melmoth, Letter book, 1895-1897: letter 5.11.1896, p. 673; LU 595/1896: minute 17.10.1896.

⁸ *Ibid.*: 1/Mel 5/1/12: PB 206/1896, 20.3.1896; PB 39/1896, 28.7.1897; *Zululand Times*, 2.8.1928; Pringle, *Conservationists and killers*, p. 114.

⁹ *Zululand Times*, 11.7.1913, 2.8.1928 and 16.8.1928; Fuller, *Tsetse in Transvaal*, p. 50.

¹⁰ *Zululand Times*, 11.7.1913; *The Agricultural News*, 15.4.1916, p. 225; NA, EPI 5/1/17 Magisterial records of the Lower Umfolozi district, Correspondence and minutes, 1906-07: 494/1907.

¹¹ F. Vaughan-Kirby, 'Game and game preservation in Zululand', *South African Journal of Science*, 1916, p. 378.

¹² NA, 1/Mel 5/1/6 Melmoth, Letter book, 1893-1895: letter 17.6.1895, p. 704; Vaughan-Kirby, 'Game preservation Zululand', pp. 379-381; Pringle, *Conservationists and killers*, pp. 114-115.

¹³ *Zululand Times*, 16.10.1908.

¹⁴ *Ibid.*, 21.10.1910.

¹⁵ *Ibid.*, 25.8.1911; NA, EPI 5/1/21, Correspondence and minutes, 1911: No. 804/1911; Vaughan-Kirby, 'Game preservation Zululand', p. 381; Pringle, *Conservationists and killers*, p. 117.

the main cause was 'the great increase of big game, which was now migrating to new pastures'.¹⁶

In 1913 the Natal administration, in an effort to minimise the danger of nagana to domestic animals in Zululand, sent C.E. Gray, principal veterinary surgeon of South Africa, to Zululand to investigate existing conditions. In 1914 the government adopted some of Gray's recommendations and abolished the closed season in the suspected areas with respect to small game, and also allowed the shooting of reedbuck and kudu of both sexes.¹⁷

Futile or not, the destruction of big game was all that the Natal administration could offer transport riders when they complained bitterly of dying trek-oxen. In 1915 nagana reached crisis proportions in Zululand and the farmers in the affected areas started an intense campaign to force the government to allow more big-game drives.¹⁸

The advocates of indiscriminate slaughter comprehensively blamed 'all game' and they consequently wished to rid Zululand of all game. This included abolishing the game reserves which were regarded as harbouring pools of infection. There were however various opinions on the actual carriers of nagana. In a 1916 report stemming from investigations done on the connection between game and nagana, the veterinary research officer of Zululand, D.T. Mitchell, placed the kudu first upon his list of dangerous and suspected game, while the zebra came next, the warthog (bush-pig) was third and wildebeest fourth.¹⁹

INCREASING PRESSURE FROM GAME DESTRUCTION-ISTS

The position in 1915 regarding nagana in Zululand had been clearly stated in a contemporary newspaper:

In the Northern Districts (of Zululand) where the big game has been preserved, the losses from nagana have been heavy, and it would seem that if the evil is allowed to increase, or even if it continues to be as bad as it now is, the whole of the country north of the Umfolosi will have to be abandoned as a home for white people; and the natives who manage to survive, will have to accustom themselves to live without domestic animals.²⁰

This increase in nagana was blamed by the white settlers entirely on the proliferation of big game which by its preservation was 'supplying a host for the tsetse fly, which is every year increasing and encroaching into parts of the country in which it has never been known to exist'.²¹

On 19 May 1915 a public meeting attended by 35 residents of the Lower Umfolosi district was held at Empangeni to discuss a request to the Natal administration for a big-game drive. What was particularly worrying to these residents was the occurrence of four cases of cattle deaths by nagana (proved so by the veterinary department after an examination of the bloodslides) in Native Reserve No. 5, which was south of the Mfolosi River, pointing, the settlers felt, to the spread of nagana southwards into areas previously considered safe. The meeting drafted a petition to the government requesting the restoration of the original game reserve boundaries to the area bounded by the Black and White Mfolosi rivers, and that all game between that reserve and the settled area be driven back into the reserve from where it had wandered.²²

As a result of this meeting, a deputation from Empangeni met the administrator of Natal on 16 June 1915 and presented their petition. Their request for a game drive was granted. The whole country south of the White Mfolosi, including the area added to the Umfolosi reserve in 1907, was opened to hunting for anyone holding an ordinary game

licence, obtainable at a reduced fee of only £1; the only restriction imposed was that neither klipspringer nor rhinoceros were allowed to be shot. Further, Proclamation No. 8 of 1915 allowed all schedule A game (which included reedbuck, waterbuck, kudu, wildebeest, buffalo and zebra) to be shot within an area of five kilometres on either side of the Somkele-Hlabisa-Nongoma road, the Mahlbatini-Nongoma-Ubombo road and the Mbhakamtetwa-Banganomo branch road.²³

The proclamations allowing the wholesale shooting of game were revoked with effect from 1 May 1916 by Proclamation No. 7 of 1916 which, however, authorized the destruction of the different species of game supposed to be responsible for the spread of nagana (as set out in Mitchell's 1916 report) in all areas of Zululand except in the game reserves and certain special shooting areas (which were defined in Provincial Notices Nos 74 and 103 of 1916). Within the special shooting areas, mainly around the game reserves, game could be shot upon payment of reduced fees. Outside of them, in the open areas, permits costing £2 each for the open season or £5 for the whole year were required. The intention with the establishment of the special shooting areas was to provide buffer areas, where possible, around the game reserves.²⁴

There followed a period of large-scale slaughter, but worse was to follow. Serious extermination of all game in northern Zululand commenced in August 1917 when Government Proclamation No. 13 opened the district of Ubombo to hunters. Anybody could shoot anything they liked, except rhinoceros, hippopotamus and nyala. Hunters from all over South Africa travelled to the area to partake in the carnage. No records were kept of the numbers and species shot, but an official estimate set the destruction at 25 000 wildebeest, not counting other species. Large numbers of hides and skins were sent to the railhead at Somkele where they fetched 1s.3d. per pound (0,45 kg). But thousands of carcasses were left merely to rot on the Makatini Flats. The wholesale slaughter was continued further northwards when on 27 February 1919 the government opened the Ingwavuma district to hunters. Edward Collins, who had come to Zululand in 1913, reported in 1924 that the whole of the area north of the Mkhuzi River had been swept clean of game. So thorough was the elimination of game from this area at that time that its effects — the almost entire absence of both game and tsetse fly north of the Mkhuzi River — could still be observed at the commencement of the chemical spraying campaign in 1945.²⁵

With the game extermination solution apparently working

¹⁶ Fuller, *Tsetse in Transvaal*, p. 52.

¹⁷ Vaughan-Kirby, 'Game preservation Zululand', p. 389.

¹⁸ *Zululand Times*, 23.4.1915 and 14.5.1915.

¹⁹ Vaughan-Kirby, 'Game preservation Zululand', pp. 386-388; *The Agricultural News*, 15.5.1916, p. 265 (Buffalo were placed 5th; wild-dogs 6th; bushbuck 7th and waterbuck 8th.)

²⁰ *Zululand Times*, 14.5.1915.

²¹ *Ibid.*, 23.4.1915.

²² *Ibid.*, 4.6.1915 and 18.6.1920; Vaughan-Kirby, 'Game preservation Zululand', p. 384. In 1907, by Government Notice No. 322, the Umfolosi Game Reserve had been extended south of the White Mfolosi River in an effort to afford the white rhinoceros more protection.

²³ *Zululand Times*, 4.6.1915, 18.6.1915 and 14.4.1916; Vaughan-Kirby, 'Game preservation Zululand', pp. 385 and 389-390; *The Agricultural News*, 15.4.1916, p. 225.

²⁴ *Zululand Times*, 14.4.1916; Vaughan-Kirby, 'Game preservation Zululand', pp. 390-391; Pringle, *Conservationists and killers*, p. 118.

²⁵ E. Collins, 'Nagana in northern Zululand', *South African Journal of Natural History*, 4(4), 1924, pp. 263-264; Pringle, *Conservationists and killers*, pp. 118 and 122; Du Toit, 'Trypanosomiasis in Zululand', p. 322.

in northern Zululand, attention was focused on southern Zululand. The problem there for the anti-game lobby was the presence of the game reserves. The general opinion was that the tsetse fly, and hence nagana, would not be got rid of unless the game was also destroyed. It was felt that it would be useless to merely drive all game out of the farming areas and into the game reserves, for these reserves remained as a source of infection. Furthermore there was no restriction on 'wandering game' which strayed out of these game reserves and into farming areas, infecting domestic animals. The incidence of wandering game was increased by climatic conditions, and the severe drought of 1919/20 forced many animals out of the reserves in their search for better grazing. In 1919 nagana flared up again in southern Zululand and the situation had become even more volatile because of the new farming settlements at Ntambanana and in the Nkweleni Valley. These new settlers turned their attention with renewed venom towards the Umfolozi and Hluhluwe reserves. Mitchell's report of 1916 had given them added ammunition since he had reported that nagana was 'clearly associated with areas where game is plentiful'. In this respect he had maintained that 'the game reserves are perhaps the greatest source of danger'.²⁶ In 1919 Sir Arnold Theiler, then director of Veterinary Teaching and Research, headed an investigation into nagana in Zululand and came to the same conclusions as had Bruce, viz., that the tsetse fly caused nagana. Theiler also linked big game as the carrier and the tsetse fly as the propagator.²⁷ When these 'conclusive proofs' had been scientifically backed, it was no wonder that the settlers blamed all game for the spread of nagana and continually asked the authorities to allow the holding of regular game drives.

THE NTAMBANANA SETTLEMENT

The so-called Ntambanana lands, north west of Empangeni along the Nseleni River in the Lower Umfolozi district, had been opened in 1918/19 and allotted to returned soldiers. Eleven farms had already been allotted in July 1918 with another 22 in June 1919 and 44 in October 1919 to a total of 77 new settlers. These farms had been advertised in the government gazette as suitable for stockfarming and the cultivation of mealies, but were in fact situated in a flybelt. Those who knew about the presence of the tsetse fly thought that the government description of 'stock farms' precluded them from being in the flybelt. Therefore they blamed the government for their cattle losses which in the first year were already serious. By the end of 1919 a total of 313 head of cattle had died while another 270 died from nagana in the first five months of 1920. As a result of these losses, the magistrate of the Lower Umfolozi district, R.M. Tanner, was authorized to hold a big-game drive to try and clear the game from the new farms at Ntambanana. In this drive, held from 4-6 December 1919, 1 040 head of big game were killed, including 507 zebra. The magistrate, after this drive, issued the new settlers in the area with extra ammunition to shoot any game that filtered back into the area covered by the drive.²⁸

But during 1920 nagana seemed to be spreading further south with the farmers along the lower Nseleni River beginning to suffer losses. G.W. Higgs, one of the earliest pioneers of the Lower Umfolozi district, had as yet never suffered as a result of nagana on his farm near the Nseleni River, but during 1920 lost cattle to the disease. He blamed the spread of nagana on the prevailing drought which had forced the game southwards bringing, he contended, the tsetse fly and nagana with them.²⁹

With the spreading outbreak and under pressure from S.H. Rutherford, secretary of the Ntambanana Farmers' Association, and other leading inhabitants of the district, the government in May 1920 authorized Tanner to 'take such steps as he deems fit for the prevention of the spread of nagana'.³⁰

At a meeting of the Ntambanana Farmers' Association on 29 May 1920 a committee consisting of the magistrate, seven members of the association and one member of the Empangeni Farmers' Association was formed and styled the Nagana Control Committee. A five-kilometre-wide buffer zone to the Ntambanana settlement was created in which all game was to be destroyed. Accordingly the government issued free ammunition to the settlers (outsiders had to provide their own) and another game drive was organized for 15-19 August 1920 under the auspices of the Nagana Control Committee with Magistrate Tanner in charge. The object of this drive was to 'exterminate all nagana game right up to the White Mfolozi'. This included the area added to the Umfolozi Reserve in 1907, opened to licenced shooting in 1915 and degazetted on 13 May 1920. More than 300 visiting hunters arrived to assist the local farmers in this game drive. At the briefing in Empangeni on 13 August they were all informed that their request that the game-drive hunters be allowed to enter the Umfolozi Reserve during the drive, had been refused. The gathering, led by G.W. Higgs, thereupon made known their intention of disregarding this and of entering the reserve to destroy as much game there as they could, since the local farmers considered the reserve to be grossly overstocked with game. This overstocking, they contended, was one of the primary causes of the spread of big game outside of the reserve. During the official drive 1 864 head of big game were killed but with the hunters taking matters into their own hands and continuing the shooting in the reserve another estimated 3 000 head of game were killed. (To avoid any unpleasant clashes or the possibility of prosecutions the Umfolozi Game Reserve had been hastily degazetted on 18 August 1920.)³¹

This game drive did not, however, seem to solve the nagana problem for the Ntambanana settlers, since all it did was scatter the remaining game in all directions, spreading nagana further into the farming areas. The government did in 1921 start building a boundary fence between the Ntambanana settlement and the Umfolozi reserve in an effort to prevent any game from filtering southwards; but it was not completed because of a lack of funds. In addition, in July 1921 they assigned R.H.T.P. Harris, then an officer of the Division for Entomology of the Department of Agriculture, assisted by H.H. Curson, to study the tsetse fly in Zululand. A research laboratory was established at Ntambanana and a tsetse-fly investigation camp was set up on the White Mfolozi River.³²

²⁶ *Zululand Times*, 14.4.1916; *The Agricultural News*, 15.5.1916, p. 263.

²⁷ *Zululand Times*, 11.6.1920.

²⁸ *Ibid.*, 9.1.1920 and 9.7.1920; NA, EPI 3/1/1: Historical register book of Empangeni, 1911-1940, p. 59.

²⁹ *Zululand Times*, 1.4.1920.

³⁰ *Ibid.*, 14.5.1920.

³¹ *Ibid.*, 11.6.1920, 9.7.1920, 30.7.1920, 6.8.1920 and 20.8.1920; Pringle, *Conservationists and killers*, pp. 123-124; NA, EPI 3/1/1, pp. 59-60; *Natal Provincial Gazette*, Proclamation No. 147 of 1920, 13.5.1920, p. 323 and Proclamation No. 231 of 1920, 18.8.1920.

³² *Zululand Times*, 27.8.1920, 17.3.1921, 14.7.1921 and 1.9.1921.

With the appointment of Harris, a new approach to the problem emerged. Although game eradication was still used for many years as a means of controlling the tsetse fly, there was a subtle change in emphasis to looking for means of destroying the actual tsetse fly itself. Harris's first period of investigation coincided with a lull in the nagana cycle. Consequently the pressures on the game reserves and on Harris



R.H.T.P. Harris.

PHOTOGRAPH: NATAL PARKS BOARD

for a quick solution also lessened. In May 1924 the nagana research laboratory at Ntambanana was transferred to Pretoria, while at the end of March 1927 the Umfolozi tsetse-fly camp was shut down and Harris transferred. In his investigations up to 1927 Harris had found tsetse flies as far south as the Mhlathuze Valley. He was also able to establish that the tsetse fly laid its egg (maggot) in a damp spot under the trees in shade where the game came down to water so that the maggot's food supply was secured. Furthermore, Harris was the first to postulate that the tsetse fly did not search for food by instinct or scent but by sight. (This was at first rejected by other scientists but later proved.) All these conclusions later became major factors in the eventual control and eradication of the tsetse fly from Zululand.³³

RECURRENCE OF NAGANA IN 1927

Since 1923 there had been no new outbreaks of nagana recorded in the Ntambanana settlement or south of the Mfolozi River. But in 1927, owing to the severe drought of the time and the consequent lack of grass in the reserves, various types of game once again began to make their appearance in the Ntambanana settlement. At the same time there were a number of reports of new cases of nagana in cattle, proving, the settlers felt, their contention that big game and nagana went hand in hand.³⁴

During June and July 1927 there was an outbreak of nagana on the farm of Malcolm Clark at Empangeni Rail in which he lost over 50 head of cattle. This was particularly distressing to farmers in the district, since this confirmed outbreak was many kilometres outside of the accepted fly-belt.³⁵ The situation had been further complicated by the influx of new settlers to the Hluhluwe, Nyalazi and Mkuzi lands, opened up in 1924 and 1925. When nagana flared up in 1927 they too began to experience cattle losses to the disease. For the first time attention was turned to the Hluhluwe and Mkuzi game reserves. In July 1927 the Hluhluwe Farmers' Association forwarded a request for aid because of losses sustained in that part of the settlement adjoining the Hluhluwe Game Reserve. They also requested that this reserve either be fenced or opened to shooting. The coloured community of the Hlabisa district, through the Nhlwathi branch of the Zululand Coloured Progressive Society, went further and strongly urged the authorities to abolish the Hluhluwe Game Reserve because of the heavy cattle losses caused by nagana.³⁶

In response to these demands the renewed shooting of game was recommended. Towards the end of 1927 the Natal

administration appointed R. Symons, assisted by a staff of six black hunters, to shoot game in the buffer zone between the Umfolozi reserve and the Ntambanana settlement. Furthermore, in November and December 1927, Dr Claude Fuller who had recently retired as chief entomologist of South Africa spent some time at the old tsetse-fly investigation camp on the Mfolozi River to carry out certain experiments in connection with nagana. He came to the conclusion that the 'extermination of the fly in the presence of game is beyond human capabilities'.³⁷ This reinforced the idea that the only way the tsetse fly scourge could be destroyed was to rid the flybelt of all game.

As the nagana outbreak worsened in 1928 further measures against game were instituted. Special shooting areas were established in the bush and river country in northern Zululand at Ingwavuma, Nongoma, Hlabisa, Mahlabatini and at Inwala (along the Msunduzi River). Zebra were also allowed to be shot all year round. Another innovation was the stationing of white guards permanently in each game reserve to ensure that the game was kept in the reserves. But by July 1928 nagana was again rife in the Ntambanana settlement, with mortality among cattle high.³⁸

The conservationists had found their task further complicated by an unsympathetic Minister of Lands, Gen. J.C.G. Kemp, who had gone on record as emphatically stating that 'if it becomes a question of choosing between keeping the game and keeping the settler then the game must go'.³⁹ But in 1928 the conservationists were able to persuade the Natal Provincial Council to appoint a Game Advisory Committee with C.F. Clarkson, MPC, as the chairman. At a conference on nagana held at Hluhluwe on 19 November 1928 Clarkson formulated ten proposals (some of which infuriated the conservationists) for the combatting of nagana. The most important of these were that the government was asked to clear the bush, and fence the areas between the reserves and the Ntambanana and Hluhluwe settlements; to provide water supplies to reserves so that game need not stray in search for it; to destroy surplus game in the reserves; to keep only sufficient game according to the carrying capacity of the reserves; and to allow the settlers to destroy any stray game in the buffer areas or on their farms. Clarkson's advocacy of further eradication of game was disliked by the conservationists but it drew attention away from the game reserves and the possibility of their being abolished. Although hunting occurred in the reserves, his proposals called for the reclamation of the Umfolozi Game Reserve

³³ *Ibid.*, 23.10.1924, 7.4.1927 and 30.6.1927; B. Smit, *Insects in southern Africa: how to control them* (Cape Town, 1964), pp. 308-309; R.H.T.P. Harris, 'Tsetse fly investigations in Zululand', (Department of Agriculture, Science Bulletin 6, Pretoria, 26.9.1927), pp. 3, 6, 14 and 16, and 'Trapping tsetse as a means for the control of trypanosomiasis (nagana)', *Journal of the South African Veterinary Association*, 2(1), 1931, p. 28. The tsetse fly is almost unique among insects in that the female does not lay her egg but retains it until it develops into a maggot at which stage it is deposited in a suitable place on the ground where it immediately burrows into the soil. Since only one fully developed larva is produced at a time, the rate of reproduction of the tsetse fly is much slower than that of most other insects.

³⁴ *Zululand Times*, 28.4.1927.

³⁵ *Ibid.*, 21.7.1927.

³⁶ *Ibid.*, 7.7.1927 and 1.9.1927.

³⁷ *Ibid.*, 24.11.1927, 1.12.1927, 12.1.1928 and 9.2.1928.

³⁸ *Ibid.*, 1.3.1928, 16.5.1928, 21.6.1928 and 5.7.1928; G.A.H. Bedford, 'Report on the transmission of nagana in the Ntambanana and Mhlathuze settlements, Zululand' (11th and 12th reports of the Director of Veterinary Services, Pretoria, 1926), pp. 275-300.

³⁹ *Zululand Times*, 15.11.1928;

and the continued existence of game preservation within the reserves. The Game Advisory Committee had tacitly accepted the inviolability of the boundaries of the Zululand game reserves, which was a big step forward for the conservationists. Clarkson's committee had also recommended that Harris be reappointed to continue his study of the tsetse fly.⁴⁰

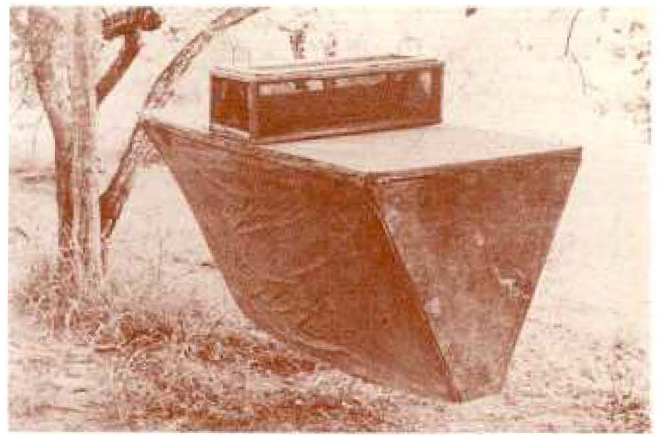
THE FIRST ORGANIZED ERADICATION CAMPAIGN

Prior to 1929 game eradication, in addition to the occasional big-game drive, had been left largely to the residents of the area or to casual hunters from elsewhere. But on the strength of Clarkson's recommendations, the Natal Provincial Administration was persuaded to finance a scheme of organized shooting aimed at reducing the numbers of game to the carrying capacity of the reserves and then to create a buffer zone around the reserve which was to be completely free of both game and tsetse fly. The buffer zone around the Umfolozi Game Reserve was divided into seven sections. A white game ranger was assigned to each section and he had under him ten skilled black hunters. Because the majority of the animals killed were zebra whose hide was regarded as worthless and its meat inedible, the hunters just hacked off a tail as record and then moved on to shoot again. These tails provided the final statistics. In the eighteen months between May 1929 and November 1930 26 162 head of game were killed in the buffer zones around the Umfolozi reserve and 377 inside. For the whole of Zululand this eradication campaign accounted for 37 861 head of game both large and small. This tally took no account of animals killed by private hunters under permit. However, keeping the buffer zones free of game became too expensive for the Natal Provincial Administration to continue. On 15 November 1930 they abandoned the project and allowed game and tsetse fly to move back into the buffer zones adjacent to the farming areas. Besides the expense this game destruction programme had other serious flaws. Absence of game stimulated hungry tsetse flies to disperse further and wider than they ordinarily travelled and as a consequence the incidence of nagana increased.⁴¹

THE HARRIS FLY TRAP

Harris had arrived back in Zululand in April 1929 to restart his investigations for the eradication of the tsetse fly. The government hoped that he would come up with a cheaper and more acceptable solution than the destruction of game. To assist Harris, who wanted the game (and therefore the tsetse fly) to be concentrated in one area, the Umfolozi Game Reserve was once again proclaimed towards the end of 1929. At the beginning of 1930 a sub-committee of the Game Advisory Committee, after a feasibility study, recommended the building of a 25-kilometre fence along the Ntambanana settlement boundary so as to keep any game from the Umfolozi Reserve out of the settlement. They also recommended that all the bush be cleared in a zone approximately one kilometre wide, parallel to the fence, with another fence parallel to the first. But at the end of August 1930 the Provincial Council turned down the building of the game fence. In addition, the serious drought being experienced at the time in Zululand led to the game spreading out from the reserves in search of grazing and bringing the tsetse fly with them. Harris, finding it impossible to confine nagana to the reserves without fencing, turned to other methods of trying to eradicate the tsetse fly.⁴²

In April 1930 Harris began using a new type of fly trap in the reserves. His trap evolved from the fact that the tsetse



A Harris fly trap.

PHOTOGRAPH: E.R. HARRISON, PIONEER MUSEUM, MTUBATUBA

fly hunted by sight and would dive towards any shaded object having even the remotest resemblance to an animal. After experimenting, Harris had developed a trap with a wooden frame covered with hessian with a six-inch gap on its underside through which a tsetse fly would enter in search of a vulnerable place to feed. On top of the framework was a wire-gauze trap from which the fly could not escape. Field workers would hang the trap low under a tree or on supporting poles where it benefited from the light shade and constant motion which attracted tsetse flies.⁴³

In May 1930 Harris, with an improved trap, had conducted an experiment lasting 24 days. In one trap he caught nearly 3 000 flies in a week, almost five-sixths of these being females. Harris was now sure that trapping was the way to eradicate the tsetse-fly population. Harris convinced the government of the effectiveness of his trap and they agreed to supply him with traps to continue with his work in the reserves. Being at first handicapped by an insufficient number of traps, Harris concentrated on those sections of the Umfolozi reserve having the highest density of game and tsetse flies. The effect of the traps on the tsetse-fly population was dramatic. In the summer of 1931 the tsetse flies had been so numerous in the Umfolozi Reserve that Harris had had to close all the windows of his car when he drove through in order to avoid being bitten severely. For June 1931 the average number of flies caught per trap over the White Mfolozi area was 2 654 and over the Black Mfolozi area 4 336. This gave an average daily density of 86,5 and 105,2 flies per trap respectively. This density began falling in the following months, leading Harris to speculate that trapping the fly was the quickest and most economical way of eradicating it.⁴⁴

In January 1932, because of financial stringency caused by the Great Depression and the refusal of the central government to assist the Natal Provincial Administration financially, all trapping work was halted and for three

⁴⁰ *Ibid.*, 22.11.1928 and 29.11.1928; Pringle, *Conservationists and killers*, p. 129.

⁴¹ *Zululand Times*, 24.10.1929; R.H.T.P. Harris, 'Some facts and figures regarding the attempted control of *Glossina pallidipes* in Zululand', *South African Journal of Science*, 29, October 1932, pp. 496 and 498; McKelvey, *Man against tsetse*, pp. 180-181; Pringle, *Conservationists and killers*, p. 132; Du Toit, 'Trypanosomiasis in Zululand', pp. 322-323.

⁴² *Zululand Times*, 18.4.1929, 25.7.1929, 16.1.1930, 23.1.1930 and 28.8.1930; Pringle, *Conservationists and killers*, p. 134.

⁴³ *Zululand Times*, 10.7.1930, 20.11.1930 and 14.2.1946; McKelvey, *Man against tsetse*, p. 182; Harris, 'Trapping tsetse', pp. 28-30, and 'Some facts and figures', p. 499.

⁴⁴ *Zululand Times*, 10.7.1930; S.H. Skaife, *A naturalist remembers* (Cape Town, 1963), p. 46; McKelvey, *Man against tsetse*, p. 183; Harris, 'Trapping tsetse', p. 30, and 'Some facts and figures', p. 502.



Examining the catch from a Harris fly trap.

PHOTOGRAPH: From J.J. McKelvey, *Man against tsetse* ... (Ithaca, 1973)

months the thousand traps went unattended. Ants and spiders got into the cages, while heavy rains fell causing a rank growth of vegetation around the traps, screening them from flies. In April 1932 Harris's staff was restored to half its previous strength but the value of the abandoned traps could no longer be accurately assessed. In addition, the game guards had also been withdrawn from the reserves which resulted in a large number of big game wandering all over the settlements. With the increasing severity of the drought during 1931 and the beginning of 1932, which was forcing game out of the Umfolozi reserve, farmers as far south as the Mhlathuze River were complaining of the presence of wildebeest on their farms (for the first time in twelve years) and of an increase in the incidence of nagana amongst their cattle. This merely served to link even more firmly in the minds of the farmers the connection between game and nagana.⁴⁵

During 1931 and 1932 the shooting of game had continued and between 1929 and 1932 close on 100 000 head of game were slaughtered outside of the reserves. By the beginning of 1933 not a single head of game was found in the Ntambanana area. But after the rains of February 1933 there were virulent outbreaks of nagana although no game was present.⁴⁶

But by 1934 the incidence of nagana was almost nil in the Ntambanana settlement and this was attributed to Harris's trapping of the tsetse flies in the Umfolozi reserve and the almost total eradication of all game in the buffer zone between the settlement and the game reserve.⁴⁷

EXPANSION OF TRAPPING

In mid-June 1934 the government acceded to Harris's request for more traps and agreed to supply him with a thousand. This was the start of the expansion of trapping and the number of fly traps in use eventually reached more than 25 000. This expansion programme was given impetus by the occurrence of a serious outbreak of nagana in the Nkwaleni Valley in April 1935 where it was reported that up to 45% of the cattle had died (out of 1 278 cattle, 534 had died from nagana by May 1935). This was a double blow to those Ntambanana settlers who had received plots in the Nkwaleni Valley in order that they might recoup the losses they had sustained in the Ntambanana settlement from earlier outbreaks of nagana. By the end of August 1935 preliminary trapping operations had been set up by Harris in the Nkwaleni Valley. In mid-March 1936 Harris had proceeded to the Hluhluwe reserve where he began setting up the first traps. By the end of 1936 3 000 traps were already in

place, and in 1937 Harris started to place traps also in the Mkuzi reserve.⁴⁸

By the end of 1939 the Harris fly trap seemed to have been the answer to the eradication of the tsetse fly and of nagana in Zululand. There had been a definite decrease in nagana and no new cases had been reported for two years from either the Nkwaleni Valley or Ntambanana. There were now 14 500 traps in the Umfolozi reserve and 7 500 in the Hluhluwe reserve. Those cattle areas of Zululand previously decimated of stock by nagana were by 1940 being completely restocked, while the development of the game reserves as tourist attractions was begun in earnest with the appointment of the Zululand Game Reserves and Parks Advisory Board (gazetted in mid-July 1938) with W.M. Power, MEC, as chairman. In February 1939 a white game ranger was appointed and posted for duty to the Umfolozi Game Reserve. It was hoped that the increasing popularity of the Hluhluwe Game Reserve would safeguard future attempts to deproclaim any of the Zululand game reserves.⁴⁹

In October 1940 Harris was able to retire feeling that he had proved that the tsetse fly appeared to be very localized and largely dependent upon the movement of game for their distribution. Prior to his retirement Harris had erected kilometres of hessian screens in the Umfolozi reserve to check the movement of wandering and game-carried tsetse fly. In addition, he had also commenced experimenting with the use of an electric fence to prevent game from straying out of the reserve.⁵⁰

But the euphoria was short-lived. At their annual general meeting in June 1941 the Hluhluwe and Northern District Farmers' Association had expressed their concern about the 'increase of game' and advocated 'its [game] control to guard against the spread of nagana, which has once more shown itself.'⁵¹ Once again the game reserves were under attack from the abolitionists.

RECURRENCE OF NAGANA AND MORE GAME KILLING

By 1942 the continued spread of nagana among cattle herds in the districts adjoining the game reserves in northern Zululand was cause for considerable concern to farmers. Towards the end of 1942 an outbreak of nagana was also reported from the Nkwaleni Valley (which over the past 20 years had lost some 3 000 head of cattle from this disease). With this increase in the incidence of nagana, attention again focused on big game as a host.⁵²

Further outbreaks of nagana were reported throughout Zululand and it was estimated that the black inhabitants of the Native Reserves adjacent to the Mkuzi and Hluhluwe reserves had lost 70% of their already depleted herds. For the first time there were accurate figures of cattle deaths from nagana in the Native Reserves, since the east-coast fever regu-

⁴⁵ *Zululand Times*, 11.6.1931, 16.7.1931 and 4.8.1932; Harris, 'Some facts and figures', p. 501; McKelvey, *Man against tsetse*, p. 183.

⁴⁶ *Zululand Times*, 30.3.1933.

⁴⁷ *Ibid.*, 15.3.1934. By January 1934 the average daily density of tsetse flies trapped in Harris's fly traps over the whole Umfolozi Reserve, was only 1.0, compared to 105.2 flies per trap in June 1931.

⁴⁸ *Ibid.*, 2.5.1935, 9.5.1935, 23.5.1935, 5.7.1935, 29.8.1935, 25.6.1936 and 9.9.1937; Pringle, *Conservationists and killers*, p. 140.

⁴⁹ *Ibid.*, 30.12.1937, 28.7.1938, 29.12.1938, 21.9.1939, 23.11.1939, 8.2.1940 and 10.10.1940.

⁵⁰ *Ibid.*, 8.2.1940 and 10.10.1940.

⁵¹ *Ibid.*, 3.7.1941.

⁵² *Ibid.*, 27.8.1942, 29.10.1942 and 10.12.1942.

lations, instituted after outbreaks of this disease in Zululand and Northern Natal from 1932-1935, were still in force. Blood smears were obtained from 90% of all cattle that were either slaughtered or had died. Cattle losses from nagana in the Native Reserves of the districts of Hlabisa, Nongoma and Mahlabatini were put at 9 500 in 1941, 18 000 in 1942, 9 500 in 1943 and down to 1 500 in 1944. These losses forced the government to take action to contain the spread of nagana. Limited by a lack of practical solutions the authorities fell back on the old and tried method of game killing. Thus it was decided to embark upon another game-eradication campaign.⁵³

In support of the extermination drive, much was made of the fact that a considerable number of cattle owned by blacks in the Hlabisa, Nongoma and Mahlabatini districts had died from nagana, as a result of which it was claimed that nagana-infected areas were expanding. This was, in fact, incorrect. The true reason for this expansion was that at the time a considerable number of blacks had moved off or had been evicted from crown lands or farms in the Vryheid and Louwsberg districts and elsewhere and had settled in the endemic nagana areas of the Hlabisa, Mahlabatini and Nongoma districts (mostly unoccupied crown lands). As had happened in the white settlements of Ntambanana, Hluhluwe and Mkhuzi, their cattle at first thrived. Unfortunately, blacks in nearby reserves, on seeing this, sent their own cattle into the lowveld upon which nagana made its appearance amongst these herds. The latter then moved their cattle back to the safe grazing grounds of their own reserves. However, it was too late, since their herds had already been infected and nagana had spread in areas where previously it had not existed.⁵⁴

Despite these factors in the spread of nagana, the game-eradication campaign proceeded. In accordance with the decisions reached regarding the control of nagana in the areas surrounding the Hluhluwe and Umfolozi reserves, permits to shoot game were issued in mid-1943. Shooting was restricted to special rangers who were to clear the areas of buffalo, wildebeest and kudu. The intention was to shoot from the outer areas in towards the game reserves. Up to July 1944 a total of 30 000 head of game had been destroyed, about 95% of which were from the Umfolozi and Mkuzi reserves and the adjoining crown lands. Shooting was not allowed in the Hluhluwe reserve where all the species were protected. In the Umfolozi Game Reserve the white rhinoceros was left untouched but confined to a sanctuary surrounded by a barrier clearing to prevent the dispersal of the tsetse fly to adjacent areas.⁵⁵

This game-eradication campaign, in fact, only aggravated the nagana outbreak further. The establishment of shooting camps in the heart of the Mkuzi and Umfolozi reserves and in the surrounding Native Reserves led to even greater scattering of the game. This result, together with the movement of cattle owned by blacks into the endemic areas of the Mahlabatini, Nongoma and Hlabisa districts and the increasing severity of a prevailing drought (which caused the game to wander out of the game reserves in search of better grazing), led to the worst and most widespread nagana outbreak in the history of Zululand. It spread into the Magut area of the Ngotshe district where prosperous black farmers were ruined in a matter of months. It also spread to Gollel near the Swaziland border where it had previously been unknown to local inhabitants (although nagana had occurred in the area prior to the rinderpest of 1897). In southern Zululand the disease swept up the Mhlatuzana and Mhlatuze valleys to within a few kilometres of Eshowe. Black cattle-owners, once again, suffered heavy losses.⁵⁶

By 1945 this new nagana epidemic had killed an estimated 60 000 head of cattle owned by whites, while the estimate for nagana-related cattle deaths in the black reserves was double this figure.⁵⁷ This outbreak left many ruined and embittered black and white farmers. However, since the Harris fly trap and the wholesale killing of game seemed unable to provide a permanent solution to nagana, other methods of eradication had now to be considered.

THE USE OF DDT

In 1945 reports from overseas were received of the successful applications of the new synthetic insecticides. The first of these to be received in South Africa was DDT (dichlorodiphenyl-trichloro-ethane). Experimental aerial spraying with DDT commenced in October 1945 in the Mkuzi Game Reserve.⁵⁸

As the spraying of the Mkuzi Game Reserve progressed, it became obvious that it would be costly to spray all of Zululand's tsetse fly-infected country. In looking for ways to make the spraying more effective, note was taken of some research done by Dr John S. Henkel. In March 1936 he had been asked by the Natal Provincial Council to continue further investigations of the types of vegetation in the game reserves and the relationship, if any, to the breeding habits of the tsetse fly. This field investigation was carried out in the Hluhluwe reserve from 12 March to 10 September 1936. He discovered that the tsetse fly used restricted and permanent breeding sites. He concluded that the tsetse fly could be eliminated if its breeding places were eliminated.⁵⁹

There had been no immediate response to Henkel's discovery but it became the cornerstone of the eventual eradication of the tsetse fly. E.B. Kluge, who had replaced Harris in 1940, had become convinced that the spraying operations would succeed only if they were concentrated on the permanent breeding areas of the tsetse fly. So, at the beginning of 1947, in order to ascertain the extent of these breeding areas, teams of black workers were assembled who spent their days sifting through loose sand looking for the buried pupal cases of the tsetse fly. River banks and valleys were the most likely places to find pupae, something the collecting team learnt from experience. In this way the breeding pattern of the tsetse fly began to emerge. Three high-density areas were located in and around the Umfolozi, Hluhluwe and Mkuzi reserves. Medium and then low-density areas occurred as one

⁵³ *Ibid.*, 25.3.1943 and 26.10.1944.

⁵⁴ *Ibid.*, 14.10.1948.

⁵⁵ *Ibid.*, 5.8.1943 and 26.10.1944; Pringle, *Conservationists and killers*, p. 145.

⁵⁶ *Zululand Times*, 14.10.1944; K. Schultz and J.D. Smit, 'Preliminary report on investigations carried out in connection with a disease affecting stock in the Ngotshe district with specific reference to nagana', *South African Journal of Science*, 43, July 1947, pp. 281-282 and 285; Du Toit, 'Trypanosomiasis in Zululand', p. 327.

⁵⁷ *Zululand Times*, 1.9.1927, 19.8.1943 and 13.1.1949; Kluge and Du Toit, 'Nagana in Zululand', p. 441; Du Toit, 'Trypanosomiasis in Zululand', p. 326; information from W.R.B. Somerville.

⁵⁸ *Zululand Times*, 1.11.1945 and 22.11.1945. For more detail concerning aerial spraying and other methods of spraying DDT see Du Toit, 'Trypanosomiasis in Zululand', pp. 341, 346, 349 and 354; R. du Toit and E.B. Kluge, 'The tsetse fly problem and its control in South Africa', *The Veterinary Record*, 59(41), 25 October 1947, p. 571; O.G.H. Fiedler, R. du Toit and E.B. Kluge, 'The influence of the tsetse fly eradication campaign on the breeding activity of *Glossinae* and their parasites in Zululand', *Onderstepoort Journal of Veterinary Research*, 26(3), June 1954, p. 390.

⁵⁹ J.S. Henkel, *Report on the plant and animal ecology of the Hluhluwe Game Reserve with special reference to tsetse flies* (Pietermaritzburg, 1937), pp. 1, 24-25 and 32-34.

moved away from the reserves. Some of the low-density areas were widely scattered, especially in the Ngotshe district. Pupae-searching lasted for 27 months and ended in March 1949. As a result, it was established that only 3% of the total range of the tsetse fly was used for breeding purposes. The survey seemed to indicate that while the tsetse fly population was small, the flies remained close to their breeding areas but as soon as their numbers increased, they spread out for up to 50 kilometres in their search for food. These feeding areas were seldom used for breeding. This survey assisted in the reorganizing of the spraying campaign and the spraying was then concentrated only on the breeding ground of the tsetse fly.⁶⁰

While the pupae survey was underway, DDT spraying as well as game eradication continued, while bush eradication and the widening of barrier clearings was instituted.⁶¹ However, nagana still remained prevalent in many areas. A cattle census taken in October 1947 in Native Reserve No. 12, to the west of the Hluhluwe Game Reserve, showed that out of a total of 21 600 cattle two years previously, only 8 070 head remained. This was a reduction of 63%, most of this mortality being attributed to nagana. In some areas the mortality from nagana had been as high as 90%.⁶²

A new artificial insecticide, BHC (benzene hexachloride) was also used in the aerial spraying. BHC was just as effective as DDT but was cheaper. In 1947 the government also started supplying a new drug '1553', which, when injected into cattle, kept their blood sterile for a month thus preventing any biting tsetse fly from infecting the animal or being infected itself.⁶³

Towards the end of 1947 the veterinary research officers were so confident of the success of the DDT and BHC spraying campaign that they recommended to the Nagana Advisory Committee (made up of representatives from all the various districts in Zululand affected by the tsetse fly) that the game destruction campaign be suspended for six months. This was agreed to and later extended for a year (to October 1948) by which time the gradual disappearance of nagana from all previously infected districts was being reported. This last game-eradication campaign had, since its inception in 1943, resulted in the destruction of 138 529 head of game. The final stage in the fight against nagana was reached with the development of the drug antrycide, which was released in January 1949. In experiments this drug was proved to prevent as well as cure nagana — hence it could be used to immunize cattle.⁶⁴

THE END OF NAGANA

The spraying campaign, costing almost £1 million, and in its last stages using 72 million litres of special 4% BHC mixture per month, was able to overcome the tsetse fly where the slaughter of hundreds of thousands of head of game had failed. At the peak of the spraying operation, twelve twin-engined aircraft and three helicopters were in use. Spraying came to a halt at the end of the summer season in early 1950 and the total area sprayed was approximately 11 200 square kilometres. Trapping to test for the incidence of the tsetse fly continued. Before the spraying campaign, thousands of tsetse flies had been caught in the Harris traps in the Umfolozi, Hluhluwe and Mkuzi game reserves. But from June 1948 to January 1950 not a single tsetse fly was caught in the Mkuzi reserve (the first area sprayed). In February 1954 the government was able to finally announce the success of its anti-tsetse fly spraying campaign. Since May 1953 no tsetse flies of the kind causing nagana were found on 'bait' cattle or in the Harris fly traps still being used to assess the

presence of any tsetse flies. Finally on 27 October 1958 the administrator of Natal was able to formally declare the Umfolozi Game Reserve open to the public as a permanent game reserve. No longer were there fears of it harbouring the tsetse fly and endangering the surrounding farmers' livelihood.⁶⁵

An explanation was also given for the approximately ten-year cyclical appearance of nagana. It was postulated in a paper by Fiedler, Du Toit and Kluge, published in 1954, that the parasitic wasp, *thyridanthrax*, was responsible. This wasp lays an egg inside the tsetse pupa and when this larva hatches it feeds on and destroys the pupa. When the number of tsetse flies increases, there are more flies than wasps but since the wasp has a shorter life cycle it eventually reaches or even exceeds the number of tsetse flies. At this point the wasps cause a decline in the tsetse-fly population - a trend which misled Harris and the game destructionists - and hence also of the incidence of nagana.⁶⁶

In November 1958 V.S. Cundill of Hluhluwe reported at a meeting of the Zululand Public Bodies and Development Association that the tsetse fly had again appeared in his district and he was afraid that there would be a recurrence of nagana. As a result, two smoke or 'de-flying' houses were erected at Charter's Creek and at False Bay on the St Lucia Lake, since these were popular picnic spots, so as to prevent the chance of visitors' motor vehicles carrying the fly back with them to the main game reserves.⁶⁷

CONCLUSION

Nagana, besides causing large-scale economic losses in terms of cattle deaths, also severely retarded the economic development of Zululand. Large areas of crown lands were not opened to white farmers although they had been demarcated for white settlement by the Land Delimitation Commission of 1902.

In spite of the failure of the big-game drives to eliminate nagana in the farming areas, the theory of game slaughter as a solution to the nagana problem was resolutely maintained by a certain section of the public right up to 1948, at which time it became evident that the synthetic insecticides provided the first permanent solution. The misguided belief in the efficacy of game eradication had led to the destruction of hundreds of thousands of wild game.

In addition, the link between game as carriers of the nagana parasite and the tsetse fly as transmitters almost led to the abolition of all the Zululand game reserves. The explanation of the cyclical movement of nagana had only been formulated in the 1950s. Hence the simultaneous reduction in the incidence of nagana every time there was wholesale killing of the game seemed to support the views of the anti-game lobby. Fortunately for posterity, the conservationists withstood the pressures on the game reserves and were able to preserve these valuable areas for future generations. □

⁶⁰ Fiedler, Du Toit and Kluge, 'Influence of tsetse fly eradication', p. 389; Pringle, *Conservationists and killers*, pp. 143 and 147.

⁶¹ *Zululand Times*, 11.3.1948; Du Toit, 'Trypanosomiasis in Zululand', p. 359; Pringle, *Conservationists and killers*, p. 144.

⁶² Du Toit, 'Trypanosomiasis in Zululand', p. 356.

⁶³ *Zululand Times*, 31.7.1947 and 23.12.1947.

⁶⁴ *Ibid.*, 24.6.1948, 14.10.1948, 6.1.1949 and 2.2.1950; Pringle, *Conservationists and killers*, p. 146; Du Toit, 'Trypanosomiasis in Zululand', p. 325.

⁶⁵ *Zululand Times*, 2.2.1950, 4.2.1954 and 30.10.1958; Du Toit, 'Trypanosomiasis in Zululand', pp. 376-377 and 380.

⁶⁶ Fiedler, Du Toit and Kluge, 'Influence of tsetse fly eradication', pp. 393-394 and 396; Du Toit, 'Trypanosomiasis in Zululand', p. 327.

⁶⁷ *Zululand Times*, 6.11.1958 and 20.11.1958.