

Tsetse and Trypanosomosis Control in the Okavango Delta, c. 1930s – 1970s

MAITSEO M.M. BOLAANE
University of Botswana

Introduction

The aim of this article is to examine the historical relationship between tsetse fly control, the cattle industry and game policy in northern Botswana. The article will locate the Botswana case in the context of contemporary tsetse and trypanosomes research in sub-Saharan Africa and illustrate some of the major factors influencing tsetse and trypanosomosis control policy in the Okavango Delta. It will also provide an overview of the development of Western scientific thinking about tsetse control in Botswana. It analyses the complex epistemologies employed in Western scientific accounts of the history of the area and emphasises the exceptionality of the Botswana context where tsetse and trypanosomosis control proceeded down a bumpy road of trial and error until late into the twentieth century. Although there seems to have been little attempt to incorporate indigenous knowledge about tsetse fly on the part of the colonial authorities, it is also interesting to note that, in the Botswana context, Africans also made sustained efforts to observe the fly environment and to experiment with its control.

Until the discovery of diamonds after independence,¹ Botswana's major capital asset was its cattle.² The advance of tsetse fly, vector of trypanosomes, which were deadly to animals and humans alike, was viewed by the colonial state as the major hindrance to the economic development of the Okavango Delta and the northwest district, Ngamiland.³ The post-war economic development of the Protectorate depended principally on the promotion of the cattle industry, and efforts were made to improve conditions related to the production and marketing of livestock. The adoption of anti-tsetse measures such as game control became an

1. Formerly British Bechuanaland Protectorate, Botswana gained its independence in 1966 as one of the poorest countries in Africa. The real gross domestic product grew on average by about nine per cent between 1966 and 2006. Diamonds are the bedrock on which Botswana's economy rests.
2. See Sir Alan William Pim, Report on the Financial and Economic Position of Bechuanaland Protectorate, 1930s, 1950s–1960s.
3. Botswana National Archives (hereafter BNA), S. 145/4/1, W.B. Brind, 'Report Field Survey on the Okavango Delta, 1951–53'.

important part of colonial policy in Ngamiland. DDT (*dichlorodiphenyl-trichloroethane*) spraying – controversial internationally – was carried out defiantly in the 1960s and 1970s on economic grounds. Tsetse fly encroachment and control was closely associated with policy towards wildlife in Botswana and was of great significance in the establishment of game parks in the north of the country.

The area infested with tsetse in Botswana was in fact relatively small when compared with that of many other African countries. However, its importance is underlined by the inclusion of the only wet environments (Okavango and Chobe) in an otherwise arid country.⁴ Moreover, only *Glossina morsitans* Westwood has ever been found in Botswana (out of 22 African species) after 40 years of tsetse research and control. This is a particularly dangerous species of tsetse fly that transmits both sleeping sickness to humans and *nagana* to livestock.⁵ The problem was compounded by the fact that wildlife was also concentrated around this wetland environment. Thus, the control of tsetse has long been related to the eradication of wildlife in Botswana.

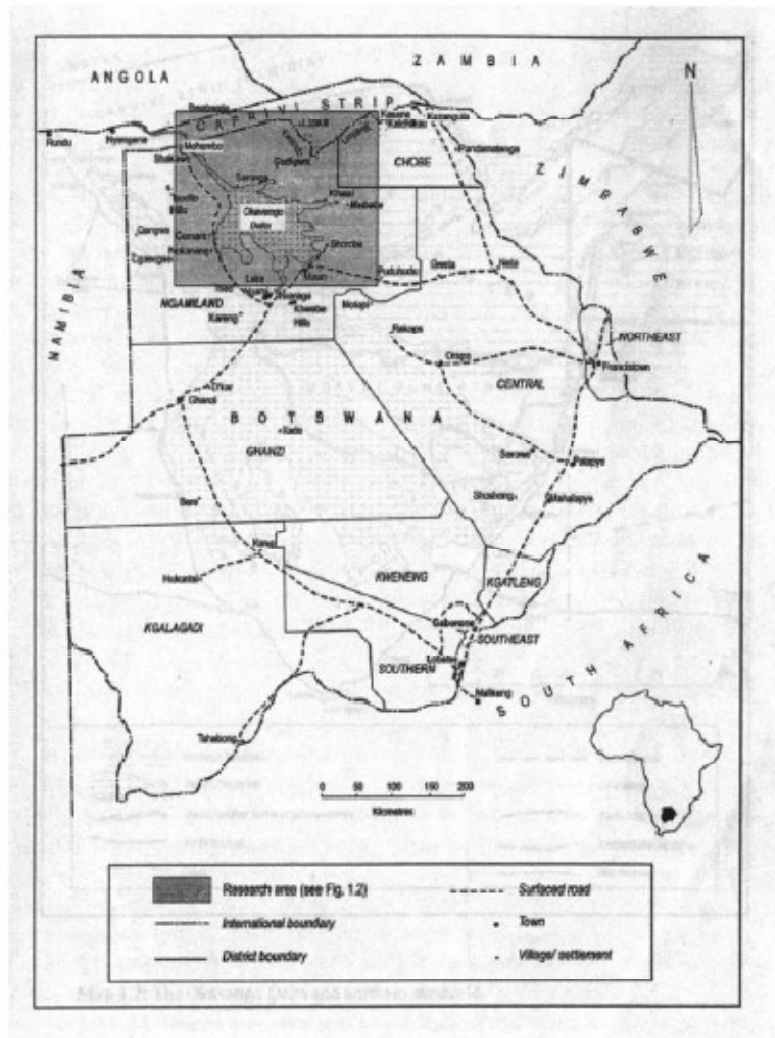
The problem of tsetse fly control has generated a large archive. Several consultants and advisors visited Botswana, and members of the Tsetse Control Department also undertook considerable research.⁶ The annual reports (1940s – 1970s) for the Department of Veterinary Services, later Veterinary Services and Tsetse Fly Control, carry a significant amount of information, especially on tsetse control and the cattle industry. International organisations such as the World Health Organisation (WHO) and the Food and Agriculture Organisation (FAO) have also investigated the problem.⁷ This material cannot all be covered here and the article focuses on the history of encroachment and control with particular reference to their links with wildlife.

4. J.E. Davies, *The History of Tsetse Fly Control in Botswana* (Gaborone, 1980), 7–8.

5. D.J. Rodgers and S.E. Randolph, 'Tsetse Flies in Africa: Bane or Boon?', *Conservation Biology*, 2, 1 (Mar. 1988), 57–98.

6. Among them was J.E. Davies, who worked in Botswana as an entomologist from April 1975 to March 1980. His work draws heavily on details of events in Botswana provided by different officials who came to Ngamiland between 1930s and 1960s. These details form the bulk of the records at the Tsetse Control Department in Maun.

7. See, for examples, BNA, Divisional Commissioner North (Div. Com (N)) 7/2; FAO, 'Report of the Expert Consultation of the Programme for the Control of African Animal Trypanosomiasis' (Rome, 28–29 Oct. 1974); D. Scott and F.L. Lamprecht, *Report on Trypanosomiasis Control in Botswana 1966–1968* (Geneva, 1968); *WWF Position Paper, Tsetse Fly Eradication in Africa* (Gland, 1987); UN/WHO Report, 'The Problem of Tsetse and Trypanosomiasis: Survey and Control in Ngamiland, Bechuanaland Protectorate' (Geneva, 1964).



Source: J.E. Davies, *The History of Tsetse Fly Control in Botswana* (Gaborone, 1980),153.

Knowledge of the Causes and Incidence of Disease

Modern studies on tsetse have outlined contemporary understandings of the cause and incidence of trypanosomiasis, a major constraint on animal production.⁸ John Ford, who worked in Nigeria, Southern Rhodesia (now Zimbabwe), Tanganyika (Tanzania) and Uganda, was assigned to Botswana in the 1950s to advise on tsetse and trypanosomiasis control. He is widely regarded as one of the leading contributors to the extensive literature on the substantial colonial and post-independence investments in tsetse and trypanosomiasis control in Africa. The book that Ford wrote in later life has become the seminal text for social scientists interested in tsetse and disease control issues.⁹ Some of the literature provides detailed discussion of tsetse flies and their habits.¹⁰ They are common in sub-Saharan Africa as far as the northern parts of South Africa, and millions of people live in tsetse-infested areas, as do their livestock.¹¹ The life cycle of the trypanosomes (parasites) involves an intermediate host, the tsetse fly; it transmits the parasites from wild animal reservoirs – of which the favourites are reedbuck, kudu, buffalo, bushbuck, and particularly warthog – to cattle or humans. The game sources are not adversely affected by trypanosomes. The converse, however, applies to cattle, to which *nagana* can be fatal.¹² According to John Ford, because many (though not all) game animals are reservoirs of pathogenic trypanosomes, early parasitologists advocated the extermination of wildlife.¹³ Ford's sojourn in Botswana put the Okavango tsetse problem into a wider African context. Understanding of causes and incidences of trypanosomiasis was limited to the state of scientific knowledge at the time, and indigenous knowledge was not regarded as of equal importance.

Occurrence of Tsetse Flies and 'Kotselo' in Ngamiland

The tsetse problem became severe in northern Botswana, particularly in Ngamiland, from the 1930s, after which Protectorate government tried to adopt drastic control measures. Most of the revenue spent in Ngamiland by the

8. Some of the key sources are A.M. Jordan, *Trypanosomiasis Control and African Rural Development* (London, 1986); D. Bourn, R. Reid, D. Rodgers, B. Snow and W. Wint, *Environmental Change and Autonomous Control of Tsetse and Trypanosomiasis in Sub-Saharan Africa* (Oxford, 2001).
9. J. Ford, *Role of Trypanosomiasis in African Ecology* (Oxford, 1971).
10. F.L. Lambrecht, 'Aspects of Evolution and Ecology of Tsetse Flies and Trypanosomiasis in a Prehistoric African Environment', *Journal of African History*, 5, 1 (1964), 2–23.
11. Jordan, *Trypanosomiasis Control*, 1–54; G. Gerster, 'Fly of the Deadly Sleep: Tsetse', *National Geographic* (1986), 814.
12. M.T. Ashcroft, 'The Importance of African Wild Animals as Reservoirs of Trypanosomiasis', *East African Medical Journal*, 36, 20 (1959), 289.
13. J. Ford, 'Game Conservation and Farming in Relation to Cattle Farming and Bovine Trypanosomiasis' (Paper, Ninth Meeting of the International Scientific Committee for Trypanosomiasis Research [ISCTR], Conakry, Guinea, 21–25 Aug. 1962).

government through the Colonial Development and Welfare Fund (CD & W) was directed at this project.¹⁴ Specialist officials, mainly entomologists, veterinarians and plant ecologists, were recruited to develop plans for tsetse fly control, which later had an impact on wildlife conservation in northern Botswana. Experts were drawn from other African colonies, such as Southern Rhodesia, Kenya, Tanganyika, Nigeria and Nyasaland (Malawi), where tsetse fly control measures were in place. Medical expertise in preventing and treating sleeping sickness was drawn mainly from South Africa and Southern Rhodesia. Tsetse thus attracted experts who applied European knowledge to the problem, and indeed intensified the colonial presence in northern Botswana.

The population distribution of Ngamiland, and especially the Okavango Delta, was affected by the availability of water and the incidence of tsetse flies. Farmers cultivated land near the riverine channels (*molapo* farming), but expansion into the swampland for additional 'moist' farming was obstructed by the presence of tsetse and trypanosomiasis. The abundant wildlife in and around the Delta maintained the fly population and acted as a reservoir of trypanosomes.¹⁵ While some families did venture into the fly area to cultivate and plant crops, and many hunted and collected honey there, tsetse restricted and shaped settlement patterns.

Before the rinderpest outbreak of 1894–98, tsetse infested large parts of Ngamiland. After game had been decimated by this epidemic, the fly retreated. However, tsetse survived in small pockets in the northwest Botswana and gradually re-appeared during the 1920s, posing a serious threat to Ngamiland's settled areas.¹⁶ Tsetse belts shifted with changes in wildlife population and distribution, in combination with other ecological factors, a point that is important for the environmental history of Ngamiland.

Travellers, explorers and hunters – such as Andersson (1857), Livingstone (1858), Chapman (1868) and Selous (1890s and 1908) – recorded tsetse in northern Botswana, but tended to skirt rather than penetrate the Okavango Delta.¹⁷ They were, however, aware of fluctuations in tsetse incidence; Chapman, for example, reported on the encroachment of flies around Mababe, stretching from Victoria Falls to the Chobe, noting that it was confined to the rivers. The second half of the nineteenth century saw a shrinking of the fly belts as hunting reduced game, which also moved away from heavily travelled areas south of Kanzungula and Victoria Falls.¹⁸ The shrinking of the fly belts was also noted in South Africa and Rhodesia, where climatic changes were implicated, as well as changes in land use. Selous

14. See BNA, Div. Com. (N), 7/2, 'CD & W Estimates of Expenditure (1958–59)'.

15. UN/WHO Report, 'The Problem of Tsetse and Trypanosomiasis'.

16. BNA, S. 572/1, 'Bechuanaland Protectorate Development Plan (1960–1964) and Draft Colonial Development and Welfare Schemes 1960–1964', 17.

17. See, for example, D. Livingstone, *Narrative of an Expedition to the Zambezi and its Tributaries* (London, 1865), 424; C.J. Andersson, *Lake Ngami or Explorations and Discoveries in the Wilds* (London, 1857).

18. See F.C. Selous, *A Hunter's Wanderings in Africa* (London, 1881).

records that by the 1880s tsetse had disappeared from Pandamatenga road. The evidence suggests that fly belts were largely determined by wildlife movements in the above-mentioned areas.¹⁹ According to J.K. Chorley, the Southern Rhodesian entomologist, this is quite understandable in the case of *G. morsitans*, which depends on game.²⁰

Tsetse fly belts were reduced further by the virulent wave of rinderpest, which had swept through East Africa in the 1890s, crossed the Zambezi and continued southwards through Botswana and Zimbabwe into South Africa.²¹ Rinderpest reduced the number of both cattle and wildlife. Observers at that time pointed out that not all game was badly affected by the disease but two of the favoured hosts of *G. morsitans*, kudu and buffalo, were reduced. In Zambia, tsetse was greatly reduced, while it disappeared altogether in the entire southern belt of Rhodesia and in the north and eastern Transvaal.²²

The recovery of both wildlife and cattle in the early decades of the twentieth century was accompanied by the re-emergence of tsetse. In August 1916, the Acting Resident Magistrate at Maun wrote: 'In recent years the tsetse fly has increased in Ngami land and it is becoming a menace to the country, apart from the losses sustained by cattle holders, some of the best grazing is entirely cut off ... The fly is now within 20 miles from Maun.'²³ Captain A.G. Stigand, Resident Magistrate of Ngamiland from 1910 to 1923, travelled by ox cart and *mokoro* (canoe) through the swamps between 1912 and 1922 drawing a very credible map, recording place names, measuring river depths and velocities and making brief notes on vegetation. In 1922, he demarcated the areas infested by flies on a map; they were clearly extending back to their nineteenth-century range. This included the Khwaai area and Chief's Island in the middle of the Delta.²⁴

Africans were also aware of such changes. H.J. Heinz, who conducted ethnological studies on the people of the Delta, recorded stories of BaYei and BaSarwa (Bushmen/San) in and around the Delta, which mentioned tsetse spreading into areas where they had not been before. Elders mentioned their attempts to reduce tsetse numbers by lighting bushfires.²⁵ Heinz recorded oral testimony that suggests tsetse were repeatedly confined to pockets before spreading

19. *Ibid.*

20. J.K. Chorley, 'A Short Historical Account of Tsetse in Southern Rhodesia', *Proceedings of the Rhodesia Scientific Association*, 36, 520 (Dec. 1938), 47-9.

21. One of the key contributors on the rinderpest epidemic and its effects on cattle is H. Kjekshus, *Ecology Control and Economic Development in East African History* (London, 1977).

22. E. Bursell, *A Prospect of Tsetse Flies* (Inaugural Lecture, University College of Rhodesia, 1968).

23. BNA, S 203/1, letter from Acting Resident Magistrate, Maun to Acting Government Secretary, Mafeking, 7 Aug. 1916.

24. On the demarcation of the tsetse-infested area, see G.A. Stigand, 'Ngamiland', *Geographical Journal*, 62, 4 (1923), 401-19. Khwaai Valley is now the Moremi Park.

25. H.J. Heinz, 'Trypanosomiasis in Ngamiland: An Ethnoparasitological Investigation', *The South African Geographical Journal*, 50 (1968), 93-100.

again.²⁶ Fire destroyed adult flies, burnt the essential shade trees for *G. morsitans* and created barriers across which they were temporarily incapable of migrating. Fire did not destroy the pupa buried under the ground, stones, and logs, so this was not a permanent solution.

I have also recorded stories of elders in the Delta from BaYei and BaSarwa groups who expressed similar views.²⁷ The focus of my investigation was the Bugakhwe San communities of Khwaai and Mababe villages, and the BaYei community of Sankoyo village, all in the vicinity of the Moremi Game Reserve. Tsetse was a major reason for the disappearance of the //Anekhwe San within the swamps and other changes in settlement. The people interviewed had extensive historical knowledge of their local environment. When explaining the Bugakhwe San movement down the Okavango panhandle into the vicinity of Moremi Park, they noted the tsetse belt, and their people kept moving, fleeing from the fly.²⁸

When one BaYei elder was asked by Heinz what disease his forefathers feared more, malaria or sleeping sickness, he said 'we fear tsetse very much, and the animals we are always concerned with are the buffalo, the warthog and baboon. They bring tsetse and *kotselo*.²⁹ The inhabitants in the vicinity of Chief's Island were bitten by 'red' tsetse which injected '*kotselo*' (slumbering/drowsiness). *Kotselo* is used here because it is indigenous to the area of study. Neighbouring communities thought that they were eating honey which induced slumber, whereas it was the tsetse. The BaYei also left the area and retreated to the west of Gomare-Nokaneng, where they and their cattle were safe. Gomare was not in the fly belt area at the time of the withdrawal of the BaYei from N/abexa, west of Chief's Island. Around the Moremi Park many people were killed by the tsetse. Heinz concludes that the //Anekhwe in the vicinity of /abauro were 'wiped out' by tsetse. Okavango oral history suggests that the San communities, particularly //Anakhwe and Bugakhwe, were formerly widespread in the Delta, and the map of the swamps prepared by Stigand (1923) is evidence of the fact that San names are found throughout the entire region.³⁰

According to Tawana oral tradition, cattle were saved by being repeatedly driven into the swamps after rinderpest in 1898, when tsetse had retreated. But the fly soon reconquered the area. Like the San and Yei, the Tawana characterised

26. *Ibid.*, 93–100.

27. The interviews are part of the extensive field work I conducted in the Okavango Delta between 1997 and 2002. The BaSarwa interviews were particularly important, because their views are largely excluded (or absent) from the archival record, despite their richness.

28. See my fieldwork notes, Khwaai, Sankoyo and Gudigwa, 1997–2001. Details on the families moving in an attempt to flee the ravages of trypanosomiasis within the Okavango are provided in M.M.M. Bolaane, 'Bugakhwe San community of Khwaai: Mapping its Own Territory', *Pula: Botswana Journal of African Studies*, 16, 2 (2002), 86–97. Such details are accompanied by direct quotes from informants.

29. Quoted in Heinz, 'Trypanosomiasis in Ngamiland', 99.

30. Maps in Stigand, 'Notes on Ngamiland', 401–19.

sleeping sickness as *kotselo* and many of them attributed it to the consumption of wild honey (usually found in heavily infested fly country).

Some elders thought that *kotselo* reached epidemic proportions at this time.³¹ Officials were not yet sure whether *kotselo* was sleeping sickness, but Acting Magistrate of Ngamiland, Lieutenant H.D. Hanney, was aware of the terrible epidemics that had recently occurred in Uganda, where some 200 000 people died between 1901 and 1906.³² Cases were also reported in Southern Rhodesia, where seven Europeans and fifty Africans were infected in 1911.³³ Hanney arranged for Dr R.U. Moffat to visit from Bulawayo. After visiting a few villages, Moffat wrote a report on a suspected outbreak of sleeping sickness in Ngamiland.³⁴

Medical, Entomological and Veterinary Expertise

A central dilemma for the colonial state was that development in Ngamiland involved cattle, while tsetse fly belts slowly recovered and expanded towards their previous limits.³⁵ By the 1930s, the spread of tsetse had approached catastrophic proportions for Ngamiland. After the Nxaragha valley, Khwaai, Kunyere and Jao Flats had been re-infested in the late 1930s, cattle had to be moved away, and valuable grazing areas were consequently lost.³⁶ The advance of tsetse had a profound impact on the economic development of the Delta, and officials felt that the control of trypanosomosis was a prerequisite for successful cattle ranching.

In 1916, chief Mathiba of BaTawana urged that a game drive and bush burning be carried out in the Boro area to prevent tsetse expanding to Maun, the administrative capital. When cattle began to be exported to Northern Rhodesia via Kazungula in 1920, the route was already threatened by tsetse.³⁷ The Bechuanaland Administration did not engage in reclamation or attack on a large scale, which was the policy used in Tanganyika. Retreat was the main alternative.³⁸ Colonial scientific understanding of the disease at this time was minimal, and no research was carried out in Botswana. In 1925 and 1926, efforts were made to widen and clear the stock routes, as well as to destroy game, but tsetse remained. Tsetse control was considered too expensive by the authorities, but in 1928 a track was

31. Interviews with elders in Gudigwa area and Khwaai, 2001 field work.

32. Resident Magistrate, Maun to Government Secretary, Mafeking, 7 Aug. 1916.

33. Chorley, 'Historical Account of Tsetse in Southern Rhodesia', 42.

34. R.U. Moffat, 'Gotsello, a Sleeping Sickness of Ngamiland, Bechuanaland', *Bulletin: Sleeping Sickness Bureau*, 9 (1909), 348–50.

35. See B. Morton, 'Social and Economic History of a Southern African Native Reserve: Ngamiland, 1890–1966', (PhD thesis, Indiana University, 1966).

36. S.N.H. Putt, 'Tsetse Control in Botswana' (MSc thesis, University of Reading, 1984), 5, 9.

37. BNA, S. 35/1/6, letter from G.E. Nettleton, Resident Commissioner to Government Secretary, Mafeking, 15 June 1917; Veterinary Services, Annual Report (1948).

38. On policy in Tanganyika, see C.F.M. Swynnerton, 'The Tsetse Flies of East Africa: A First Study of their Ecology with a View to their Control', *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 84 (1936) 1–579.

cut to the east of the Xusa fly belt by the Suzman Brothers, and cattle traders from Livingstone and Imperial Secretary Captain Clifford arrived in Maun to investigate the tsetse situation in connection with cattle exports. This led to a recommendation by the High Commissioner that a buffer zone, free of cattle and game, be established between fly and non-fly areas in Ngamiland, but no action followed. In 1929, the Governor-General, the Earl of Athlone, visited Ngamiland and was confronted by a deputation of local white traders.³⁹ The extent of the fly-infested areas in the district also increased concern among African farmers.

Dr Guy Marshall, a key scientific authority, was asked by the Secretary of State for the Colonies to discuss tsetse in Ngamiland with the High Commissioner when he attended the Sixth Pan African Veterinary Conference in Pretoria in August 1929.⁴⁰ The outcome of their discussion was a full investigation by Dr G.D. Hale-Carpenter, who had been part of the sleeping sickness operations of the Uganda Medical Services. Professor H.H. Curson, a veterinary research officer at the Onderstepoort Veterinary Institute in Pretoria, was seconded to join Hale-Carpenter, and both men arrived in Maun in November 1930, financed by a grant from the Colonial Development Fund. Curson had been instructed to 'make observations on every possible factor, which would benefit the cattle industry'.⁴¹ Despite tsetse, trading operations were expanding and during the 1920s export numbers increased to nearly 10 000 head of cattle annually.

Curson gave a list of detailed recommendations and to reduce the risks of *nagana* he suggested determining fly limits, preventing cattle from grazing near fly areas, as well as treatment of infected cattle with tartar emetic. This was difficult to administer and was not a reliable cure. He suggested clearing bush on the northern cattle route and utilising local and European hunters to destroy game in the areas of fly advance north of Maun and Tsau. He thought that a radical reduction of game in defined zones had proved to be the most effective method of controlling tsetse in Southern Rhodesia: 'All that is required is the driving back of game at least 10 miles so as to *maintain the present state of affairs*'.⁴²

Between the 1930s and 1960s, tsetse fly was discussed in scientific forums in the southern African region, especially in Southern Rhodesia, where white settlers suffered losses. In 1909, an entomologist had been appointed there and the destruction of game as a defensive measure against the encroachment of the tsetse was first tried out as an experiment in the Wankie district in 1918.⁴³ This decision was based on knowledge of the dependence of *G. morsitans* on the blood of big

39. H.H. Curson, 'Report Preliminary: *Nagana* in Ngamiland and Chobe Magisterial Districts' (Mafeking, 1932).

40. Guy Marshall had a farm in Southern Rhodesia, which Swynnerton (as in Tanzania anti-tsetse campaign) managed in the 1910s-colonial networks.

41. Curson, '*Nagana* in Ngamiland and Chobe'; UN/WHO Report, 'The Problem of Tsetse and Trypanosomiasis'.

42. Original emphasis in Curson, '*Nagana* in Ngamiland and Chobe'.

43. See E. Thomas, *Report of the Commission of Enquiry on Human and Animal Trypanosomiasis in Southern Rhodesia* (Salisbury, 1955).

game. The results of this experiment were satisfactory to officials, as the fly was driven back and animal trypanosomosis eradicated from Shangani/Gwaai area. When the belts slowly began to expand in other parts of the country, the same measures were carried out between 1925 and 1929, and reinforced by the provision of fences in the 1930s when there had been some cases of sleeping sickness.⁴⁴ Game-free buffer zones were created.⁴⁵ Wildlife extermination was practised widely in Southern Rhodesia, as this was a policy pursued by entomologists, but in South Africa there was intense debate as to whether this was useful. There, game culls occurred sporadically (often in response to high death levels among settler cattle in certain seasons) rather than as a definite long-term disease control strategy.⁴⁶

However, it was the Rhodesian strategies that informed approaches in Botswana. In 1934, a regiment of older men was ordered by the BaTswana Tribal Administration to destroy baboons near Sedie (north of Maun), as they travelled into tsetse areas and were thought to be bringing back the fly. Acting Chief Dibolaeng declared: 'I feel sorry that tsetse is so small that it cannot be shot at with a gun, as we would shoot it; however, we will try to diminish its food, or chase it away from near us.' For his part, the Resident Commissioner reminded a *kgotla* meeting that 'one way of keeping tsetse fly back is by pushing forward cultivation'.⁴⁷ Licences were issued to Africans to purchase ammunition 'to enable them to obtain food and at the same time to reduce and drive back the game', which, noted the veterinary officer, 'we hold are largely responsible for the spread of tsetse fly'.⁴⁸ Clearing bush was encouraged in northern Botswana. This was the beginning of a connection between bush clearance and game culls.

By the 1930s, occurrences of the *Rhodesiense* form of sleeping sickness – which was especially nasty as it was far more virulent than the chronic *Gambiense* – in sparsely populated savannah regions had become evident.⁴⁹ In northern Botswana, definite evidence of the disease in people was obtained.⁵⁰ It was arranged that Dr W.A.S. Lamborn, a medical entomologist from Nyasaland

44. Chorley, 'Historical Account of Tsetse in Southern Rhodesia', 44–9.

45. *Ibid.*, 50 and J.A. Whellan, 'Tsetse Fly in Southern Rhodesia, 1950–51', *Rhodesia Agriculture Journal* (Salisbury, 1953).

46. These were more subtle arguments of James Stevenson-Hamilton: not all game die in culls, therefore reservoirs for trypanosomosis will always remain and game killing is thus considered a waste of time. It is butchery rather than a scientific disease control strategy: see J. Stevenson-Hamilton, 'The Relation between Game and Tsetse Flies', *Bulletin of Entomology Research*, 2, 113 (1912), 50–90.

47. BNA S. 218/14, Minutes of *kgotla* meeting, Maun, 3 Sep. 1934.

48. Quoted in BNA, S.67/2, letter from Maun DC to Government Secretary, 14 May 1945.

49. According to Bourm et al, The *Rhodesian* type is found in eastern and southern Africa and the *Gambian* type in western and central Africa: see Bourm et al, *Environmental Change and Autonomous Control of Tsetse*, 1.

50. See BNA, S. 219/2, W.A.S. Lamborn, 'Report on the Incidence of Sleeping Sickness in Ngamiland' (Mafeking, 1935) and I.W. Mackichan, 'Report on Sleeping Sickness Survey of Ngamiland, Chobe and part of Caprivi Zipfel' (Mafeking, 1940).

Protectorate (Malawi), should visit Caprivi/Chobe. He produced a report to the Bechuanaland government recommending the evacuation of the remaining population from the northern belt, which should be declared a prohibited area for settlement. Lamborn's report was taken seriously by the colonial government. Some villages in and around the Okavango Swamps and the Chobe/Linyati Swamps were evacuated as a result of the death of Africans. In the 1920s, similar measures had been taken in Nyasaland.⁵¹

In 1938, the young wife of a white government official was admitted to hospital in Pretoria after suffering a miscarriage and having been ill in Maun for some time. Trypanosomosis was found in her blood; it transpired that she had been camping in the fly belt 40 miles north-west of Maun the previous September. A young white boy passed through the fly belt on his way home from school in Mafeking. He became ill and trypanosomosis was found in his blood at Maun hospital.⁵² According to the entomologist, Davies, these two cases were the first from the Okavango to be definitely identified. Both of them, as well as cases from Chobe, were the first from Bechuanaland to have the causal agent recognised as *Trypanosoma rhodesiense*.⁵³

At the same time, sleeping sickness was identified in a 30-year-old Okavango worker on the South African mines. The Maun Medical Officer who visited this village found another case there.⁵⁴ Reports of Delta people dying of tsetse confirmed suspicions of more widespread infection in the African population. The incidence of animal trypanosomosis was also causing concern, and it was becoming increasingly evident that the disease was spreading in the herds of local cattle, indicating that the fly belt was extending into some of the more densely populated and highly productive areas of the district.⁵⁵

In 1939, the Nxaragha area was opened to free shooting, which attracted large numbers of shooting parties to Ngamiland. The theory was that hunting parties should be spaced along the fly limit, so that game and tsetse could be driven back along a broad front. However, due to lack of supervision, all the parties went to an area where most game occurred, and the scattered game retreated down the Nxaragha valley, distributing tsetse five miles further than had ever been recorded

51. See J. McCracken, 'Colonialism, Capitalism and the Ecological Crisis in Malawi: A Reassessment', in D. Anderson and R. Grove, eds, *Conservation in Africa: Peoples, Policies and Practice* (Cambridge, 1987), 63–7.
52. See M.J. Broderick and A. Pijper, 'A Case of Sleeping Sickness from Bechuanaland', *South African Medical Journal*, 13 (1939), 127–8; J.H.S. Gear and S. de Meillon, 'Laboratory Investigations of Two Cases of Trypanosomiasis Contracted in Ngamiland, Bechuanaland', *South African Medical Journal*, 4, 13 (1939), 233–6.
53. Davies, *Tsetse Fly Control in Botswana*, 32.
54. BNA, S. 219/2, BP Medical Report, 29 June 1939. This is confirmed by the Khwaai/Gudigwa interviews, 1997–2001.
55. See the UN/WHO Report, 'The Problem of Tsetse and Trypanosomiasis'.

before. As in Nyasaland, shooting of game could make the situation worse.⁵⁶ The scheme was therefore abandoned. More successful operations started on the western front between Tsau and Nokaneng, where tsetse seemed poised to cross into inhabited cattle-farming areas. African workers began to remove the woodland from Thaoghe area. The aim was to create a 1.5-mile-wide clearing, across which tsetse would be reluctant to pass. A third move by the District Commissioner was to order defying chambers or the smudging of huts which would be erected on the edge of the fly belt, so that vehicles and pedestrians passing from tsetse to grazing areas could be disinfected.

The threat of a sleeping sickness epidemic led to Sir Walter Johnson being invited in 1937 from Nigeria to advise on a specific course of action. Johnson had served in Nigeria as Director of Medical Services.⁵⁷ He suggested that application be made to the Colonial Development Advisory Committee for funds to engage a medical officer to undertake a sleeping-sickness survey and a veterinary officer to survey tsetse and cattle trypanosomiasis. The Bechuanaland Administration was duly granted £4 000 for such a purpose.⁵⁸ Dr I.W. MacKichan of the Colonial Medical Service, Uganda, and Dr J.W. Macaulay of the Kenya Veterinary Department were seconded. MacKichan received assistance from chiefs' representatives in each area that he visited in Ngamiland to obtain blood samples from people.⁵⁹ By 1940, he had travelled over much of Ngamiland and Chobe as far as the Caprivi and obtained samples from a large proportion of the population. He found nine positive smears and three other cases with definite sleeping-sickness symptoms, mostly among adult males.

MacKichan concluded that sleeping sickness occurred in areas where tsetse were spreading and man-fly contact was increasing, such as the Nxaragha valley and the area north of Tsau, towards the south-west of the Delta.⁶⁰ He found little evidence of infection in the few antelopes he examined, and therefore concluded that sub-clinical human carriers, rather than wildlife, must be important, but he stressed that he had found no evidence for this. Nevertheless, game destruction continued to be enforced for tsetse control after the Second World War.⁶¹ In South Africa, scientists still were debating whether killing the game would lead to an intensified trypanosomiasis reservoir among domestic cattle, but these discussions only occurred in Botswana in the post-war period.

Macaulay's work became most important in guiding a long-term policy on tsetse fly control in relation to wildlife. By 1943, he was concerned that tsetse

56. BNA, S. 2 19/2/3, J.W. Macaulay, *A Tsetse and Trypanosomiasis Survey in Bechuanaland 1940-1942* (Mafeking, 1942); see also McCracken, 'Ecological Crisis in Malawi'.

57. Davies, *Tsetse Fly Control in Botswana*, 32.

58. See UN/WHO Report, 'Problem of Tsetse and Trypanosomiasis', 4.

59. Macaulay, 'Trypanosomiasis Survey in Bechuanaland', and MacKichan, 'Sleeping Sickness Survey of Ngamiland'.

60. Davies, *Tsetse Fly Control in Botswana*, 34.

61. I.W. MacKichan, 'Report on Sleeping Sickness Survey in Ngamiland: Chobe and Part of Caprivi Zipfel'; (Mafeking, Medical Department, 1940).

threatened to engulf almost the whole of the naturally watered pastoral area of the BaTswana Tribal Reserve, especially the southern and more developed part. He was able to assemble a staff of a European overseer, an African clerk/microscopist, and hunters.⁶² Macaulay recommended a number of practical administrative measures, including game control, which would help control tsetse. In 1941–42, as a result of a serious outbreak of sleeping sickness in the Nokaneng-Tsau area, over 300 Africans were hospitalised for treatment in Maun, 100 miles away. Macaulay suggested clearing vegetation from the bank of the Thaoghe River. The encroachment of tsetse here led to serious losses of cattle and the subsequent evacuation of the area: perhaps as many as 2 500 people and 10 000 cattle moved, out of a total Ngamiland population of about 41 600 people and 123 500 cattle.⁶³ The area was also said to have been one of the best for crop production in the district. Macaulay's extensive fieldwork was considered a model, 'the first major piece of tsetse work to come out of Botswana'.⁶⁴

Macaulay collected a large amount of environmental and meteorological data on the Okavango Delta. He was intrigued by the Delta's complexity, including the unpredictability of annual flooding and rainfall, both of which affected tsetse incidence. He was convinced that it was the humidity caused by the annual floods that enabled the fly to flourish.⁶⁵ He made reference to the extensive flooding of the intricate system of *molapo* – one of the peculiar conditions of the central swampland which he argued affected the vegetation and thus the distribution of the fly. It also affected the distribution and movement of game, with which Macaulay connected the outward spread of tsetse but which, like the floods, did not always take the same direction. Macaulay's report was significant, especially in undermining wildlife preservation and conservation in northern Botswana.

Macaulay noted that expenditure on tsetse control should be related to economic factors. He calculated that cattle worth £96 000 were at risk from trypanosomiasis, and quoted a figure of £25 000 as the annual value of Ngamiland cattle exports, mostly to the Northern Rhodesian copper belt. The sparse human population and the low economic level of Ngamiland did not justify major short-term expenditure.⁶⁶ After some experimental bush clearing (cutting down and burning undergrowth), he recommended game control as practised in Southern Rhodesia. A scheme was drawn up for immediate implementation: organised game destruction in the two main danger areas of Ngamiland – Nokaneng and the section threatening Maun, including the Nxaragha valley – would occur. Macaulay recommended the encouragement of hunters and sportsmen, who would also provide meat for labourers employed on bush clearing. Game, he considered, was a luxury that could not be afforded and he discouraged game reserves. At the time,

62. Macaulay, 'Review on Tsetse Fly Control in Ngamiland' (1951).

63. UN/WHO Report, 'Problem of Tsetse and Trypanosomiasis', 2–3.

64. *Ibid.*

65. Macaulay, 'Tsetse Fly and Trypanosomiasis in Bechuanaland'.

66. *Ibid.*; Macaulay, 'Review on Tsetse Fly Control in Ngamiland'.

the national cry was 'money'; cattle produced it, while wildlife did not. He asked for his recommendations to be fully publicised, especially among local people.⁶⁷ A £90 000 grant from the CD & W Fund was voted for this purpose for a five-year period from 1943,⁶⁸ the main motive being to protect Maun, the administrative capital of Ngamiland.

The Veterinary Department fully supported these strategies as part of its attempt to expand the livestock industry and improve 'methods of management, feeding, breeding and disease control'.⁶⁹ Disease control was enforced through the rebuilding of border fences (cordons) and inoculation campaigns against the increased dangers of spread of infectious diseases, particularly foot and mouth, trypanosomosis, bovine pleuropneumonia and rabies. Foot and mouth and trypanosomosis were considered more of a threat because of their regular outbreaks; the former in particular, which was a problem in most parts of the Protectorate, threatened livestock export to the main market in South Africa.⁷⁰ There was an outbreak of foot and mouth at the end of 1949 in South West Africa (Namibia), and its presence in neighbouring areas in Angola necessitated a special series of inspections and other precautions in Ngamiland. These diseases brought more veterinary services into Ngamiland in the late 1940s, and treatment of cattle for trypanosomosis increased. The spread of both trypanosomosis and foot and mouth was linked to wandering game.

The Tsetse Control Department and its Operations

In 1943, the Tsetse Fly Control Department (TFC) was established on the basis of the CD & W grant. By 1949, it employed six whites and 429 Africans, and their range of activities showed that the Department intended to involve Africans in the control operations. The first work done was the cutting of poles for game fences and the surveying of the area from the air. By 1945, 150 hunters were operating on the Maun front. Boreholes were sunk so that cattle could be moved away from the tsetse control areas, but this effort proved unsuccessful, as only one of seven boreholes produced water. Clearing also continued, and people were encouraged to settle and plough cleared areas.⁷¹ In 1945, the game fence was completed from Toteng (in the south) to Shorobe (in the north), a distance of about 700 miles. Game drives were organised at the same time, so that as much game as possible was outside the fence. The fence enclosed an area of about 1 000 square miles to

67. Macaulay, 'Review on Tsetse Fly Control in Ngamiland'.

68. UN/WHO Report, 'Problem of Tsetse and Trypanosomiasis'.

69. See Bechuanaland Protectorate, Veterinary Divisional Annual Reports, 1947–1963. This is a policy that was carried through to the independence period.

70. Veterinary Annual Reports (1948 and 1949); BNA, S. 283/4, 'Ngamiland Cattle Industry (1950s–1960s)'.

71. BNA, 433, 'Expedition on Tsetse Fly Control (1940s–1950s); M. Crawshaw, 'Notes and Recommendations for the Purpose of Discussion of Plans to be Adopted to Deal with the Tsetse Fly Menace in Ngamiland' (Mafeking, 1945).

the west of Maun (towards the Delta area), and game destruction – ‘nature’s own method of tsetse fly control’ – continued.⁷² By the end of 1945, according to one tsetse fly control officer, the fly situation had improved to such a degree that Africans ‘were moving back to the areas from which they were driven by the fly advance’.⁷³ The threat to Maun had been removed, and no cases of *nagana* had been reported for a considerable time. A local tsetse committee was set up, chaired by the District Commissioner (DC), to communicate with and explain tsetse control policy to local people. By 1946, tsetse control had cost £43 178, leaving a balance of £46 822 from the original sum voted under the CD & W scheme.

In 1946, P.A. Buxton, Professor of Entomology at the London School of Tropical Medicine and Hygiene, reported optimistically: ‘the problems of control in Ngamiland appear relatively simple.’ Only one species of fly was involved; it occupied a limited variety of vegetation types and was probably only just able to maintain itself, being at the limits of its distribution in Africa. His visit led to a further CD & W grant of £78 575 over ten years.⁷⁴ Yet the period 1946 to 1953 seemed to have been the start of a reverse in the fortunes of the TFC. The 1948 floods were more extensive than usual and hindered the building of the fence. Camps became inaccessible and game reinvaded the areas previously almost cleared. The incidence of sleeping sickness increased among TFC staff. In 1947, all staff embarked on a course of Pentamidine,⁷⁵ and blood smears from cattle in Ngamiland and the Chobe showed incidence of trypanosomiasis.⁷⁶

Africans became disillusioned. Speaking at a *kgotla* meeting in 1948 attended by, among others, the Resident Commissioner, Rammina Raditladi argued that ‘the tsetse has bitten the Government, and its doctors’. Another speaker, Kebepilwe, expressed a slightly different view, saying: ‘I think that tsetse beats us both; Africans and Europeans.’⁷⁷ When the High Commissioner visited Ngamiland in 1949, tsetse fly had driven the people and cattle away from the fertile Nkaragha Valley.⁷⁸ Among the consequences of these migrations was a decline in food production.⁷⁹ Overgrazing, soil erosion and the invasion of thorn scrub in some areas were reported, as was ‘general deterioration of the physique of Ngamiland stock’.⁸⁰

During the 1950s, it became clear that the situation remained unsatisfactory. Tsetse was still persistent in control areas and spread on occasion outside them.

72. Crawshaw, ‘Notes and Recommendations’.

73. Davies, *History of Tsetse Fly Control in Botswana*, 44.

74. BNA, S. 548/3, P.A. Buxton’s report, ‘Notes on Tsetse and Trypanosomiasis in Ngamiland’, 1946.

75. BNA, S. 219/2, Med. 5/3/I, MOH to Forest Officer, 14 Jan. 1947, and MOH’s report, ‘Sleeping Sickness and Plague’, 22 Mar. 1949.

76. I.J. Lewis’s report, ‘Tsetse Fly Control in Ngamiland’ (1957).

77. BNA, S. 219/7, Minutes of *kgotla* meeting, Maun, 1948.

78. BNA, S. 219/7, High Commissioner’s tour of Ngamiland, 19 Sep. 1949.

79. R.K.K. Molefi, *Medical History of Botswana 1885–1966* (Gaborone, 1996), 148.

80. BNA, S. 219/7, ‘Ngamiland Annual Report’ (1946).

Responsibility for tsetse control then rested with the District Commissioner, who could not give it his full attention. In 1951, Macaulay returned three times to assess the situation (after his departure almost ten years before), and advocated better fences, more hunters with better transport, bigger bonuses, more ammunition and closer supervision.⁸¹ The fences were gradually proving to be ineffective, but the idea of eradication of sleeping sickness and *nagana* by the destruction of their vectors continued to dominate colonial thinking in northern Botswana.

In 1953, John Ford, the Director of the East African Tsetse and Trypanosomiasis Research and Reclamation Organisation (EATTRRO) in Nairobi, was brought in to give advice. Ford reported that although the Kalahari was unsuitable for *G. morsitans*, 'the abundant soil water provided by the Ngamiland swamps ... permits the existence of localized vegetation far more mesophytic in character than the climate would otherwise allow. The limits of this peculiar vegetation are also the limits of the permanent habitat of the tsetse.'⁸² He explained that a narrow band of gallery forest normally bordered the *molapo* system and was dominated by large trees; and below them was a dense coverage of shrubs that provided the key habitat of *G. morsitans*. However, Ford was another optimistic visitor. His opinion was that total eradication of the whole fly belt was possible without wholesale destruction of habitat or game. He was an advocate of a new technique of 'discriminative' (selective) clearing of particular habitats using aerial photographs.⁸³ The key to this approach, employed in East and West Africa, was identifying the specific sites of tsetse concentration.⁸⁴ Discriminative research was also carried out in South Africa, where DDT-spraying only on pupa/breeding sites was employed.⁸⁵ Aerial and soil surveys were used to gather this information.

Ford was convinced that vegetation rather than game determined the distribution of tsetse in the Okavango and that vegetation manipulation held the key to eradication. He thought that the Okavango fly belt was near its geographical limits and would not expand much more.⁸⁶ However, he was conscious of economic considerations and considered that the cost of tsetse control in Ngamiland during the last ten years had been far too high in relation to the benefits gained. He suggested rice growing, as cattle farming was not a good defence against re-encroachment of fly. The alternative to such combined operations would be to reduce tsetse control to a minimum, and leave the Delta much as it was. A

81. BNA, Div. Com. (N), 1/ & 10/9, 'Report: Control of Tsetse and Trypanosomiasis'.

82. BNA, Div. Com. (N), 7/2, Ford's report, 'Anti-Tsetse Measures in Ngamiland, BP' (1953). Similar discussion is pursued in Lambrecht, 'Aspects of Evolution and Ecology', 2-23. Mesophytes need a moderate amount of water.

83. Ford's report, 'Anti-Tsetse Measures in Ngamiland'. The term 'discriminative' is used throughout reports of tsetse control in the Okavango.

84. Ngamiland report, 'Control of Tsetse and Trypanosomiasis' (1957); E.A. Lewis, *The Tsetse and Trypanosomiasis Situation in Ngamiland BP, April - May 1956* (Geneva, 1956).

85. R. du Toit, 'Trypanosomiasis in Zululand and the Control of Tsetse Flies by Chemical Means', *Onderstepoort Journal of Veterinary Research*, 26 (1954), 317.

86. Ford's report, 'Anti-Tsetse Measures in Ngamiland'.

new Tsetse Fly Control Officer was charged with the responsibility of doing a detailed survey of the whole fly belt. He noted that the cold winters of Ngamiland restricted the period of emergence of fly pupae to August and September. This phenomenon, suggested earlier by Macaulay, could make air spraying more efficient.⁸⁷

Period of Selective Bush Clearing, 1953–1957

Ford's report was accepted, with some reservations, as the new foundation for planning. In 1953, Ivor J. Lewis was recruited as the Tsetse Fly Control Officer. A South African with a B.Sc. Degree in Biology from Rhodes University, he had worked for nearly three years as a survey officer with the Nyasaland Tsetse Department. Like Ford, he thought game destruction had never completely eliminated tsetse around Maun, and his assessment was that there had been considerable re-invasion. He suggested a two-year period of minimum defence, during which small-scale discriminative clearing would be done experimentally to determine its effectiveness and cost.⁸⁸ The Maun DC, Mr Allison, was concerned that Lewis proposed to abandon practical control work for two years, even though the fly belt was bulging westwards between Tsau and Nokaneng. It is important to observe that shooting did not stop during the period 1953–1956 or thereafter.

During the 1950s, control operations became a matter of concern at government headquarters as well as the regional office of the WHO in Africa. The Resident Commissioner and Government Secretary in Mafeking, the Chief Secretary in Pretoria and the Divisional Commissioner for Northern Protectorate, J.F. Millard, all expressed concern. Millard agreed with Ford that too much had already been spent for the benefits gained. Crop yields even in the most fertile *molapo* and ancient water courses are far below the average of some of the vast still undeveloped river basins of Central Africa.⁸⁹ He suggested that, if tsetse was near its limits, wells should be sunk or water piped out to the 'magnificent pastures' outside the fly belt. Cattle, he considered, were the only proven economic resource of Ngamiland.⁹⁰

Lewis agreed that tsetse control should be economically worthwhile and began more intensive monitoring of results. Deaths attributed to trypanosomiasis were uneven: in 1954, 563; in 1955, 278; and in 1956, 473.⁹¹ Vegetation mapping proceeded under an EATTRRO ecologist, R.D. Pilson, who considered the staff position at TFC 'totally inadequate' for the proposed work of clearing on two fronts, making vegetation maps, surveying, observing and costing. He did, however, concede that game destruction had 'up to now succeeded in keeping *G.*

87. See Davies, *History of Tsetse Fly Control in Botswana*, 52.

88. Ivor Lewis's report, 'Tsetse Fly Control in Ngamiland' (1957).

89. BNA, S. 283/4, Report to the Government Secretary, 11 Aug. 1953.

90. BNA, S. 283/4, Report 'Ngamiland Cattle Industry' (Oct. 1958), 3–5.

91. Report, 'Control of Tsetse and Trypanosomiasis' (1957).

morsitans under fair control'.⁹² His views on game destruction contradicted both Ford and Lewis.

In July 1955, Dr. E.A. Lewis, the director of EATTRRO, was invited to visit Ngamiland as a WHO consultant. Like Ford and Ivor Lewis, E.A. Lewis thought that game destruction had not been effective, and advocated selective clearing in conjunction with game control. Ford and Lewis agreed that a large percentage of the sites found were in forests, under tall trees with undergrowth 'so dense that no sunlight could enter'.⁹³ On the basis of such data, E.A. Lewis considered the survey of the plant communities of considerable value in developing policy on tsetse control.⁹⁴ Lewis called for active collaboration with tribal authorities, not least to attract workers for bush clearance, with the promise that land freed of tsetse would be allocated to people with permanent water supply in the form of wells.

E.A. Lewis saw renewed energy in tsetse control under Ivor Lewis, and reported an overall reduction of game, except warthog, which had increased.⁹⁵ But he also received alarming reports that tsetse encroachment in some areas had caused serious new outbreaks of disease.⁹⁶ This deterioration was confirmed on a second visit in 1956, financed by the WHO. According to official records figures, cattle in Makakung had declined from 10 512 to 6 666 in one year.⁹⁷ The selective clearance policy seemed to be failing.

All this was noted by the government. The feeling at the headquarters in Mafeking was that the struggle against tsetse on the edges of the Delta was probably not economically justifiable. When the Chief Medical Officer and advisor to the Colonial Office, Sir Eric D. Pristie, visited Bechuanaland in 1953, he had already raised questions about large-scale clearance, as well as the recurrent expenditure that would be required: 'the position seems different to that of other parts of Africa where population pressure is often the driving force of tsetse fly reclamation schemes'.⁹⁸ A water development programme outside the fly belt was probably a better answer to the problem. The geophysical surveys showed that the spread of tsetse was not confined to the west side of the swamp. Flies could now be found only two miles north of Shorobe (not far from Maun), whereas in 1953 they only occurred to the north of Sankuyo. In 1957, Dr. K. Unsworth, the Director

92. R.D. Pilson, 'A Report on a Visit to the *Glossina morsitans* Infested Areas of the Okavango, Ngamiland, Northern Province' (1955); 'Tsetse Survey and Control in Ngamiland' (1957).

93. See Pilson, 'A Review of the Tsetse Situation in the Mapeno Section of the Tsau Area and its Bearing on the Grazing Potential of the District' (1957), quoting Ford's and Lewis's reports.

94. E.A. Lewis, *The Tsetse and Trypanosomiasis Situation*.

95. *Ibid.*

96. BNA, Div. Com. (N) 7/2, letter from E. Wright to E. Lewis, May 1956. In 1962, E. Wright became a member of the Ngamiland Fauna Conservation Society which established the Moremi Game Reserve in 1963. In the 1960s, the Wright family were among the Ngamiland cattle traders and their businesses spread to trading stores. Today the Wrights are among the prominent business families of Ngamiland.

97. BNA, Div. Com. (N) 7/2, minutes of Central Policy of Tsetse Control, Francistown, 3 July 1957; see also Veterinary Records, 1956.

98. BNA, S. 393/3/3, Report on Health and Medical Policies, BP, 1953.

of Veterinary Services, argued that legislation would be necessary to prevent certain areas of the swampy ground being used by livestock.⁹⁹

Increasingly, expert opinion was divided. Professor Davey of the Liverpool School of Tropical Medicine, who visited Maun in 1957, believed that cattle exports were undervalued and argued that to abandon the area to tsetse would mean losing much arable land and grazing. Food would have to be found elsewhere in Bechuanaland for most of the Ngamiland population and their cattle.¹⁰⁰ The administrative centre in Maun would probably also have to be moved. If, however, tsetse control was accompanied by organised agricultural and livestock schemes, the resulting economic development would eventually make it all worth while.¹⁰¹

Ivor Lewis was not yet prepared to concede that selective clearing had failed, and he submitted a new application to the CD & W Fund for £98 000.¹⁰² He was still confident that a detailed study of tsetse habitat requirements would provide sufficient knowledge to refine discriminative clearing. The focus turned to *Acacia giraffea* as the most important part of tsetse habitat. Additional funds for tsetse control were supplied by the Bechuanaland Protectorate.¹⁰³

Tsetse Control as an Element of Wider Post-War Development Planning in Ngamiland

Post-war planning did not favour Ngamiland because of tsetse and shortages of underground water supplies. Even the cattle trade was hampered by restrictions. In the early 1950s, cattle from this area was banned from trekking to the railway line, which lay over 300 miles east of the district border. Consequently, Ngamiland traders had to trek cattle to the north to sell to Northern Rhodesia, where prices were low. In 1958, foot and mouth outbreaks in the Caprivi Strip prompted Bechuanaland officials to prevent its spread into their territory.¹⁰⁴ A new outbreak of the foot and mouth SAT III-type virus led to the closure of exports from the area for the whole year.

Co-operation and liaison with neighbouring veterinary services was of importance in the control of disease. South African personnel were stationed in the Caprivi for the investigation of foot and mouth.¹⁰⁵ A conference was held in Bulawayo, at which Bechuanaland was seen as a particular threat to neighbouring

99. BNA, Div. Com. (N) 3/2, letter from Director of Veterinary Services to Mafeking, 11 Sep. 1956.

100. BNA, Div. Com. (N) 7/2, Davey's Report (June 1957), citing Ngamiland Report, 'Control of Tsetse and Trypanosomiasis'.

101. *Ibid.*

102. BNA, Div. Com. (N) 7/2, Ivor Lewis's report (1956). See also BNA, 450, 'BP Development Plan and Draft CD & Welfare Schemes 1960-1964', 17.

103. BNA, Div. Com. (N) 7/2, Ivor Lewis, 'Tsetse Fly Control in Ngamiland' and E.A. Lewis, 'The Tsetse and Trypanosomiasis Situation in Ngamiland'.

104. BNA, Div. Com. (N) 3/2, letter from Director of Veterinary Services, Northern Rhodesia to Director of Veterinary Services, Pretoria, 23 Aug. 1956.

105. Veterinary Service Annual Reports (1951-1954).

countries.¹⁰⁶ The Bechuanaland Director of Veterinary Services warned that the disease could only be suppressed at great expense, and the mobility of people and animals, especially mine workers from the Copperbelt, was likely to undermine controls.¹⁰⁷ Nevertheless, controls were imposed on canoe traffic across the Chobe as well as along other transport routes, including airports. The prevalence of foot and mouth further undermined attempts to establish a flourishing livestock industry in Ngamiland. The cattle economy was failing.

By the late 1950s, a change in the nature of the struggle against tsetse in Ngamiland became evident: game elimination began to give way to game control. Davies judged the earlier strategies as 'often unorganised and ineffectual and muddled by lack of clear ideas on the best methods to use and the scale on which to apply them. This lasted from the last years of MacGiles to the frantic first years of Ivor Lewis, when much was planned but little done.'¹⁰⁸ In 1957, with new finance and a clear goal of large-scale discriminative clearing, the TFC began to find its feet. Control measures expanded through felling of trees by mechanical saws, as well as ring barking and treatment with diesel. An average of 44 hunters operated per month, killing 2 972 animals during the year.¹⁰⁹ The number of human sleeping sickness remained low, however, and affected cattle were usually sold quickly to traders who treated them in Maun before moving them, thus keeping the death rate low.

In July 1957, the first meeting of the Central Policy Committee of Tsetse and Trypanosomosis Control took place in Francistown.¹¹⁰ Discussions during the central policy meetings show yet another phase of determination to intensify control. Renewed interest was shown in resettlement programmes, particularly in the Nxaragha valley.

Serious moves towards control by insecticides (including DDT *dioldrex*) were also made during the late 1950s and early 1960s. However, Davies has noted that a record of one drum of *benzol*-based DDT emulsion being sent to the tsetse fly control unit by veterinary services could be traced back to August 1945, although there is no evidence of its application for tsetse control in the Protectorate at the time.¹¹¹ As early as 1953, Ford mentioned that 'since much of the *Glossina morsitans* habitat in Ngamiland is linear because of its dependence on *molapo* systems ... there might be a field for cheap use of insecticide applied from the ground'.¹¹² Ivor Lewis noted that the South Africans had only cleared tsetse with insecticide 'at great cost and after a long time'.¹¹³ However, by 1958, much

106. See debate on 'Game Policy', BP Legislative Council, 1961.

107. Letter from Director of Veterinary Services, 15 June 1954; Veterinary Annual Report, 1 Feb. 1954.

108. Davies, *Tsetse Fly Control in Botswana*, 61.

109. E.A. Lewis's report (1957).

110. Minutes of Tsetse Committee, 3 July 1957.

111. Davies, *Tsetse Fly Control in Botswana*, 68.

112. See Ford's report (1953).

113. See Lewis's report (1957).

experience with ground application of insecticides had been gained in Nigeria and Uganda, and the Central Policy Committee recognised that although selective clearing and resettlement were useful methods against stationary fly belts, only game control and ground spraying with insecticides could stop an advancing belt.¹¹⁴ Ivor Lewis visited British research institutions and saw ground spraying in Uganda and aerial spraying in Tanganyika, both organised by the Colonial Pesticides Unit at Arusha. By the time Lewis returned in 1960, the enthusiasm for insecticides was such that an application was made to the WHO for funds to do preliminary trials. A 99 per cent reduction through insecticide use had been achieved in Uganda at a low cost, and *G. morsitans* was eradicated from some parts of Nigeria. In the Okavango area, the transition from conventional control to large-scale ground spraying intensified in 1967.¹¹⁵ The theory of ground application was that in the hot dry season tsetse restricted most of their breeding to certain vegetation types and showed a preference for particular resting sites. Thus, insecticide could be very selectively applied to maximum effect, thus reducing costs and pollution.¹¹⁶

In the early 1960s, the total annual recurrent expenditure of TFC was estimated at £100 000, or about 2.4 per cent of the entire budget of the Protectorate, although it benefited under 10 per cent of the population.¹¹⁷ A visitor wrote that 'the expenditure of money on tsetse control in the area is staggering in relation to the permanent results achieved or likely to be achieved'.¹¹⁸ However, Ngamiland was regarded as a 'crisis area' that also threatened Rhodesia and the Caprivi Strip.¹¹⁹ Bechuanaland had an international obligation to control its tsetse fly.

Game Extermination vs Game Conservation: A Process of Tsetse Control

As has been demonstrated, tsetse control was closely linked to game conservation and hunting. Botswana was one of the few African countries that did not have a national park until after independence, but some areas were protected by statute.

The proposal for the creation of the Chobe Game Reserve met opposition from officials such as the Veterinary Officer, H.H. Webb, who considered that it would encourage the spread of tsetse fly. The Director of Veterinary Services argued that 'our cattle industry can never be put onto a proper footing if we are going to consider the game'.¹²⁰ Some local people in Chobe also raised concern because they wanted to be allowed to carry guns to protect themselves from lions.

114. Minutes of the Local Tsetse Committee meeting, Maun, 31 July 1957. For further discussion on spraying with insecticides, see Bourn, *et al.*, *Environmental Change and Autonomous Control of Tsetse*.

115. Veterinary Annual Report, 1982–83.

116. See Davies, *Tsetse Fly in Botswana*, 105.

117. Willet's report, 'Trypanosomiasis Problem in BP'.

118. See Marshall's report on tsetse.

119. Quoted in 'Local Dev. Committee report', minutes of Tsetse Committee, 8 Oct. 1963.

120. See C. Spinage, *Fauna Conservation Laws in Botswana* (Gaborone, 1991).

Nevertheless, the area was officially closed to hunting between 1932 and 1943. After 1943, no more notices were issued due to the eastward spread of tsetse and an increase in the incidence of sleeping sickness in the Maun area, which resulted in the institution of definite plans for tsetse control.

Some officials felt that no restrictions should be placed upon African hunting and that they should have opportunity to defend themselves against game encroachment. Advocates of this position argued: 'However fond we may be for the preservation of wildlife, surely we cannot hold to such an idea in the face of increased human suffering and poverty.'¹²¹ Other officials maintained that hunting by tsetse fly controllers had been expensive and 'that the game population could be severely reduced if European hunters were allowed in the swamps throughout the year, recouping their expenses by the export of *biltong*'.¹²² Between 1945 and 1964, 60 638 game animals were killed in the process of tsetse fly control. Although there are no records for individual years, the total number suggest a gradual intensification of this game destruction programme.¹²³

The Divisional Commissioner (North), John Millard (born in the Eastern Cape), was aware of changing attitudes towards wildlife, and proposed that 'an area could be set aside in the territory as a national park in order that at least some of the disappearing species may be preserved'.¹²⁴ He had been closely connected with such developments in the Congo, Uganda, Kenya and Tanganyika.¹²⁵ While appreciating that preservation of wildlife could not be run hand in hand with other developments such as the livestock industry, which he considered the 'sheet-anchor of the territory', he suggested preservation of large mammals such as giraffe, eland, cheetah, leopard and lion in Chobe. A long-term view was necessary, even if hunting were to be sustained.

Quickly, the Chobe Game Reserve was established as part of a broader trend towards wildlife conservation in the late 1950s and the 1960s. In 1959, it was gazetted, and in 1961 the Fauna Conservation Proclamation was declared in the Bechuanaland Protectorate.¹²⁶ The gazetting of the Chobe Game Reserve was followed in February 1961 by the declaration of the Central Kalahari Game Reserve, one of the largest in Africa totalling an estimated 581 730 square kilometres.¹²⁷ The Chobe no-hunting area was elevated finally to national park

121. BNA, Med. 5/3/2, DMS to D. Atkins, 27 Oct. 1948.

122. BNA, S. 222/2/1, 'Minute on hunting and animal disease control', 29 June 1957.

123. BNA, 694, 'The numbers of game killed in tsetse fly control operations, 1942-63'.

124. BNA, Div. Com. (N) 2/8, letter from Millard to Mafeking, 1 Apr. 1953.

125. BNA, Div. Com., letter from Millard to W.F. Mackenzie, 18 May 1953.

126. Letter from DC to Game Ranger on 'Fauna Conservation Proclamation No. 22 of 1961', 22 Apr. 1961.

127. See G. Silberbauer, *Report to the Government of Bechuanaland on the Bushman Survey* (Gaborone, 1965). Recently the Central Kalahari Game Reserve has been associated with a controversy regarding the Botswana government's decision to relocate San from it. The San have since challenged the government's decision at the Lobatse High Court. Judgement was delivered in their favour on 13 Dec. 2006.

status in 1968. Wildlife tourism appeared to be more lucrative than cattle ranching in these environments. Game reserves in Zululand in particular were a means of coming to terms with tsetse, rather than trying to eradicate *nagana* as was the case in Ngamiland.

Controversy Surrounding Game Extermination and DDT Innovation

The control of tsetse by game extermination increasingly became a controversial issue in the 1960s. Through the wildlife societies, the World Conservation Union (IUCN) and the World Wildlife Fund (WWF), conservationists expressed concern about the destruction of wild animals as a method of controlling tsetse-borne trypanosomes. The concern was that environmental and ecological implications of eradication were not fully appreciated and that adequate measures were not always taken to minimise damage. The WWF, for instance, maintained a position that tsetse eradication was not the only means of improving rural living standards. In their view, an alternative form of rational, sustainable land-use was the development of wildlife utilisation.¹²⁸ The destruction of one natural resource in the apparent interest of another did not commend itself within the international conservation community. Moreover, this was a period of a greater recognition of the importance of wildlife as a natural resource, particularly in Africa. In his report to UNESCO in 1960, Sir Julian Huxley observed that various tsetse control methods had been and were being employed in vast areas of Africa where cattle succumbed to the trypanosome infection to which wild game are immune. He further noted that even game-slaughter aimed at eliminating the vectors of the trypanosome parasite was tried on a large scale in Southern Rhodesia before 1945, but had proved destructive of a valuable resource and often inefficient, since various small species survive and continue to act as vectors.¹²⁹ John Ford also believed that large-scale game destruction was a wasteful and wrong method of trypanosomosis control in the 1960s, but he acknowledged that other techniques, especially bush clearing and insecticide spraying, were not entirely effective and supported the idea of culling some species.

It is easy to understand why the temptation to revert to game destruction sometimes seemed to be irresistible to hard-pressed veterinarians. Experience showed that rapid and wholesale elimination of wild animals, in many areas the principal host, was followed by a decrease in the fly population. This was demonstrated again by a game-elimination experiment during 1962–63, the main target being warthog, which was increasingly recognised as an important – perhaps the most important – host-species. But evidence for long-term success was less conclusive, and during the 1960s it was frequently challenged. P.E. Glover, of the

128. G. Child, *Tsetse Fly Eradication in Africa* (Gland, 1979), 1–2.

129. Quoted in J. Ford, 'Control of Tsetse-Fly by "Game" Extermination', *IUCN Bulletin*, 5 (Apr.-June 1965), 7.

Tanzania National Parks, cited an example of an intensive hunting experiment in Rhodesia that wastefully killed species which should not have been culled. He argued that zebra, impala and duiker were seldom hosts for tsetse, while Thompson's gazelles tended to keep out of tsetse habitats. Critics argued that no instance was known where game elimination by itself had provided a final solution to the tsetse problem. A residue of tsetse had contrived to adapt itself to more elusive hosts, ready to make a 'comeback' if conditions became more favourable – including those provided by an increase in domestic stock.¹³⁰ Fraser Darling argued that the Rhodesian slaughter policy was ineffective because the warthog, kudu and duiker could survive and infiltrate again.¹³¹

By contrast, some now saw tsetse as guaranteeing the safety of wildlife. The European Economic Community (EEC) was even challenged for its intention to fund the Rhodesia, Mozambique, Malawi and Zambia tsetse eradication schemes. The protagonists of game farming pursued a thesis that wildlife was less destructive of the environment than cattle, which comparatively were more likely to produce negative effects from overstocking.¹³² This had been a key concern of veterinarians since the 1930s.

DDT, banned in Europe, North America and South Africa, was increasingly controversial in the 1960s and 1970s.¹³³ This centred around the fact that DDT and its metabolites, DDE (*dichlorodiphenyldichloroethylene*) and DDD (*dichlorodiphenyldichloroethane*), although effective as pest control, are known to be toxic, carcinogenic and bio accumulative. These compounds stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by micro-organisms; half the DDT in soil will break down in 2–15 years, depending on the type of soil. DDT and its metabolites, especially DDE, build up in plants and in the fatty tissue of fish, birds and other animals. Eating contaminated foods or food products would have an effect on humans. This includes drinking contaminated water or breathing contaminated air.

Nevertheless, in the early 1970s, DDT was tried out for the first time in the Okavango and Chobe areas to terminate tsetse breeding cycles, and was considered much cheaper than dieldrin. The intensive spraying of litres of DDT and dieldrin/endosulfan resulted in the clearance of 13 000 square kilometres of tsetse. In the early 1980s, further ground spraying was carried out on the Savuti channel and the Linyati river of the Chobe to protect cattle. The number of sleeping sickness cases treated at Maun hospital declined considerably. According to P.R. Atkinson's report, the fly rounds showed that insecticides sprayed in May retained their effectiveness until the rains in November, while dieldrin lasted better into rains

130. P.E. Glover, *A Review of Recent Knowledge on the Relationship between the Tsetse Fly and Its Vertebrate Hosts* (Geneva, 1965).

131. F. Darling, 'Control of Tsetse Fly By "Game" Extermination', *IUCN Bulletin*, 16 (July/Sep. 1965).

132. P. Brookes-Ball, 'After Tsetse Fly Elimination – What?', *President's Desk* (Harare, 1984), 5–11.

133. R. Allop *et al.*, 'Fatal Attraction for the Tsetse Fly', *New Scientist*, 7 (Nov. 1985), 40.

than DDT, decomposing during the wet season and thus reducing its effectiveness. But there was also some evidence that dieldrin similarly deteriorated in the hot dry season. Some problems were encountered with atomisation of the dieldrin mixture, which was a departure from normal petro-chemical mixture, being water-based. The operation of the early 1980s continued to use the same combination of insecticide, but in a more volatile petro-chemical base. Overall population reduction was 99.8 per cent.¹³⁴ Subsequently, many countries banned DDT, which had also come into wide agricultural and commercial usage. The insecticide was nevertheless serving a purpose in the Okavango. Botswana and other developing countries were less concerned about the environmental controversy due to the fact that DDT was effective and cheaper than the new generation of pesticides that had come into use in developed countries.

Conclusion

In their analysis, many scientific experts concluded that game destruction had not been effective. Ford, in particular, advocated selective clearing in conjunction with game control, but acknowledged that other techniques, especially bush clearing and insecticide spraying, were not entirely effective. Expert opinion was divided. Officials in Botswana differed in their views about game destruction. Some supported it, especially those who were engaged in TFC operations and those with a history of hunting. A large number of animals was destroyed on this pretext. Many were of the view that trypanosomiasis limited the pace of rural development and that the potential for domestic livestock production could not be exploited as long as *Glossina morsitans* were present. Cattle had considerable social and economic significance in Botswana. Much of the British colonial policy (and later that of the independent government) was therefore aimed at eradicating tsetse to create fly-free areas for cattle and crop production. By and large, these measures were unsuccessful. Most officials also supported hunting in Ngamiland, both to diminish wildlife and secure revenue from licences. At the time, the Protectorate was administered on a shoe-string, with miniscule national revenue and minimum funding from Britain. Wildlife was at the time not seen as a viable option in the economy of Bechuanaland. No Colonial Development and Welfare funds were earmarked for wildlife.

Thus, wildlife always took second place to cattle when land-use was considered; integrated land-use by cattle and wildlife was not then seen as a possibility. Officials on the ground and their seniors in Mafeking became particularly concerned when tsetse seemed to be spreading towards Maun, the administrative centre, and the Nxaragha resettlement scheme. In Southern Rhodesia, where developments were important for policy in Botswana, wildlife eradication remained a major anti-tsetse strategy, despite increasing awareness of

134. Veterinary Annual Report, 1982–83.

the environmental implications of tsetse control among international wildlife conservation agencies.