

THE BRANCH OF TSETSE FLY OPERATIONS

by G. F. Cockbill.

1. FUNCTION OF THE BRANCH

It is the function of the Branch to administer the Tsetse Fly Act, under which all traffic to and from tsetse fly areas is controlled, to define the limits of tsetse infested areas, and to devise and implement methods of tsetse fly control.

The Director of the Branch is ex officio, a member of the Trypanosomiasis Committee, a body composed of representatives from interested Departments to advise the Minister on matters related to tsetse and trypanosomiasis.

2. THE HISTORY OF THE BRANCH

Although the Branch is the most recently created in the Department, it has had a long history. From 1909 until 1953, the control of tsetse fly was the responsibility of the Entomology Branch, but in 1953 it was decided that Tsetse Fly problems were of such national importance as to warrant creating a separate Branch of Tsetse Fly Operations.

3. THE ECONOMIC STATUS OF TSETSE FLIES IN S. RHODESIA

Intrinsically, the tsetse fly has a nuisance value only. Its importance lies in the fact that it transmits the causative organisms of trypanosomiasis to man and vertebrate animals. The trypanosomes T. congolense and T. vivax cause nagana in cattle, and T. rhodesiense, sleeping sickness in man.

Game animals infected with T. vivax or T. congolense do not exhibit signs of disease, but act as reservoirs of infection. These trypanosomes when injected by the tsetse fly into the blood stream of domestic animals cause a progressive anaemia and breakdown of the nervous tissues, which if left untreated, results in death. A human form of trypanosomiasis is endemic in parts of the Zambezi Valley. In so far as it transmits a disease fatal to domestic animals and man, the tsetse fly can be regarded as a major factor limiting the distribution of agriculture and therefore of permanent settlement in East, West and Central Africa.

The recent Government decision to proceed with the Kariba Gorge Project has made the control of tsetse fly in that area a matter of prime importance. At Kariba, human trypanosomiasis occurs. Fly is abundant, and human communities occur in scattered groups. These conditions are ideal for giving rise to epidemics of human trypanosomiasis.

It should be remembered in this connection that the construction of the Panama Canal had to await the solution of the problem of Yellow Fever which was found to be transmitted by the mosquito Aedes aegypti.

The importance attached by the Government to tsetse problems can best be gained by reference to the annual estimates. We are the most expensive Branch of the Department.

In its favour, it can be argued that since the tsetse fly has limited the spread of primitive agriculture, it has saved vast areas of Africa from soil erosion and exhaustion.

4. THE BIONOMICS OF THE TSETSE FLY

There are 20 species of tsetse fly in Africa, three of which occur in this Colony. Each has peculiar requirements of host and habitat. All, both male and female, feed exclusively on blood. In taking up blood from

their way to the salivary glands or mouthparts to be injected into a further host at a subsequent blood meal.

All tsetse are dependent upon the availability of shade for their existence, but their requirements show marked specific differences.

Thus, the most important species in the Colony, Glossina morsitans favours open savannah woodland, particularly Mopani and Brachystegia-Isoberlinia woodlands. Its range extends over some 16,000 square miles in the north western, northern and north eastern areas of the Colony. While the fly has an extensive range in the leafy season, its range is restricted in the dry season mainly to the vegetation bordering river courses where food and shelter are available. It is readily attracted to man, and its presence soon detected.

The species G. pallidipes is causing us increasing concern. Its range has, in recent years extended up the steep wooded valleys of the Zambesi escarpment into the high veld. It is to be found in fairly dense thickets such as are to be found in isolated patches bordering rivers throughout the tsetse areas. Since it occurs in isolated communities and is not readily attracted to man its presence in an area may escape detection for a long time.

A third species G. brevipalpis is of little economic importance since it rarely comes into contact with man or domestic animals. It frequents the very dense forest that can be found along our south eastern border between Chirinda forest and Melsetter.

5. TSETSE FLY PROBLEMS IN S. RHODESIA

The tsetse fly problems of Southern Rhodesia are best portrayed against a background of the history of the disease, since we have more past records of sick animals than of tsetse flies.

There is constant pressure from fly to re-occupy its old haunts. It must be appreciated that the tsetse does not present only a domestic problem. The infested areas of S. Rhodesia form part of a continuous belt which extends throughout East, West and Central Africa. Our northern and eastern borders are subjected to invasion by fly from areas where little or no control measures are carried out. Control of tsetse at this level is an international matter, in which little progress has been made.

Even our domestic problems have acquired international status since we have become Federated. Our administrative problems are considerable. Many of our control measures depend for their ~~implementation~~ upon the co-operation of the Territorial Government through its Departments. For example, control measures on Forestry Commission land require permission from the Forestry Commission. All permits to shoot game are issued by a Territorial Department. We recommend certain control measures involving native settlement to the Native Department, but have no way of implementing them. We have no right to enter Native Purchase Areas to carry out control measures. In the past tsetse in S. Rhodesia has been a problem in so far as it threatened established agriculture. While the need for protecting established agriculture is ever present, the time has come ^{when} more and more land must be reclaimed from tsetse to accommodate an expanding agriculture and rapidly increasing native population. Much of the land available for native settlement is infested by tsetse or is marginal to tsetse areas.

6. THE ORGANISATION OF THE BRANCH

Authorised Staff.

a) H. Q. staff is concerned with administration, planning, recording and with co-operating with other interested departments. The staff consists of Director, Senior Entomologist and clerical staff. Not only does the

b) There are three field entomologists with four posts to be filled. It is the work of the field entomologists to determine the precise limits of fly distribution, to investigate fluctuations in fly populations and the factors which control these fluctuations, and to superintend control measures in his area.

c) The 16 rangers are each responsible for some 1,000 square miles of infested territory. Each is provided with a vehicle, usually a Landrover, camping equipment and a labour force. He builds his own house, (lately we have been providing Altents) makes roads, drifts and bridges; he maps his area and indicates the general distribution of fly. He has between 50 and 100 African hunters in his charge, each issued with a rifle and ammunition. He reports to H.Q. at the end of each month on the ammunition and rations issued and expended and on the numbers and kinds of animals killed. He has a number of Special African Constables to help control his native staff. He has to be keen, resourceful and intelligent.

d) There are about 900 African hunters and a few hundred labourers used in road building and bush clearance work.

7. CONTROL MEASURES

The principle underlying the application of control measures is simply stated. It is required to investigate the factors controlling fluctuations in the populations of the pest under investigation, so that those factors favouring an increase in numbers may be minimised and those favouring a decrease may be intensified.

1. Game Destruction

The policy of creating a game and cattle free barrier zone between tsetse country and farming areas has been the official policy since 1922.

The main arguments in favour of the policy is that it has been shown to be effective in clearing fly from the Gwaai Valley, the Umboe valley, the Darwin area and from the Hartley area; that sporadic outbreaks of trypanosomiasis and isolated captures of fly occur along elephant routes; and that game and fly disappeared simultaneously after the rinderpest epizootic of 1896 suggesting that removing the game animals from an area would also remove fly.

However, removing the game from an area does not alter the habitat of the fly. If the game reoccupies a cleared area, fly could return. Such a situation arose in Karoi in recent years. Operations must continue over a long period to be effective, and land cleared of fly must be consolidated by settlement before reinvasion can take place.

2. Bush Clearance

In the dry season, tsetse concentrate on permanent breeding sites amongst the leafy vegetation bordering rivers. By removing such vegetation the flies are denied shelter and die from exposure. Experiments to determine the value of bush clearance as a means of control were initiated some years ago at Kariangwe, but owing to the crisis at Karoi, the entomologist in charge was recalled and the work was abandoned. A further trial was started at Msukwe but it became merged in the aerial spraying activities and its effect was lost sight of. It is an expensive measure. Labour must be found, paid for and transported. In other countries tribal discipline is such that voluntary native labour is forthcoming.

3. Border Clearing

On the Eastern Border, between Melsetter and Chirinda, about 40 miles of forest have now been clear felled, to a width of from one to three miles. The maintenance of this clearing costs some £7,000 per annum. It appears to be effective in preventing *G. pallidipes* and *G. brevipalpis* from crossing from

4. Judicious Grass fires

By withholding grass fires until a good burn can be assumed, large areas may be rendered quite bare of shade, and inhospitable to fly during the dry season. In the Darwin area this method has been found to yield good results, coupled with game destruction. Clearing the grass also renders game more visible to hunters, thereby intensifying game destruction.

5. Application of Insecticide

(a) By means of Aircraft: Aircraft are particularly effective in applying insecticide where large areas are involved.

The principle underlying control of tsetse by means of insecticides sprayed from aircraft is that an infested area is treated to kill the adult flies by immediate contact. Residual doses are not used. Those flies which emerge from pupa in the ground, subsequent to the application will not produce young for at least 32 days. A second application should be carried out after 28 - 30 days to kill the new flies before young are produced. Since pupae may remain viable in the ground for several months repeated applications are necessary to cover the full life cycle. Six to eight applications are regarded as a minimum. If one generation survives or misses an application, the whole process should begin again.

Considerable effort was put into organising a programme, building an aerodrome and roads, transporting fuel and insecticide recording flights and tsetse populations during two spraying undertakings carried out in the Msukwe - Bledge area, west of the Urungwe Reserve. The success of the operations must be judged on the reduction of fly, and the whole cost related to that area which received repeated applications.

Only 12 square miles received repeated treatment out of an anticipated area of 215 square miles. The reduction of fly density in this small area was over 90%, which approached the estimated 98% required to bring about permanent elimination of fly.

Since we have some 16,000 square miles of territory to control, aerial spraying may be regarded as being too costly for general application. The prime cause of failure of these operations was the adverse weather experienced. The effective spraying period was limited to approximately the first hours of daylight. Even then, high wind and high temperatures prevented the aerosol from coming into contact with fly over most of the area.

(b) By means of Swingfog: Application of aerosol at ground level has certain advantages over aerial application. The aerosol is brought into immediate contact with the fly, and has not first to penetrate a leafy canopy. The period over which application can be effectively made extends from late afternoon, throughout the night, to mid morning, and places inaccessible to aircraft such as deep river gorges, can be treated.

The main disadvantage, of course, is that operations proceed at walking pace, and less ground is covered per hour. However, considering the relative spraying time available and greater efficiency of the smoke reaching the fly, it is likely to provide a useful means of control under suitable conditions.

Investigations carried out so far have been encouraging. Ten machines are going into operation in the Kariba area.

6. TRAFFIC CONTROL

The removal of tsetse from traffic leaving tsetse infested areas helps to limit the spread of fly. Six cleansing chambers are in operation on the main roads leading from infested areas. In addition, on minor roads traffic is examined for fly at gates put across the road. Vehicles drive into large chambers, the doors of which are then closed, and deflying operations carried out. The cleansing chamber is effective only during the

7. TRAPS

Traps for catching tsetse are used along the Border clearing between Melsetter and Chirinda . Experience has shown that the common species, G. morsitans is not attracted to traps, but G. pallidipes and G. brevipalpis are taken in small numbers. Trapping however, is not regarded as an effective means of controlling fly in this country.

8. INTENSIVE SETTLEMENT

In order to consolidate land freed of tsetse, permanent human settlement must be established. The most effective and economical means promises to be that of intensive native settlement on a no-cattle economy.

At present, there are stringent maximum limits to the number of families per unit of land. (40 per square mile). It is required far to exceed these limits so that a rapid and thorough change in the habitat of the fly can be brought about. It is considered that such settlement would bring about ~~elimination of~~ fly in infested areas.

It will require a profound change of native agricultural policy in relation to infested areas to bring these measures into effect.

9. FUTURE POLICY

The main contribution towards a solution of our difficulties is a recommendation to the Government from the Trypanosomiasis Committee to create a Department of Tsetse Fly Control and Reclamation. This Department would include the activities of an entomological unit, a veterinarian unit and a Native Department unit, each specialising in its own aspect of tsetse and trypanosomiasis control. It is also recommended that a medical unit should concentrate on matters related to human trypanosomiasis.

In addition to consolidating the present position. The problems confronting us now are the precise determination of the fly distribution particularly that of G. pallidipes; the elaboration of suitable methods of assessing fly populations so that the economics of the various control measures may be assessed; the careful investigation of individual control methods, and of ways and means of maintaining human populations in close contact with fly.

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