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Annual Report of the Division of Entomology

FOR THE YEAR ENDED 31st DECEMBER, 1937.

By Rupert W. Jack, Chief Entomologist.

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AGRICULTURE.

(1) **Locusts.**—The Red Locust (*Nomadacris septemfasciata* Serv.) has been present in the Colony throughout the year in swarm formation, but the numbers were relatively small. The damage to crops generally was not as extensive as in previous years, injury to crops and early grass being reported from a few districts only. Breeding during the wet season of 1936-37 was confined to several localities in the low veld. During the dry season swarms gradually infiltrated into the Colony and egg-laying was reported in several localities in the Mazoe and Lomagundi districts during the last few days of December. The Department is well equipped to deal with any outbreaks which may occur. However, widespread hatching of hoppers is not anticipated, but there are signs that breeding may take place in the Colony on a larger scale than during last wet season.

During the year many reports of storks and kites following swarms have been received. Insect parasites, however, were scarce compared with former years.

Provisional agreement has been notified in connection with a project put forward by the Committee on Locust Control of the Economic Advisory Council in Great Britain for permanent international control of the Red Locust in its permanent breeding grounds, some of which have been identified in several restricted localities in Northern Rhodesia and Tanganyika Territory.

(2) **Pests of Growing Maize.**—Stalk-borer (*Busseola fusca*, Full.) was not reported as a pest during the year. Outbreaks of Army Worm (*Laphygma exempta*, Walk.) were reported

from several localities in January and March, and from the Salisbury, Hartley, Lomagundi and Mazoe districts in late December, and the young maize crop in some localities sustained extensive damage. Other pests of young maize were as follows:—

The snout beetles, *Tanymecus destructor*, Mshl. and *Systates exaptus*, Mshl., caused severe injury in the Salisbury, Hartley and Mazoe districts during December. Some damage by the beetle, *Exora discoidalis*, Jac., was reported from the Salisbury district. In one locality in the Lomagundi district caterpillars of the small moth *Marasmia trapezalis*, Guen., (Pyralidae) injured the leaves. Maize planted in land which had been green-manured with sunnhemp (*Crotalaria juncea*, L.) was severely attacked in the roots and germinating seed by a Curculionid beetle* larva in December in the Salisbury district. The effect of the use of sunnhemp as a green-manuring crop on the incidence of insect pests is a problem which must be studied closely by the Department, as there is some evidence that unfortunate repercussions may result in so far as the increase of destructive species of beetles which breed in the soil concerned.

(3) **Pests of Growing Tobacco.**—(*a*) **Root Gallworm** (*Heterodera marioni*, Goodey).—Reports of extensive injury to tobacco, both in the seed-beds and in the field by this pest, possibly as a result of the early rainfall of the last season, have been received from the Umvukwe area. The control and eradication of root gallworm is of the greatest importance to the industry, and it is satisfactory to note that an officer of the Tobacco Research Station at Trelawney has been appointed to investigate the problem.

(*b*) **Tobacco White Fly** (*Bemisia rhodesiaensis*, Corb.).—The incidence of this pest, the vector of "leaf-curl" disease, is decreasing as a result of the enforcement of the law concerning the removal of tobacco plants from the fields after the harvest in the late dry season. White Fly was found only on a few farms in Mashonaland.

(*c*) **Sand Crickets** (*Brachytrypes membranaceus*, Dr.).—In the Salisbury district sand crickets continue to be a pest of newly transplanted tobacco. Poison baiting, using a

Systates exaptus, Mshl.

moistened mixture of barium fluosilicate and maize meal (1:40), was carried out in one locality in an attempt to limit the infestation in the fields immediately prior to planting out, and a moderate degree of control was effected. It should be noted, however, that eradication of this pest from fields by means of poison bait is not possible owing to the subsequent reinfestation of fields which takes place during the rainy season. Control methods need to be continued from year to year.

(*d*) **Other Pests of Tobacco.**—The surface beetle, *Gonocephalum simplex*, F., severely injured the stems of newly-planted out tobacco in some localities in the Salisbury district, particularly in low-lying fields. The beetle recorded as a species of *Protostrophus* in my Annual Report for 1936, has now been identified as *Analeurops cuthbertsoni*, Mshl., and it has been found injuring the leaves of young tobacco plants in early December near Salisbury. Leaf miner (*Phthorimaea operculella*, Zell.) and stem borer (*P. heliopa*, Lw.) were present in the early part of the year, but no extensive damage by them has been reported. Tobacco aphis, or "green fly" (*Myzus persicae*, Sulz.) heavily infested some fields of Turkish tobacco during March and April in the Darwendale area, the early cessation of the rains bringing about favourable dry conditions for their breeding. Some damage to young tobacco by grasshoppers was reported in December from the Tobacco Research Station near Trelawney. Promising results with a moistened mixture of barium fluosilicate and maize meal broadcast on seed-beds as a poison bait for cutworms (*Euxoa segetum*, Schiff.) has been reported by a farmer in the Salisbury South area.

(4) **Pests of Leguminous Crops.**—(*a*) **Sunnhemp.**—The leaf-eating beetles, *Exora discoidalis*, Jac., and *E. apicipenn*, Jac. (Galerucidae) were responsible for much damage to the seedling crop in early December in the Mazoe and Salisbury area, and extensive areas had to be re-sown as a consequence of their attacks. The late sown crop appeared to suffer much less injury, and it is possible that by delaying the time of sowing until after the mass emergence of these beetles in early December, a satisfactory stand may be obtained.

(*b*) **Dolichos Bean** (*Dolichos Lablab*, L.) pods were severely infested with American bollworm (*Heliothis obsoleta*, F.) during April in the Salisbury district. Young plants were attacked by the beetle *Systates exaptus*, Mshl., in late December near Salisbury.

(*c*) **Cowpeas** (*Vigna*) and **Soya Beans** (*Glycine*) were injured by the leaf-eating *Ootheca mutabilis*, Sahlb. during late December in the Salisbury district.

(5) **Pests of Cotton.**—The following notes on the incidence of cotton pests have been kindly contributed by the Plant Breeder in charge of the Cotton Station, Gatooma:—

"The year saw the passing of the Cotton Pest Prevention Act, 1937, prohibiting the practice of ratooning cotton plants, and of allowing them to stand over from one growing season to the next. It is designed to prevent the spread of cotton stainers and Sudan bollworm. It is hoped that the enforcement of this measure will not only prevent the spread of Sudan bollworm (*Diparopsis castanea*, Hmp.) but, in some areas, will reduce it to the position of a minor pest. The season has been a bad one from the point of view of damage by stainers (*Dysdercus* spp.) but a considerable part of the damage resulted from a spread from areas of ratooned cotton. The enforcement of the Cotton Pest Prevention Act will reduce the amount of such staining. In most years attack by American bollworm (*Heliothis obsoleta*, F.) is the most important single factor affecting the crop; but this past season it has been comparatively unimportant, and secondary to other factors, *viz.*, stainer damage, and the February to March period of drought. As a result of the favourable early seasons, a fair portion of the crop had matured before the occurrence of extensive egg-laying by American bollworm moths at the end of February. A very interesting feature of the season has been the attractiveness of dolichos beans to ovipositing American bollworm moths. It has been a year of very mild attack of jassids (*Empoasca facialis*, Jac.) even susceptible strains yielding well, but the breeding of strains of high resistance to jassids is one of the primary considerations in the selection and breeding work."

(6) **Pests of Citrus.**—The following notes on the incidence of pests has been kindly contributed by the Director of the B.S.A. Company's Citrus Experimental Station at Mazoe.

"Citrus was free from any serious outbreaks of insect pests during the year. The mild attack of the American or cotton bollworm (*Heliothis obsoleta*, F.) was no doubt attributable in part to the severe winter. One of the lighest attacks on record of the citrus thrips (*Scirtothrips aurantii*, Faure) was experienced, and this was somewhat unexpected in view of the high temperatures of October and November, and the absence of rain. The citrus aphis (*A. tavaresi*, del.G.) gave very little trouble, and no swams of Red Locusts were encountered. Infestation by red scale (*Aonidiella aurentii*, Mask.) was much the same as usual, and losses were negligible where adequate control measures were practised."

(7) **Pests of Fruit other than Citrus.**—The chafer beetles, *Anomala exitialis*, Per. and *A. pinguis*, Per. defoliated and damaged the blossoms of apple trees during October in the Marandellas district. The leaf-eating beetles, *Adoretus testaceus*, Bhn. and *Trochalus sp.*, and a beetle *Corimosphena fasciculosus*, Per. (Tenebrionidae) severely injured apple foliage during November in Makoni district. Woolly aphis (*Eriosema lanigerum*, Hausm.) was found during November on some imported apple trees in the Salisbury district. Caterpillars of the moth, *Parasa latistriga*, Wlk., injured the leaves of plum trees during June in the Marandellas district. An unidentified blister mite was reported during November as injurious to pear foliage in the Inyanga district.

(8) **Pests of Vegetables and Garden Plants.**—Bagrada bug (*B. hilaris*, Burm.) was a pest during July and August of cabbages and other cruciferous crops in several localities. The diamond back moth (*Plutella maculipennis*, Curt.) and the cabbage aphis (*Brevicoryne brassicae*, L.) were very injurious to cabbage during the late dry season in the Salisbury district. In the same district an unidentified aphid was reported as a pest of globe artichokes during December. The chafer beetles, *Anomala exitialis*, Per., and *Adoretus testaceus*, Bhn., caused much damage to the foliage of rose trees during November and December. The gladiolus stem-borer (*Epimadiza hirta*,

Mall.) and an unidentified "yellow thrips" caused considerable injury to gladiolus plants during November in the Salisbury district. Caterpillars of the moth, *Brithys pancratii*, Cyr., severely injured the stems of amaryllidaceous plants during February at Salisbury.

(9) **Termites Infesting Buildings.**—Some of the termites, or "white ants," which have been reported during the year destroying wooden structures in buildings have been identified as follows:—*Termes badius*, Hav., *T. pauperans*, Silv. and *T. transvaalensis*, Sjöst.

(10) **Pests of Stored Products.**—(*a*) **Tobacco.**—Owing to the continued hygienic methods and early and complete disposal of crops, the position on farms and in warehouses as regards the stored tobacco worm (*Ephestia elutella*, Hubn.) and the tobacco beetle (*Lasioderma serricorne*, L.) remains satisfactory.

In a large factory there has been a decided improvement. This is attributed mainly to the continued reduction of old stocks of unpapered bales of Virginia tobacco, and the practice of introducing only tobacco that has been conditioned in a Proctor machine and properly baled and wrapped in tar-impregnated paper. This practice is strongly recommended to other manufacturers. Farm-packed bales which are brought direct from the auction floors are not in a good condition to escape insect attack.

Supplementary control methods practised are (1) strict observance of cleanliness, (2) the whole-time employment of natives catching or searching for Ephestia, and (3) smearing all store-room windows with engine oil. The oil is sticky and catches *Ephestia* and *Lasioderma*, both of which tend to fly to the windows in the late afternoon and possibly in the morning.

Turkish tobacco, which may neither be "proctored" nor wrapped in paper, is isolated in a separate store-room and subjected to the above supplementary methods, plus the hanging of many sticky fly-bands over the bales.

(*b*) **Maize.**—An unusual infestation of maize weevil (*Calandra oryzae*, L.) occurred during the winter. Investigations indicated that the outbreak was due to the early drying of the grain in the field, resulting from the early cessation of

the rains. Early drying brought about early attack by weevil. The final effect was, however, a subnormal infestation in the spring, as the grain had by this time dried out to a degree unfavourable to the extensive breeding of weevil.

The study of environmental conditions in a maize stack has led to experiments in control of maize weevil by minimising the loss of heat from the outside bags of a stack. The work has been hampered for the past two seasons by illness and by the difficulty of obtaining the use of a suitable stack for more than comparatively short periods. However, some promising results are indicated.

(11) **Miscellaneous Insects Records.**—The following insects and their host plants are worthy of record. Some of the records are the results of observations made during the year, and others are records held over from previous years, pending authentic identification of the insects:—

(*a*) The moth, *Hapalia ablactalia*, Wlk. (Pyralidae) whose caterpillars infest the fruits of Zimbabwe Creeper (*Podranea brycei*, Bignoniaceae) during March.

(*b*) The moth, *Acrocercops scalariella*, Zell. (Gracilaridae) whose caterpillars defoliate the garden plant, *Anchusa capensis* (Boraginaceae) during March.

(*c*) The beetle, *Dinoderus minutus*, F. (Bostrychidae) whose grubs bore in the cut stems of an indigenous bamboo (*Oxytenanthera abyssinica*) during September.

(*d*) The beetle, *Bagous longulus*, Gyll. (Curculionidae) which injures the leaves of water lilies (*Nymphaea*) during February.

(*e*) The beetle, *Blosyrus ipomoeae*, Mshl. (Curculionidae) which injures the leaves of sweet potatoes (*Ipomoea*) during April.

(*f*) The fruit fly, *Pardalaspis bipustulata*, Bez. (Trypetidae) whose maggots infest the fruits of a wild plant *Capparis ?tomentosa*, Lam., during March.

(*g*) The fly, *Atherigona nudiseta*, Mall. (Anthomyiidae) whose maggots injure the stems of Rhodes Grass, *Chloris gayana*, during February and March.

(*h*) The small ant, *Acantholepis capensis*, Mayr., var. *incisa*, Forel, which sometimes infests houses in Salisbury, and sometimes attends mealy bugs (*Pseudococcus*) and Australian bugs (*Icerya purchasi*) on citrus trees during December.

MEDICAL AND VETERINARY.

The following report on the tsetse fly operations has been contributed by Mr. J. K. Chorley, who is in immediate control of this undertaking.

I will only remark that one of the greatest problems in connection with the reclamation of country from tsetse fly is the utilisation and consolidation of the areas reclaimed. This problem is particularly difficult in Southern Rhodesia, where the country concerned is mostly unsuitable for European settlement and incapable of supporting any considerable native population. Furthermore, it appears that at present there is very little demand for fly-free areas for native occupation.

Large areas, when cleared of fly, are therefore available as temporary sanctuaries for game. It appears that there is a conspicuous opportunity in the present stage of development of the Colony to get rid of tsetse fly altogether, and still to retain the game. The plan consists of a slowly advancing wave of game reduction operations combined with game sanctuaries established in the areas cleared of fly. Local undertakings of a different nature may be found necessary and feasible to avoid reducing rhinoceros, and perhaps other species, beyond the recovery point. Elephant and rhinoceros would not be molested in the first place, at least until with the result of breaking contact between the fly and other species of game became apparent. Presuming sufficient localisation of the fly in contact with rhinoceros or other species, the feasibility of the application to limited areas of the results obtained by research on tsetse fly both in other parts of Africa and in this Colony could be explored.

This appears to be the logical policy in the Colony at the present time in view of the experience gained in eliminating *morsitans* by controlled operations against the game.

By Mr. J. K. Chorley.

The destruction of game as a defensive measure against the encroachment of the tsetse fly *Glossina morsitans* in Southern Rhodesia was first adopted as an experiment in the

Wankie district in 1919. The results of this experiment were entirely satisfactory, the fly was driven back north of the Shangani River and animal trypanosomiasis, the disease carried by the tsetse, was eradicated from the Gwaai Valley. When, in 1925, the slowly expanding northern fly belt began to invade settled areas, in the Umboe and Sipolilo areas of the Lomagundi district, causing heavy losses of both European and native owned stock, it was decided to apply the same measures that had proved successful in the Wankie district, but reinforced by the erection of game fences where the pressure of the invasion was greatest and where immediate results were required.

Evidence that satisfactory results were being obtained was rather slow in making itself evident, partially because of the nature of the country involved, which was particularly favourable to both fly and game, and partially owing to the cryptic nature of the disease amongst stock not subject to repeated infection. Native cattle possess some degree of resistance to trypanosomiasis and numerous natural recoveries have been observed. Animals which have recovered may "break down" at a later date if subjected to adverse conditions or are over-worked, or if they contract some other disease. In such circumstances, deaths may occur many miles from the site of infection, and even years after the disease was originally contracted, trypanosomes being present in the blood stream at death. Increasing pressure of the tsetse in other areas (notably the Gatooma area, in 1926, where game destruction and fencing were immediately applied) necessitated in 1929, in the absence of other known and proved control measures, the application and extension of game destruction over the whole fly front wherever the ever-extending fly belt was beginning to invade new ground. The land being invaded during these years was about 1,000 square miles per annum, and the prospect of losing much occupied land, with its train of ruined and disillusioned farmers, of economic loss and the destruction of forty years of endeavour was imminent.

Happily these prospects did not mature. The policy of controlled and intensive game destruction with the object of creating a game free buffer zone between the fly and settlement has proved successful in stopping the advance of the fly in all

the areas where it has been applied. Furthermore, not only has the immediate object of stopping further advances been gained, but it has been found possible in practice to recover ground. The experimental stage has passed. To-day it is a proved measure which can, with confidence, be applied in any area on the periphery of a fly belt wherever land is required for European or native development.

The cost, both financial and ethical, has been great, and is an ever mounting total, and the question of how far we shall bite into the fly belt reclaiming land for which at the moment there is no immediate want is one which will soon demand an answer. It may be asked what are the immediate objectives of the present policy? Stated briefly, they are:—

(*a*) In the northern districts to drive the fly below the escarpment and to reclaim the Urungwe Native Reserve.

(*b*) In the Hartley, Sebungwe and the south-western portion of the Lomagundi districts to drive the fly back to a line running roughly from the south-western beacon of the Urungwe Native Reserve to a point north of Gokwe in the Sebungwe. In effect, to reclaim the whole of the old Mafungabusi-Hartley fly areas based on the Umfuli and Umniati Rivers. This area would include the recent sleeping sickness area at Gowe and the mining district around the Emerald and Copper Queen Mines. It is expected that this objective will be achieved within the next few years. Much progress has already been made.

(*c*) In the Wankie, Bubi and Sebungwe districts to drive the fly some fifteen to twenty miles north of the Shangani River, and thus protect the Wankie Game Reserve from invasion and permit farming operations with a stock along the Gwaai and Shangani Rivers. This objective has nearly been achieved to-day.

There is a possible alternative to this policy. It is thought that the tsetse can be eradicated from the whole of the fly areas by a judicious and cautious extension of our present policy of game destruction, advancing by a series of wave assaults covering a period of years, and that this could be accomplished without exterminating the game in any of the districts concerned.

Concomitantly, a policy of rigid game protection would have to be enforced in the areas cleared and thought to be safe from re-invasion by the tsetse. In certain areas in the low veld where elephant and rhinoceros are abundant, other measures might have to be employed such as bush and thicket clearing. In the first place, these animals would not be shot, as it is thought that they could not recover if shot out of any given area. These remarks apply particularly to rhinoceros, which cannot be driven, are very localised and remain for years based upon a few favoured water-holes.

In several districts large areas have been closed to free shooting during the past two years, and the game has rapidly increased in these areas. In the Lomagundi district, in an area closed to free shooting two years ago, requests have been received from the Farmers' Associations to declare kudu vermin. Fortunately the area which it is suggested might be cleared of tsetse by the measures outlined, lie outside the zone of European settlement, and little mining activity either for base or precious metals is likely to develop.

The utilisation of these reclaimed areas, which may eventually be in the neighbourhood of some 6-7,000 square miles, is a problem which will require much thought and is one which will bring many other problems in its train. It is one bound up with the rate of development of the country as a country of progressive white civilisation, of native land settlement and tenure, and with minor but essential problems connected with the provision of water, dip tanks, money-crops, roads, etc.

Already some progress has been made in the Wankie district in settling natives in the Mabale Valley, a tributary of the Gwaai River, and a dip tank is being provided from funds supplied by the Agricultural Department which has, in conjunction with the Roads Department, provided water. Similar provision may have to be made in the Doma area where a further 300 square miles has been cleared of fly, and the introduction of stock will shortly be sanctioned, also in Lomagundi, S.W., including the Magondi Reserve. The poorly watered and infertile area west of Gatooma is a par-

ticularly difficult problem, but once the two main river systems are cleared of fly, native settlement along the rivers may increase.

During the year a further 1,500 square miles of land has been reclaimed which, with the 2,500 square miles mentioned in last year's annual report, makes a total of approximately 4,000 square miles. The greater portion of this area is either Crown land or Native Purchase Area, which makes the creation of any permanent scheme of native settlement very difficult.

This large area is accounted for by the fact that in the Wankie district the tsetse is intimately connected with the river systems and does not permanently occupy the "Gusi" forests on the Kalahari Sand. Similarly, in the Lomagundi district, close to the escarpment, tsetse was restricted to the river systems and did not infest the broken arid and mountainous country forming the escarpment. For all practical purposes these areas are considered as infested—there were no cattle there and no cattle could be introduced. They are shown as infested on our maps.

On the Eastern Border it is disappointing to have to report that a number of cases of trypanosomiasis occurred during the year on farms adjacent to the border. Most of the farms concerned are in the basin of either the Inyamadzi or Chiredza Rivers, or are connected by a forest belt with these two river basins. Consequently, further clearing work was undertaken at the junction of these two rivers where they cross the border, the clearing being made approximately three-quarters of a mile wider at this point. The original clearing was maintained, all re-growth being slashed back and an exceptionally good burn was obtained in October.

A further spread of *G. morsitans* in Portuguese East Africa towards the border was recorded during the year, a number of flies being captured in the Busi Valley, at a point not more than five miles from the border clearing. An apparent increase of *G. morsitans* appears to have occurred on the Chibabava Road below Spungabera, the Portuguese Administrative post of the Mossurise district. The threat of an invasion of the lower end of the Melsetter district by this fly at some

future date has definitely increased during the year and the matter is the subject of serious consideration at the present time.

Arrangements are being made for the conveyance of alien natives by motor lorry from the food depot on the M'Kumvura River to Darwin during the dry season. This route is clear of fly, and there is no danger of sleeping sickness being introduced into the Zambesi Valley fly areas along this route, but the main alien paths in the Sipolilo and Miami districts pass through many miles of dense fly, and the danger of such an occurrence happening is real.

During the year certain economies have been effected in the reduction of native hunters and in the expenditure of ammunition.

1. **Darwin.**—The natives continue to show confidence in the success of the operations by introducing more cattle into the Kandeya Reserve, and by placing cattle at kraals close to the Masongerera and Kapanda footpaths. They still show reluctance to place cattle in the vicinity of the Nyamarapara Path, at which chamber a number of flies are caught. These flies are brought up from the low veld from an area outside the zone of our operations. The number of native hunters has been halved, as it is not proposed at present to do more than maintain the present position in the Darwin district.

2. **Sipolilo.**—An isolated case of trypanosomiasis occurred in a bull running with some native stock north of the Dande River. Individual cases of this description can be expected in this area as there are no cleansing chambers on the main footpaths from the Zambesi Valley and occasional flies may be carried up the escarpment by pedestrians. It is not considered necessary to erect chambers until such time as the broken country near the escarpment is required for settlement. The position remains satisfactory, though no resusciation of farming activity is taking place in the European areas along the Hunyani River cleared of fly some years ago.

3. **Lomagundi (Doma).**—The operations in this area have yielded most striking results during the past few years and the ultimate objective of the operations, namely, the driving back of the fly below the escarpment, appears to have been achieved during the present year. A density count carried out late in the season indicates that the river systems north of the northern fence and as far as the escarpment are now cleared of fly. In this broken country a few rhinoceros still survive, but being protected, it was thought that their presence might delay the clearing up of this area. It is possible that the activities of the native hunters has changed their habits and prevented them from remaining in the vicinity of their favourite water-holes and in consequence eliminating them as a source of food for the few tsetse which persisted around these water supplies.

More native cattle have been introduced into the southern fenced zone, making a total of slightly over 1,600 head. These herds have been carefully inspected each month, and no cases of trypanosomiasis have occurred. If future surveys confirm the present position, cattle will be allowed into the northern fenced zone during the coming year. The area cleared of fly between the northern and southern fences amounts to approximately 600 square miles, while a further 500 to 600 has been cleared between the northern fence and the escarpment, making a total of some 1,100 square miles. These are concrete results achieved with the minimum of that costly scientific control so greatly prized by some workers elsewhere.

4. **Urungwe.**—A slight improvement has taken place in the vicinity of Manyangau Hill and the new mica claims which are being opened up north of the Mkwichi River. A few rhinoceros and a small herd of elephant are based on this river, but our operations north of Manyangau appears to have reduced the density of fly in the broken and arid country to the north. This reduction of fly density is reflected in the few flies caught at the Manyangau cleansing chamber. The fly position elsewhere in the area remains much as last year. Two flies, presumably carried from the western side of the Reserve,

were caught in the vicinity of the Ranger's Camp, but for the first time for many years no cases of trypanosomiasis have been reported. A new large cleansing chamber has been erected at Vuti to deal with the large lorries with trailers transporting material to the Otto Beit Bridge over the Zambesi River at Chirundu. With the completion of this bridge and the construction of good roads, a large increase in traffic to and from the north is expected. The opening up of the Zambesi Valley has already caused considerable changes in the game population, and may eventually cause changes in the distribution of the fly. This change is already reflected in the reduced number of flies caught at Vuti cleansing chamber.

5. **Lomagundi, S.W.**—This area may be considered as part of the Hartley fly area north of the Umfuli River. During the year the few fly which long persisted on the lower end of the Umfuli River have been reduced to vanishing point, only two flies having been caught during the year. A corresponding clearance of tsetse from the Hartley side of the Umfuli has been achieved. If desired, cattle could now be introduced into the Magondi Reserve.

6. **Gatooma.**—During the year further progressive gains have been made in this area. With the exception of a small area around the Seki-Sakugwe junction, where an occasional stray fly may still be found, tsetse has been completely eradicated from the twenty mile buffer zone west of the eastern game fence. In July, the operations were extended to the Sebungwe district. In this new area fly exists on the Umniati River from just north of the Rhino Mine to a little north of the Nyhondi River, but disappears some miles south of the Umfuli junction. A few fly are also present on the Renje, Sakugwe and Nyhondi Rivers, small tributaries of the Umniati on its eastern bank, but nowhere in the area does the density of fly exceed five per boy per hour. This area includes the old sleeping sickness centre at Gowe, and the whole of the area was very heavily infested in the immediate past. Tsetse appears to have disappeared or been considerably reduced in the vicinity of the Emerald and Copper Queen Mines.

Owing to the complete eradication of fly from the Rob's Drift Road, the cleansing chamber at Gambeza was closed down in August. The area cleared of fly in this area is

estimated to be 1,200 square miles, which, together with the 300-400 square miles cleared north of the Umfuli River, makes a total of some 1,600 square miles.

7. **Gwaai-Shangani Area.**—A further progressive improvement has to be reported from this area during the year north of the Shangani River and more particularly on the Kana River. A fly survey carried out at the end of the dry season indicates the complete eradication of fly from the northern bank of the Shangani River and also from the Kana and Tshongokwe Rivers. The present limit of fly appears to be a line drawn from Mbobos Kraal to the pan on the Mzola River some fifteen miles above its junction with the Shangani River, thence eastward along the Kalahari sand watershed between the Kana and Mzola Rivers, *i.e.*, fly has been eradicated, or nearly so, over a strip roughly eight to twenty miles wide north of the Shangani River. About 700 square miles has been cleared to date.

The dip tank at Macheya is being re-opened, and native settlement with cattle along the Shangani River may be intensified. In the Mabale Valley, south of the Gwaai River, native settlement is taking place under the direction of the Native Department, a dip tank being provided by the Agricultural Department.

A few more cattle have been introduced on to the Gwaai Settlement farms and no cases of trypanosomiasis have been reported. The threat of tsetse invading the Wankie Game Reserve and the Shangani Native Reserve has been eliminated.

Traffic Control.—The cleansing chamber on the Rob's Drift Road was closed down in August, leaving five cleansing chambers, as compared with thirteen some six years ago. These stations are situated as follows:—One in the Wankie district on Walker's Road, two in the Miami district and two in the Darwin district. The regulations for the control of traffic in the Wankie district have not been strictly enforced during the year, as no further pegging of tin and tungsten claims has occurred within the fly area, and no traffic has developed. The station on Walker's Road has been maintained, as it was expected that this road might be opened up as an alternative route to the mining area north of the Gwaai River. This has

not eventuated, although a few cars have crossed Shangani River to visit the hot springs at Luvimbi. If possible this road will be opened up to the Zambesi River during the coming year. A large cleansing chamber has been erected at Vuti to deal with large motor lorries transporting material to the new bridge across the Zambesi River at Chirundu, and was brought into commission during August.

The details of traffic dealt with at the cleansing chambers is as follows:—

1. **Rob's Drift Road, Gatooma.**—Sixty-nine motor cars, four hundred and twenty cyclists and five hundred and six pedestrians (553 parties) bringing no flies.

The number of flies caught at this station in past years were: 1931 (687); 1932 (377); 1933 (498); 1934 (478); 1935 (36); 1936 (9). The last fly caught off cars was in December, 1936, and off pedestrians in August, 1935. This chamber was closed at the end of August.

2. **Miami-Zambesi Road.**—(*a*) *Vuti Chamber.*—Six hundred and forty-four (644) motor cars bringing eighty-three (83) flies (48 male, 35 female), four thousand seven hundred and thirty-five (4,735) pedestrians, two hundred and sixteen cyclists (216), (846 parties) bringing one hundred and fifty-eight (158) flies (93 male, 65 female). Total two hundred and forty-one (241) flies (141 male, 100 female).

Compared with 1932 (106); 1933 (94); 1934 (178); 1935 (454); 1936 (519).

(*b*)- *Manyangau Chamber.*—Five thousand and twenty-seven (5,027) pedestrians, two hundred and fifty-seven (257) cyclists, (897 parties) bringing eighty-eight (88) flies (49 male, 39 female).

Compared with 1935 (296); 1936 (401).

3. **Walker's Road.**—Thirty-two (32) motor cars, six hundred (600) pedestrians, six (6) cyclists (275 parties) bringing no flies.

Compared with 1932 (4,180); 1933 (989); 1934 (551); 1935 (59); 1936 (4).

The last fly caught off a motor car was in October, 1936, and off pedestrians in January, 1936.

4. **Darwin.**—(*a*) *Nyamapara Path.*—Two thousand seven hundred and eighty-one (2,781) pedestrians and eighty-one (81) cyclists (644 parties) bringing forty (40) flies (27 male, 13 female).

Compared with 1932 (112); 1933 (97); 1934 (85); 1935 (161); 1936 (403).

(*b*) *Kapanda Path.*—Two thousand seven hundred and seventy-seven (2,777) pedestrians, eighty-two (82) cyclists (745 parties) bringing three (3) flies (1 male, 2 female).

Compared with 15 flies for six months in 1936.

Melsetter Border.—The good results at first obtained from the border clearing were not fully maintained during the year under review, as a number of cases of trypanosomiasis occurred on four border farms. There were sixty suspected cases with thirty odd deaths. As an additional precautionary measure the clearing was made nearly a mile wider at the junction of the Inyamadzi and Cheredza Rivers. All re-growth on the old clearing was slashed back and a very clean burn was obtained in October, the grass being dry after early winter frosts and thick, owing to the poor burn in 1936. Three specimens of the tsetse *Glossina morsitans* were caught on the Busi River at the Gogoyo Road, a point which is not more than five miles from the border clearing on the Inyamadzi River. A rapid survey of the tsetse position in the northern Mossurise district close to the border was carried out during the year. Measures to prevent this species of fly from invading the Colony are under consideration.

Tsetse Fly Research.—Laboratory research in reference to the physiology and behaviour of *Glossina morsitans*, West. has been continued intensively throughout the year. An ample supply of wild pupae of this species has been maintained and much information of a potentially useful nature has accumulated.

It was the intention at the end of last year to produce a progress report on the work accomplished, but in the absence of statistical assistance and in face of the necessity of con-

tinuing the experiments, it has not been found possible to complete such a report, although considerable progress has been made in tabulating and writing up results. A letter on the method of estimating the water content of tsetse flies was published in *Nature* in January, and a short paper of a preliminary nature entitled "The Effect of Temperature on the Reaction of *Glossina morsitans*, West. to Light" appeared in the *Bulletin of Entomological Research* for October.

A great disappointment was sustained in connection with the project to extend the scope of the research to *Glossina pallidipes* and possibly *G. brevipalpis*. Through the courtesy of the Governor of the Mocambique Company's Territory permission was obtained to despatch a pupae collecting party to the Mossurise district of Portuguese East Africa. This party was in charge of a tsetse fly ranger who had successfully maintained the supply of *morsitans* pupae from the Lomagundi district. Unfortunately, it appears that in the type of country concerned the breeding sites of *pallidipes* and *brevipalpis* are not sufficiently differentiated for considerable number of pupae of these species to be collected, and after about three months the party was recalled. I understand that similar difficulties have been experienced with these species in other parts of Africa.

Comparisons between the reaction to meteorological factors of different species of *Glossina*, each adapted to a different environment, would undoubtedly have added greatly to the value of the research work, and the failure to obtain a supply of species other than *morsitans* is greatly to be regretted.

During the year 42,399 pupae of *morsitans* have been received at Headquarters and 15,961 flies have been bred out.

It is not proposed that intensive laboratory work on *morsitans* should be continued beyond the end of the present financial year, but arrangements have been made for an ecological and eco-climatic study during the coming dry season of the country around Chipane, in the Lomagundi district, which has supplied the pupae for laboratory work during the past two years.

Trypanosomiasis Committee.—All meetings of the Trypanosomiasis Committee throughout the year have been attended by one or more members of the Entomological Branch.

Flies of Medical and Veterinary Interest.—Two species of small midges, *Simulium nigritarsis*, Coq., and *S. pseudomedusaeformis*, De Meillon, have been found to breed during July in the River Makabusi near Salisbury. The breeding habits of some common flies have been investigated, and several carnivorous species of Dipterous maggots, including those of *Dimorphia flavicornis*, Macq., have been found to prey upon the maggots of house-flies, including *Musca interrupta*, Walk., and *M. lusoria*, Wied., in cattle dung.

Tick Survey.—The Bont Tick (*Amblyomma hebraeum*, Koch) the vector of heartwater disease of cattle, has increased its range northward from Matabeleland to the Gwelo and Hartley district. The spread of this tick is causing concern to the Department.

Bed Bugs (*Climex lectularius*, L.) **in Native Quarters.**—Experiments in the control of bed bugs in native quarters built of plastered brick are giving promising results. The attempted control consists of restricting the bugs to the lower parts of the room by means of barriers and shelters, and killing them regularly by heat from a blow lamp.

The Insect Collection.—The following numbers of insect species were identified by the Museums and other Institutions named:—

The Imperial Institute of Entomology, London: 74;

The American Museum of Natural History, New York, U.S.A.: 24;

Instituto Oswaldo Cruz, Rio de Janeiro: 9;

The South African Institute for Medical Research, Johannesburg: 10;

The Department of Agriculture and Forestry, Pretoria: 9; and the

National Museum of Southern Rhodesia, Bulawayo: 22.

More than one hundred and sixty species of insects were sent for identification to specialists in Africa and overseas during the year.

A large number of insects, including the types or paratypes of species new to science were presented to the following institutions:—

The British Museum (Nat. Hist.) London;

The School of Tropical Medicine, Liverpool;

The American Museum of Natural History, New York;

Harvard University, Boston;

The State College of Massachusetts, Amherst;

The University of Wisconsin, Madison;

Instituto Agronomica, Campinas, Brazil;

The South African Institute for Medical Research; and

The National Museum of Southern Rhodesia.

The collection of insects made by the late Major J. E. Drysdale, in the Umtali district, was presented to the Branch by the Executors of his estate, and form a valuable addition to the collection of the Branch.

ADMINSTRATIVE.

Tobacco Pest Suppression Act, 1933.—Under Part I. of the Act, Inspectors found the tobacco beetle (*Lasioderma serricorne*, F.) in one farm premises and four central warehouses. In no case was the infestation severe, but one central warehouse where tobacco was being matured, was fumigated by the owners. Evidence of the presence of the stored tobacco worm (*Ephestia elutella*, Hubn.) was found in two central warehouses operated by the same company. It was confined to waste tobacco. The owners' licences were suspended until all waste was swept up and burned, and the premises thoroughly cleaned.

Under Part II. of the Act, the tobacco whitefly (*Bemisia rhodesiaensis*, Corb.) was found on nine farms, on five of which leaf curl also was observed. Leaf curl was found on a total of six farms. In no case was whitefly or leaf curl abundant. When tobacco re-growth was in evidence, immediate steps were taken to have it destroyed.

Number of Licences Issued and Inspections made.

	1937.	1936.
Licences	583	595
Inspections	350	624

An interval of nearly four months occurred during which no inspections were made. This was necessitated by the resignation of the whole-time inspector and the consequent appointment and training of a new one. The time lost is reflected in the number of inspections carried out.

Importation of Plants Regulation Ordinance, 1904.

Number of Consignments of Plants, Fruit, etc., dealt with at Ports of Entry.

	1937.	1936.
Salisbury	2,834	2,343
Bulawayo...	11,221	12,159
Umtali	1,153	837
Gwelo	1,027	1,062
Plumtree	351	626
Beitbridge	—	40
	16,586	17,077

Number of Permits for the Introduction of Plants into the Colony.

	1937.	1936.
Special Permits	252	214
Annual Permits	62	60

Regulations in other Countries affecting Export of Plants from Southern Rhodesia.

Number of Certificates of Cleanliness issued in respect of Plants, etc., for Export.

	1937.	1936.
Certificates	48	56

More certificates were issued in respect of potatoes destined for neighbouring countries than for any other class of plant.

Six meetings of the Plant Regulatory Board were held during the year.

Injurious Substances and Animals Ordinance, 1909.

Number of Permits issued for the Importation of Bees, Beeswax and Foundation Comb from Overseas.

	1937.	1936.
Bees	—	—
Foundation Comb	—	—
Beeswax	3	3

The above permits are in respect of importations from overseas only. Importations from the Union of South Africa are unrestricted, and no records of such are kept by this Department.

Nurseries Ordinance, 1909: as Amended.

Number of Nurseries Registered and Inspected.

	1937.	1936.
Registered	13	16
Inspected	10	12

GENERAL.

Farms Visited.—Thirty-three farms were visited and advice given on pest control, besides the three hundred and fifty inspections made under the "Tobacco Pest Suppression Act, 1933.

Lectures and Exhibits.—A comprehensive exhibit containing some new features designed to promote the interest of visitors, was placed on the Agricultural Show at Salisbury, and a talk on insects was given to scholars.

Four lectures on ticks were given to the recruits of the British South Africa Police, and addresses were delivered to two District Farmers' Associations.

Two radio broadcasts from Salisbury were given by members of my staff, the one by Mr. Chorley entitled "The Influence of Tsetse Fly on the History of Southern Rhodesia" in April, and the other by Mr. Mossop, entitled "Some Tobacco Pests that can be Serious" in July, the latter being published in the *Rhodesia Agricultural Journal* for August, 1937.

Visitors.—In the course of the year Professor Parrot, of the Agricultural Experiment Station, Geneva, U.S.A.; Professor Munro, of the Imperial College of Science, London; and Dr. Compere, of the California Citrus Experiment Station, visited the laboratories and discussed some problems of insect control. Sir William Clark, High Commissioner for South Africa, accompanied by His Excellency the Governor, visited the Tsetse Fly Research Laboratory.

PUBLICATIONS.

The following papers by members of the staff were published during 1937:—

1. "Ticks infesting Domestic Animals in Southern Rhodesia" (continued), by R. W. Jack, *Rhodesia Agricultural Journal*, XXXIV., i., pp. 25-27. Salisbury, January. (Illustrated.) Revision. Reprinted as Bull. 1011.

2. "Water and Fat Content of Tsetse Flies," *Nature*, Vol. 139, No. 3505, p. 31 (Jan. 2nd). London.

3. "Some Facts and Common Fancies Concerning Declared Tobacco Pests," by M. C. Mossop, *Rhodesia Agricultural Journal*, XXXIV., 2, pp. 127-136. Salisbury, February. (Illustrated.) Reprinted as Bull. 1014.

4. "A Poison Bait for Young Locust Hoppers," by the Entomological Branch, Ibid, 2, pp. 137-141. Salisbury, February.

5. "Some Tobacco Pests that can be Serious," by M. C. Mossop, Ibid, 8, pp. 606-611. Salisbury, August. Reprinted as Bull. 1039.

6. "On the Biology of some Rhodesian Diptera, together with Descriptions of three Species of Asilidae new to Science," by E. G. Engel and Alexander Cuthbertson. Transactions of the Rhodesia Scientific Association, XXXV., 1, pp. 1-15. Salisbury, August. (Illustrated.)

7. "Biological Notes on some Diptera in Southern Rhodesia," by Alexander Cuthbertson, Ibid, pp. 16-34. Salisbury, August.

8. "The War Against Pests," by M. C. Mossop, *The Rhodesia Herald*, Salisbury, 19th August.

9. "The Effect of Temperature on the Reaction of *Glossina morsitans*, Westw. to Light. A Preliminary Note," by R. W. Jack and W. L. Williams, *Bulletin of Entomological Research*, 28, 3, pp. 499-503. London, October. (Illustrated.)

10. "An Unusual Winter Outbreak of Maize Weevil (*Calandra oryzae*, L.), by M. C. Mossop, *Rhodesia Agricultural Journal*, XXXIV., 12, pp. 935-941. Salisbury, December. Reprinted as Bull. 1050.

11. "Monthly Reports on the Locust Position," by R. W. Jack, Ibid, Nos. 1-12. Salisbury, January-December.

Acknowledgements.—I have pleasure in acknowleding the cordial co-operation of officers of other Departments and Divisions of the Agricultural Department throughout the year. In this connection may be mentioned particularly the Department of Native Affairs and B.S.A. Police in reference to locust administration, and the former again in connection with tsetse fly operations. Officers of the Division of Chemistry have been particularly helpful in connection with tsetse fly research.

I have also pleasure in testifying to the loyal service rendered by members of my staff during the year.

I greatly regret to record the death in May of the year under review of Mr. J. K. Kieser, who entered the Service of the Division in the capacity of Tsetse Fly Ranger, October, 1928. His death followed an operation for appendicitis.