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Division of Entomology,
Annual Report for Year 1936.

By R. W. Jack, Chief Entomologist.

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DIVISION of ENTOMOLOGY,
ANNUAL REPORT FOR YEAR 1936.

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AGRICULTURAL.

(1) **Locusts.**—The Red Locust (*Nomadacris septemfasciata*, Serv.) has been present in swarm formation in the Colony through the year.

The first reports of egg-laying during 1935-36 season were received in January, 1936, but the discovery of second stage hoppers during that month in the Mtobo district shows that some eggs must have been deposited early in December, 1935.

Hoppers appeared in four districts during February and the last hoppers were destroyed or developed wings in early June.

The following districts suffered hopper outbreaks on a greater or lesser scale, namely:—Darwin, Mazoe, Salisbury, Lomagundi, Mrewa, Mtoko, Makoni, Charter, Hartley, Gwelo, Selukwe, Victoria, Belingwe, Chibi and Nyamandhlovu.

What appears to have been the last swarm of the 1935 generation was reported in the Gwelo district on March 2nd, whilst the earliest fliers of the 1936 generation appeared in the Eastern districts in mid-May, having apparently come from Portuguese East Africa.

Whilst swarms have been continuously present, no reports of egg-laying in the Colony had been received to the end of December, 1936.

Campaign.—The campaign against hoppers extended from February to the end of May, but only three localities were involved before March. In most districts the outbreaks were effectively dealt with in all accessible situations. Difficulty was, however, experienced in one district due to concealment of outbreaks by the local farmers and definite refusal to take action on the part of several, necessitating prosecutions. Such

occurrences are greatly to be deplored, but there is without doubt considerable reluctance in the case of certain stock farmers to use the poison on their farms.

Experiments with a poisoned bait, developed in the Union of South Africa, gave promising results. This bait, which consists of maize meal, molasses and arsenite of soda, is judged in the Union to be less dangerous to stock than spraying on account of the lower quantity of poison used to the acre. Further experience is, however, needed as to the results of its use in possibly careless hands. The bait is, in any case, particularly useful against hoppers which hatch out amongst growing crops, where spraying is very difficult, if not impossible.

Enemies and Diseases.—The locusts have been notably free from disease during the year, and no great activity of parasites has been recorded. Birds have, however, been observed following the swarms in great numbers on various occasions.

In spite of all natural agents of destruction some very large swarms were present in the Colony up to the end of the year.

Prospects.—Whilst it appears that eggs are likely to be laid over limited areas in the Colony during the present season, there has as yet been no definite pre-breeding invasions from north of the Zambesi River, such as has preceded heavy hopper outbreaks in the past, and on the whole the prospects for the present season are reasonably favourable.

There are ample stores of pumps and poison on hand to cope with any developments.

(2) **Pests of Stored Products.**—(*a*) *Tobacco.*—The position regarding our two main pests of stored tobacco, *viz.*, the Stored Tobacco Worm (*Ephestia elutella*, Hubn.) and the Tobacco Beetle (*Lasioderma serricorne*, Fab.) remains substantially the same as during the past two or three years. This satisfactory state of affairs is attributed to proper hygiene and complete and early disposal of crops.

Adults, but not larvæ, of L. *serricorne* were found in fire-cured tobacco, but were not believed to have developed in this medium.

(*b*) *Maize.*—The pest on which attention is being focussed is the weevil, *Calandra oryzæ*, L. Investigations show that field infestation is higher on premises where maize is stored for grinding as required on the farm, than on premises from which the grain is sent to central mills early in the season for storage, to be returned as meal when needed. The problem of the best treatment for shelling dumps, from which field infestation may arise, has not yet been investigated. Environmental conditions in a maize stack are being studied with a view to devising modification of storage practice to effect control of the weevil. Interesting and possibly economic results are, so far, indicated.

(3) **Pests of Growing Tobacco.**—(*a*) *Root Gallworm* (*Heterodera marioni*, Goodey).—The increasing importance of this pest to the tobacco industry is now realised, and for this reason an officer of the Tobacco Research Station at Trelawney is carrying out investigations.

(*b*) *Tobacco White Fly* (*Bemisia rhodesiænsis*, Corbett).—This pest was not common as a pest of tobacco, being recorded only on five farms in four districts of Mashonaland.

(*c*) *Sand Crickets* (*Brachytrypes membranaceus*, Dr.).—Field tests with a moistened mixture of barium fluosilicate and maize meal gave promising results in the Salisbury South area where this cricket is a serious pest. A mortality of over 90 per cent. was reported.

(*d*) *Others Pests of Tobacco.*—A beetle, *Protostrophus*, sp., caused considerable damage to newly-transplanted tobacco during November in the Salisbury district. Cutworms, *Euxoa segetum*, Schiff, were reported as injurious to plants in the fields during February.

(4) **Pests of Citrus.**—The following has been kindly contributed by the B.S.A. Company's Entomologist at Mazoe:—

Serious damage was done by the attack of the Cotton Bollworm (*Heliothis obsoleta*, F.) and the loss will be almost as much as in 1934. The appearance of the attack did not indicate that such serious consequences would follow, but, unlike previous years, the initial flight of moths was followed by a second flight subsequent to rainfall at the end of August. The protracted summer which enabled extra summer generation to develop was also a contributory cause.

The Citrus Aphis (*A. tavaresi*, Del. G.) accounted for a little loss, but was relatively unimportant.

The Citrus Thrip (*Scirtothrips aurantii*, Faure) attack was the mildest experienced for many years and a single application of colloidal-sulphur-lime sulphur spray was sufficient for control purposes.

Although Soft Scale (*Lecanium hesperidum*, L.) has caused no trouble during the past few years, precautionary measures will be necessary during the coming year.

Other citrus pests have been of no importance and there was no damage done by Red Locust.

(5) **Pests of Fruit, other than Citrus.**—The White Mango Scale (*Aulacaspis cinnamoni*, Newst.) was found in another garden in Salisbury on a large mango tree. The Tingid, *Teleonema australis*, Dist., was very injurious to the foliage of cultivated olives in the Bulawayo district.

(6) **Cotton Pests.**—The following has been kindly contributed by the Cotton Specialist:—

American Bollworm (*H. obsoleta*, F.) damage on cotton was probably slightly less than for the last year or two, although in some areas crops were fairly heavily attacked. By regulating the time of planting of cotton and other crops, some alleviation of attack may be obtained.

Sudan Bollworm (*Diparopsis castanea*, Hmp.) damage was slightly heavier than in the previous year. Investigations show the importance of prohibiting ratooning, and the leaving of cotton crops "stand-over" from one season to another, in limiting the spread of Sudan bollworm.

Stainer (*Dysdercus spp.*) damage generally was heavier than in the previous year. Serious damage in a district appears to be correlated with the presence of fairly abundant host plants.

Jassid (*Empoasca fascialis*, Jac.).—Throughout most of the country jassid damage was slight. But in one or two isolated areas, especially on a part of the Cotton Station, Gatooma, jassid attack was abnormally heavy. This emphasises the importance of the new more highly resistant strains of cotton which are being bred up at Gatooma.

(7) **Pests of Growing Maize.**—*Streak Disease of Maize.*—Investigations were carried out in the Umtali district in January. A species of jassid (*Cicadulina mbila*, Naudé), which was found near Odzi in "streak" infected fields, was incriminated as a vector of this virus disease by Dr. Wickens, of the Plant Pathological Branch. *Cicadulina zeæ*, Naudé, was found in association with *C. mbila*, but no transmission was effected in experiments at the laboratories.

The snout beetle, *Tanymecus destructor*, Mshl., was abundant in November and December in newly sown maize lands. Poison baiting as recommended by this Branch has been frequently adopted.

The surface beetles, *Emyon tristis*, Fhs., and *Gonocephalum simplex*, F., were reported as injurious to uncovered maize grain, and to maize seedlings, in the Salisbury district during December. Infestation of volunteer maize by the stalk borer (*Busseola fusca*, Full.) was noted in mid-December in the Salisbury district, but the infestation of maize generally in Mashonaland was not serious.

(8) **Pests of Other Crops.**—Wheat was attacked by *Cirphis loreyi*, Dup. (Noctuidæ) in June and July in the Shamva district. The caterpillars were lightly parasitised by a Tachnid fly, *Linnæmyia angulicornis*, Speis.

Seedling cowpeas at the Agricultural Experimental Station, Salisbury, were attacked by the snout beetles, *Systates exaptus*, Mshl., and *Tanymecus destructor*, Mshl., in December.

(9) **Pests of Forest and Shade Trees.**—In the Gwelo district, a long-horned beetle, *Phoracantha semipunctata*, F. (Cerambycidæ), caused extensive damage to established plantations of Eucalyptus, *E. maideni* and *E. paniculata*, being severely attacked. The borer beetle, *Apate monachus*, F. (Bostrychidæ) is a pest of a shade tree, *Trichilia emetica*, Vahl. (Meliaceæ) in the Salisbury district.

(10) **Sunnhemp**.—In the seedling and young stages was seriously attacked by a beetle, *Exora discoidalis*, Jac. (Chrysomelidæ) in several localities near Salisbury during November

and December. The crop was also injured by the beetles, *Systates exaptus*, Mshl., and *Mimaulus testudo*, Fhs. (Curculionidæ).

An attack by a beetle, *Exora sheppardi*, Jac.,* was reported from a farm in the Umvukwes area in early December.

(11) **Pests of Vegetables and Garden Plants.**—Bagrada bugs (*B. hilaris*, Burm.) did a considerable amount of damage to cabbages, turnips and other crucifers during July and August in several localities. The web-worm (*Hellula undalis*, F.) was a pest of cabbages in August in the Salisbury district. A small moth, *Crocidolomia binatalis*, Zett. (Pyralidæ) injured cabbages and cauliflowers in the Marandellas area during February.

The first flowering shoots of gladiolus were severely injured in November by a Sphegid wasp, *Crabro* (*Dasyproctus*) *bipunctatus*, Lep., which makes its nest in the stems. A thrip (undetermined) was a pest of gladiolus in December and January in the Umtali, Salisbury and Gwelo districts. A Coreid bug, *Anthocoris fusciculus*, F., caused wilting of the stems of Moonflower (Datura) in March in the Salisbury district.

A Dodonæa hedge was severely infested with a lac insect, *Tachardina affluens*, Brain, in the Bulawayo district.

(12) **Miscellaneous Insect Records.**—The following insects and their host plants are worthy of record. Many of the records are the results of observations made during the year, and a few others, of earlier observations, were made when no authentic names were available:—

(1) The leaf-eating beetle, *Phædonia areata*, F., (Chrysomelidæ) which defoliated an experimental plot of a cover-crop, *Indigofera endecaphylla*, at Salisbury.

(2) The mite, *Rhizoglyphus echinopus*, F. & R., which infested the bulb of *Lilium longifolia* in July, 1935.

(3) The Bruchids, *Bruchus centromaculatus*, All., *Pachymerus cassiæ*, Gyl. and *P. pallidus*, Ol., which infests the seed pods of Cassia.

(4) The Bruchid, *Bruchus subuiformis*, Pic., which infests the seeds of Albizzia, sp.

*Identified by the Imperial Institute of Entomology as *E. apicipenne*, Jac.

(5) The Bruchid, *Bruchus rhodesianus*, Pic., which infested the seeds of dhal (*Cajonus indicus*), imported from India.

(6) The Membracid bug, *Oxyrachis gibbulus*, Mel., whose host plant is *Albizzia antunesiana* (Leguminosæ).

MEDICAL AND VETERINARY.

The following report on the tsetse fly operations has been submitted by Mr. J. K. Chorley, who is immediately in charge of this undertaking. I append a few remarks as follows:—

The continued success of the game reduction cordon in keeping the fly confined to country which is more or less useless for settlement, is a matter for satisfaction.

In addition, whilst reclamation of country from fly is not the primary object of these operations, substantial additional areas have been freed from the pest in two sections during the year.

In the Gwaai-Shangani region the fly has once again been driven back to the northern side of the Shangani River, and although fly occurs rather further west to the north of the Shangani than it did in 1922, the position is now substantially the same as at the conclusion of the four years' operations which were commenced in 1919 and discontinued in 1922. At a conservative estimate two hundred and fifty square miles of country have been cleared of permanent fly in this section since 1931.

In the Hartley district (Gatooma section), the fly has continued to recede westwards and now occupies only a relatively narrow strip of country, some 12 miles wide at its widest point, on the eastern side of the Umniati River. It is interesting that a small area on the lower Nyabangwe (Yabongwe) River in which the fly survived after 1896 is included in the area now cleared of permanent fly.

The sections of Lomagundi, S.W., and Gatooma both deal with one large salient from the main fly area. It is possible to state that at the end of the year under review this salient had been shortened by about 20 miles and narrowed

by about 15 miles on either side. The area cleared of permanent fly in this salient is roughly 1,200 square miles. Adding the areas in other sections, as given in last year's report, and the two hundred and fifty square miles in the Gwaai-Shangani region, we obtain a total of over 2,500 square miles cleared of fly, not counting the Darwin district, where an area of about 400 square miles has been made more or less safe for cattle. The last-named area is not included in the total because, whilst cattle could not be kept there, the country was not actually infested with permanent fly, only occasional specimens being met with during the worst period.

The continued improvement of the position in the South Melsetter district, presumably the result of the border clearing against *Glossina pallidipes*, is also very encouraging, but the serious threat occasioned by the advance of *morsitans* through Portuguese Territory towards the Rhodesian border in the region of the low veld of the Sabi Valley is very disquieting.

Tsetse Fly Operations (J. K. Chorley).—It is pleasing to record that during the past year, as a result of the controlled operations against game, additional gains have to be recorded. In all areas, with the exception of the western portion of the Urungwe district, the fly has been eradicated over considerable areas covered by the operations, more land reclaimed and farming areas adjacent to the fly areas further protected from invasion by ranging or carried tsetse. No advances of fly have been recorded in any area where, owing to the country being doubtfully suitable for advance, it has not been considered necessary to operate for the present. The number of cases of animal trypanosomiasis diagnosed by the Director of Veterinary Research or by this Division during the year has been small, nineteen in all. Six of these cases are probably relapses. These cases were distributed as follows:—Four head of European-owned stock in the Sebungwe district, three in the Hartley district, three in the Wankie district, two in the Melsetter district and one in the Lomagundi district. Of native-owned stock, nine cases occurred in the Urungwe Native Reserve and two in the Doma area.

In consequence of this improvement it has been possible to reduce the total of paid native hunters and to close down four of the traffic cleansing stations in the Wankie district,

thus freeing the main tourist route to the Victoria Falls from all restrictions imposed on traffic by regulations under the Tsetse Fly Act.

Pursuant to the policy of reducing the open shooting areas, wherever they no longer serve a useful purpose in controlling tsetse, the open shooting areas in the Lomagundi, Darwin and Hartley districts have been abolished, and the open shooting area in the Wankie district considerably reduced. The closing of this latter area should greatly benefit the Wankie Game Reserve, where it is expected the larger antelope will now begin to increase.

In the southern fenced zone in the Doma area, approximately 1,400 head of native-owned stock have been introduced and two dipping tanks repaired and restored to commission. Whether it is a wise policy to introduce such large numbers of stock into this area has still to be seen. The cattle running close to the middle fence are within eight miles of an area where a few fly are known to persist and consequently these cattle are within the danger zone. Some cases of trypanosomiasis are almost certain to occur.

Certain developments under the "Land Apportionment Act, 1926," have been contemplated during the year which would have seriously interfered with the policy of this Division of creating, by the use of unpaid native hunters, game free zones along the edge of the fly front. As a result of representations made, it has been decided that those natives living on Crown lands on the edge of the fly areas shall, for the time being, be permitted to remain in occupation. The hut tax of those natives employed as unpaid hunters will in future be paid by this Division.

Two rather disquieting developments have been discovered during the year. The first is the discovery brought to light after a fly survey carried out by this Division in the Northern Mossurise District of Portuguese East Africa that the tsetse fly, *Glossina morsitans*, is slowly spreading west through the low veld and threatens, at some future date, to invade the low lying Sabi Valley at the southern end of the Melsetter district. The present Border clearing is designed to prevent the incursion of the thicket loving species, *G. pallidipes* and *G. brevi-*

palpis. It will be difficult to construct a clearing in the low veld which would be effective against *G. morsitans*. The matter is receiving consideration at the moment.

The other disquieting development is the increase in the number of alien natives found infected with human trypanosomiasis (sleeping sickness). Most of these cases have entered the Colony on foot and have passed through our northern fly belt *en route*. There is every possibility of new centres of sleeping sickness occuring in the Colony and the disease may break out either in an epidemic or endemic form. Prevention lies in a close medical examination of all immigrant labour before entering the Colony.

The following is a brief statement of the position to date in each area where operations are being carried out:—

1. Darwin.—The improvement mentioned in my last report has been maintained and further consolidated. A considerable increase in the number of native cattle maintained in the area has taken place during the year, and cattle are now being kept at kraals close to the escarpment. No cases of animal trypanosomiasis have been reported. The Masongerera footpath, one of the main routes taken by immigrant labour from the north, has been kept free of fly and the cleansing chamber on this path has been closed. For the time being it does not appear necessary to extend the area covered by the operations, and in consequence no addition has been made to the area cleared of fly. Any extension of the operations would necessitate the destruction of many rhinoceros. The operations in this area are carried out by unpaid native hunters.

2. **Sipolilo.**—A careful fly survey has been carried out in the portion of the area lying between the northern game fence and Chiwe Hill, as, according to native evidence, two flies were reported to have been seen near Chiwe Hill. No flies were located and all native and European-owned stock examined were found in good condition. No cases of trypanosomiasis have been reported and the estimated area of about 400 square miles, mentioned in last year's report as having been cleared of fly, has been kept clear.

3. **Lomagundi (Doma).**—Considerable movements of native-owned stock have taken place during the year, following the

outbreak of East Coast fever in the Umboe Valley. Some 1,400 head of cattle are now running inside the southern fenced zone, a number of them close to the middle fence and within the danger zone. Twelve additional paid hunters have been engaged to accelerate the eradication of the few remaining fly which persist in the vicinity of the Chipingabadza Vlei and also close to the northern fence. This slight infestation is probably maintained by constant infiltration along the Rakute River from the area north of the northern fence where operations have been in progress for only eighteen months.

If it is possible to maintain free of trypanosomiasis such a large number of cattle in the 300 odd square miles in the southern fenced zone, it will be a great achievement and will rank as the biggest effort at reclamation that has been carried out anywhere in Africa. The area already cleared of fly in this section is estimated to be about 600 square miles, but cattle have not as yet been permitted within the northern zone.

4. **Urungwe.**—A number of head of native-owned stock died of trypanosomiasis during the year in the eastern portion of the Urungwe Native Reserve. It is considered that this outbreak resulted from flies being carried from the centre and western side of the Reserve. There are very few resident natives on the western side of the Reserve, and it has been found necessary to employ twelve paid native hunters to clear up this area. It is not expected that much improvement will occur for several years owing to several factors which make effective reduction of the game difficult, *e.g.*, lack of water, the broken nature of the country, the presence of many rhinoceros and the annual movements of elephant from below the escarpment. These latter animals are not destroyed. There has been no deterioration in the general position.

5. **Lomagundi S.W.**—Only very occasional flies are now to be found in this area, and these are confined to the Umfuli River below the Chititimira (Beaconsfield) Falls. No cases of trypanosomiasis have been reported during the year nor for several years. No extension has taken place in the area covered by the operations, which have been carried on as before in order to maintain and consolidate the 300 square miles of previously infested country reclaimed up to date.

6. **Gatooma.**—The whole of the fenced zone is now considered to be free from fly, while in the area covered by the operations west of the western fence fly persists only in small numbers in a few areas which previously were very heavily infested. Fly appears to have been eradicated from the late dry season concentration ground around Chisambe Vlei, Nyampane Vlei and Java Java, and along the route traversed by the Rob's Drift Road. Similarly the previously infested area in the Gwelo district and around the Mafungabusi Peak have been maintained clear of fly. A number of cattle are now running on farms in the Golden Valley area where heavy losses occurred in the past. Considerable mining activity and felling of bush is taking place in the Golden Valley and Mafungabusi areas which will assist in consolidating the position.

In this area the country now cleared of fly is estimated to be about 900 square miles.

7. **Gwaai-Shangani Area.**—The rapid and progressive improvement which has taken place in this area has been most marked during the year. Previously very heavily infested, the whole of the Gwaai River Valley as far as its junction with the Shangani River is now cleared of permanent fly. Between the Gwaai and Shangani Rivers, where only three years ago very high fly densities were recorded at certain favoured localities in the Shangani Valley, no flies have been recorded during special surveys carried out twice during the year, nor have any flies been encountered during normal patrol work. The area south of the Shangani River is now considered to be free from permanent fly.

North of the Shangani River fly persists at several points, e.g., in the vicinity of the Gwaai-Shangani junction, at Luvimbe Vlei and up the Mzola and Kana Rivers, but the density has been very greatly reduced.

The open shooting area has been very much reduced in size and now only includes the Gwaai River Settlement Farms and a small area enclosed by the Bulawayo-Victoria Falls Road, the Inyantue River and the Gwaai River.

It should now be possible to re-stock the farms along the Gwaai River Settlement, although the Kalahari sand veld is

poorly grassed and incapable of carrying much stock. The amount of grazing present in the late dry season is both poor and scarce, except close to the Gwaai River. A few head of stock, principally milking animals, are now being introduced on to three of these farms. Farming operations during the past few years have been carried out by hand labour or by donkeys and mules. It will never be possible to employ oxen for ploughing in the wet vleis at present being cultivated for wheat, potatoes and vegetables, but the manure now becoming available will be a great asset.

Traffic Control.—In those areas where the cleansing stations are situated within the zone of operations, the return of flies caught at each station indicates very clearly the effectiveness of the operations. As previously indicated, five cleansing chambers have been closed down and one removed to a new site during the year. No cases of infringement of the regulations published under the "Tsetse Fly Act, 1929" have been reported.

It is interesting to note that at three chambers situated on the outside edge of the zone of controlled operations against game, the number of flies caught shows a considerable increase over former years. This probably indicates an increase in both fly and game in the undisturbed area.

Urungwe.—1. *Vuti Chamber.*—This station on the main Sinoia-Zambesi Road is situated on the northern edge of the operations and the number of flies caught shows an increase over previous years. This increase is accounted for by the increased traffic due to road construction parties and possibly to an increase in fly density north of the shooting area.

Five hundred and twenty-six (526) cars, six thousand three hundred and fifty-nine (6,359) pedestrians and three hundred and forty-five (345) cyclists, three hundred and ninety-two (392) parties, passed through the chamber, bringing a total of five hundred and nineteen flies (519)—three hundred and thirty-nine (339) male and one hundred and eighty (180) females. Of these 235 flies (156 male, 79 female) were taken off cars and 284 flies (183 male, 101 female) were taken off cyclists and pedestrians.

The number of flies caught at this chamber in 1932, 1933, 1934 and 1935 were—106, 94, 178 and 454 respectively.

2. *Manyangau Chamber.*—This station is erected on one of the main native footpaths leading from the Zambesi Valley to Miami. There has also been a considerable increase in the number of flies caught at this station which, like the Vuti Chamber, is on the northern edge of the operations.

Seven thousand seven hundred and fourteen (7,714) pedestrians and three hundred and fifty-three (353 cyclists, four hundred and fifty-five (455) parties), passed through the chamber, bringing a total of four hundred and one (401) flies (272 male, 129 female).

At this chamber two hundred and ninety-six (296) flies were cought in 1935.

Gatooma.—*Rob's Drift Road.*—The retrogression of fly in this area has proceeded to such an extent that it is now possible to travel by car from the eastern fence to Rob's Drift without picking up a single fly. It is questionable whether the maintenance of this chamber is justified on purely economic grounds at the present time. There is, however, a small amount of mining activity in the Rob's Drift area which may increase and some prospecting is taking place in the Copper Queen area which may lead to increased traffic. Although there is very little through motor traffic from the known fly area, so long as the chamber is in commission the few flies picked up are caught instead of being carried to the Golden Valley farming district. It is unfortunate that the only producing mine in the area west of the western fence has recently closed down. No flies were caught off pedestrians and only nine (9) off motor cars. All these flies originated in the vicinity of Rob's Drift well outside the shooting area.

One hundred and seventy-six (176) cars, bringing nine (9) flies (5 male, 4 female), and six hundred and ninety-five (695) pedestrians and five hundred and ninety-six (596) cyclists passed through the chamber during the year.

The number of flies caught at this station in 1932, 1933, 1934 and 1935 were 377, 498, 478 and 36 respectively.

Bulawayo-Victoria Falls Road.—Following the complete, or almost complete, disappearance of fly from that portion of the Gwaai River Valley traversed by the Bulawayo-Victoria Falls Road, four of the cleansing chambers in this area have been closed. This has necessitated the proclamation of a new defined fly area under the Tsetse Fly Act, 1929, and the publication of new regulations. These regulations have been designed to assist in the opening up of the new tin and tungsten deposits now being exploited in the vicinity of Hojokwe Mountain, east of the Gwaai River. Motor traffic is now permitted to cross the Gwaai and Shangani Rivers by two roads, Walker's Road and the new road leading to the new tin mines. Provision is made for freeing such traffic of tsetse flies on the return journey. The discovery of these new fields and the development of mining activity in this area may greatly assist in preventing fly spreading down the Gwaai River Valley towards Wankie and the Victoria Falls.

1. *Dett Valley Chamber.*—This chamber was closed in July, the last fly having been caught in March, 1935.

One hundred and fifteen cars (115), four hundred and eighty-nine (489) pedestrians and forty-five (45) cyclists (129 parties) were examined in the chamber during the year.

2. *Farm* 114 *Chamber.*—This chamber was closed in July, the last fly being caught off a motor car in April, 1935, and off pedestrians in March, 1936.

Six hundred and twenty (620) cars, two thousand four hundred and ten (2,410) pedestrians and seventeen (17) cyclists (240 parties) passed through the chamber bringing two (2) fly (1 male, 1 female) caught off pedestrians. One fly (1 female) caught off a pedestrian entering the area and one fly off a pedestrian leaving the area.

3. *Walker's Road Chamber.*—A cleansing chamber suitable for the cleansing of motor traffic has been erected at this station to deal with motor traffic crossing the Shangani River. The following traffic was examined during the year:—Six (6) cars bringing 1 fly (1 male), nine hundred and eighty-two (982) pedestrians, eight (8) cyclists (446 parties) bringing three (3) flies (1 male, 2 female). Total four (4) flies (2 male,

2 female). The number of flies caught at this station in 1932, 1933, 1934 and 1935 were 4,180, 989, 551 and 59 respectively.

4. *Sikumi Farm Chamber.*—This station was closed in July, the last fly having been caught off a pedestrian in July, 1935. During the year sixty-four (64) cars, three hundred and thirty-eight (338) pedestrians and five (5) cyclists (164 parties) passed through the chamber.

5. *Mabole Valley Chamber.*—(*a*) *Out of the Area.*—This chamber was closed in August, the last fly being caught off a motor car in May, 1935, and off a pedestrian in January, 1936. The following traffic was examined during the year:—Seven hundred and ninety-three (793) cars, four hundred and ten (410) pedestrians and twenty-three (23) cyclists (169 parties) bringing four (4) flies (3 male, 1 female) all off pedestrians.

(*b*) *Into the Area.*—Three hundred and seventy-two (372) pedestrians, twenty-three (23) cyclists (131 parties), bringing no flies, passed through the chamber.

The following table shows the number of flies caught at each station since the inception of traffic control in the Wankie area:—

Chamber.	1931.	1932.	1933.	1934.	1935.	1936.
(*a*) Dett Valley	230	336	183	59	5	Nil
(*b*) Farm 114 Chamber	128	299	152	104	22	2
(*c*) Walker's Road Chamber	—	4,180	989	551	59	4
(*d*) Sikumi Farm Chamber...	—	—	64	30	7	Nil
(*e*) Mabale Valley ...	—	—	154	196	18	4

(a) Since June, 1931.
(b) Since June, 1931.
(c) Since January, 1932. Closed to motor traffic August, 1932. Re-opened to motor traffic December, 1936.
(d) Since January, 1933.
(e) Since March, 1933.

Darwin.—In consequence of the greatly improved position in this area, particularly on the western side, the cleansing chamber on the Masongerera footpath was closed down on the

31st May and moved to the Kapanda footpath. The necessary alterations in the regulations under the "Tsetse Fly Act, 1929" were gazetted. The chamber at Nyamapara was destroyed by a gale in October, but is being replaced.

The following traffic was dealt with during the year:—

(*a*) *Nyamapara Chamber.*—Three thousand four hundred and twenty (3,420) pedestrians and fifty (50) cyclists, bringing four hundred and three (403) flies (274 male, 129 female).

The number of flies caught at this chamber in 1932, 1933, 1934 and 1935 were 112, 97, 85 and 161 respectively.

(*b*) *Masongerera Path* (closed May, 1936).—Four thousand five hundred and fifty-four (4,554) pedestrians, one hundred and forty-three (143) cyclists bringing no flies. No flies have been caught at this chamber for over two years.

The number of flies at this chamber in 1932, 1933, 1934 and 1935 were:—100, 12, 9 and nil respectively.

(*c*) *Kapanda Path* (opened June, 1936).—One thousand nine hundred and twenty-seven (1,927) pedestrians and seventy (70) cyclists, bringing fifteen (15) flies (9 male, 6 female).

Melsetter Border.—The beneficial effect of the thirty-five mile anti-tsetse clearing along the Melsetter Border has been most marked during the year. As far as can be ascertained only two new cases of animal trypanosomiasis occurred on the border farms protected by the clearing, and no cases occurred away from the border. The clearing has not been extended but protection work has been carried out and all re-growth slashed back. Owing to the abnormally wet winter, new green grass was both early and abundant, while the old season's grass failed to dry off, making a good burn very difficult. Much of the clearing only burnt patchily and many of the wooded kloofs, where grass growth was poor, failed to burn. It is considered that it should be possible to get a good burn two out of every three years and that this, assisted with annual slashing, will suffice to keep down re-growth to the desired level.

A fly survey carried out in Portuguese Territory, close to the Border, has brought to light the disquieting fact that

the tsetse, *Glossina morsitans*, is slowly spreading west through the low veld towards our border and there is a distinct threat that this fly may at some future date invade the Sabi Valley.

TSETSE FLY RESEARCH.

Laboratory research on *Glossina morsitans*, Westw., has continued on an intensive basis throughout the year. For this purpose 7,960 flies have been bred out at Salisbury from pupæ collected in the field.

For the purposes of comparison some work has also been carried out with the common Rhodesian house fly, *Musca domestica vicina*, Macq.

At the end of the year the field covered includes briefly the higher and lower fatal temperature limits over different priods of time, the effects of temperature and humidity on length of life under starvation, on longevity and reproduction, on development and on hunger. A great amount of time has been devoted to the physiology of the flies and results of considerable interest have been obtained. This latter work has mainly been concerned with the effect of environmental conditions on the water and fat content of the flies. To give some idea of the amount of work involved it may be stated that the fat content has been determined individually in no less than 2,445 flies during the year.

In addition certain investigations on the effect of environment on the behaviour of *morsitans* have yielded important results.

It is quite impossible in the present report to deal in any detail with the results obtained. The data largely still await collation and examination by statistical methods, a labour to which it has not as yet been possible to give much attention.

The possibility of practical application of the knowledge obtained is, of course, the most important point. Any pronouncement in this connection will have to await study of the eco- and micro-climates existing in the field.

A few points may, however, be mentioned. It is probable that at low altitudes in the late dry season the fly is sometimes in a precarious position due to the maximum shade temperature

during the day approaching very close to the lethal point. In fact, it is not at all improbable that the fly may be excluded from certain regions on this account alone, whilst in others the death rate may be very high during the peak temperature period of the year. A little modification of the environment in the way of destruction of necessary refuges, perhaps only of undergrowth, may make it impossible for the fly to survive this critical period.

Again, in certain parts of the fly area in Southern Rhodesia sharp frosts are frequent and, whilst these frosts call for measurement, they very possibly cause a serious mortality in certain otherwise very suitable country. It has been found that neither the adult nor the pupal *morsitans* can withstand more than a few degrees of frost for a few hours. Here again clearing of undergrowth might be a useful measure, as it would assist penetration of frost to the pupal sites.

As another point of interest, it is abundantly clear that during the latter part of the dry season when the temperature is highest and the atmospheric humidity is very low, the flies need more frequent and regular meals for survival than is the case at less exacting seasons. At that time of year, they are faced with the danger of death through evaporation of water from their bodies, which can only be replenished by ingestion of blood. An effective scheme resulting in separation of the fly and game at this period of the year might conceivably render continuous game destruction unecessary. Such an undertaking would certainly be difficult in practice, but the idea is worth bearing in mind for future reference.

The results obtained from the work on behaviour have an important bearing on trapping and may prove of value later in the field.

The collections of pupæ in the field during the past fifteen months have confirmed observations made by Mr. J. K. Chorley on the Umniati River from 1921-1923 to the effect that at certain seasons in this Colony the pupæ are subject to a high rate of parasitisation, especially by species of *Thyridanthrax* (Bombyliidæ) although *Mutilla* is also present.

It is difficult to conceive how this interesting fact can be put to practical use at present, but it reveals a weakness in the

annual cycle of the fly of which it may be possible to take some advantage when our knowledge increases.

There is a great deal of further investigation in prospect both on *morsitans* and *pallidipes*, the latter having not yet been studied.

As soon as the supply of pupæ dimnishes, as it is expected to do from January to April, it is proposed to draw up a comprehensive progress report on the work completed to date.

Trypanosomiasis Committee.—Four meetings of the Executive and one general meeting of the above Committee were attended during the year.

Myiasis in Sheep.—Several cases of myiasis in Merino sheep due to the blow-fly, *Chrysomyia chloropyga*, Wied., have been reported from the Melsetter district. The larvæ were found in the soiled wool around the anus of sheep suffering from "scour" and intestinal parasites, such as *Moniezia*.

Myiasis in Man.—The larvæ of the green bottle-fly, *Lucilia cuprina*, Wied., were reported from the body of an infant in the Bulawayo district. The larvæ of a "*skin-maggot fly*" referred to *Cordylobia* (*Stasisia*) *rodhaini*, Ged., were taken from the skin of a child in the Salisbury district during March and April.

Tick Survey.—The Spinose ear-tick (*Argas, or Ornithodorus mégnini*, Dugès.) has been reported from the Salisbury and Hartley districts. In the one case infestation occurred in a horse bred in the Colony but which had been stabled for some time, and in the other case infestation was noted in a pony imported from the Union of South Africa.

Publications.—

"Annual Report of the Division of Entomology for the year ending 31st December, 1935," by R. W. Jack. *Rhodesia Agricultural Journal*, XXXIII., 5, 1936, pp. 329-356.

"Biological Notes on some Diptera of Southern Rhodesia," by A. Cuthbertson, *Occasional Papers of the Rhodesian Museum*, Bulawayo, No. 5, p.p. 46-63.

"Ticks Infesting Domestic Animals in Southern Rhodesia," by R. W. Jack, *Rhodesia Agricultural Journal*, XXXIII., 12, 1936, pp. 907-929. (Illustrated.) Revision.

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

The Imperial Institute of Entomology, London, 70.

The Britsh Museum (Nat. His.), 23.

The University Museum, Oxford, 14.

Zoologische Sammlung des Bayerischen Staates, Munich, Germany, 4.

The American Museum of Natural History, New York, U.S.A., 32.

State College of Massachusetts, Amherst, 12.

University of Harvard, Medical School, Boston, 3, and Instituto de Biologia Vegetal, Rio de Janeira, Brazil, 5.

About 200 species of insects have been sent overseas during the year for identification.

A number of insects, including the types of species new tc science, have been presented to the British Museum (Nat. Hist.), the American Museum of Natural History, the South African Institute for Medical Research, the National Museum of Southern Rhodesia and several other institutions.

ADMINISTRATIVE.

Tobacco Pest Suppression Act, 1933.—Under Part I. of the Act inspectors found the Tobacco Beetle, *Lasioderma serricorne*, Fab., in four farm premises and three central warehouses. The infected tobacco was burned. The Stored Tobacco Worm, *Ephestia elutella*, Hubn., was found on one farm premises and three central warehouses. In each case the infected tobacco was burned and a thorough cleaning of the premises, including spaces under floor, was effected. The total number of bales burned owing to infestation by insects was 117. A considerable additional amount of uninfested, more or less useless tobacco, was destroyed by fire, or used as fertiliser, etc., owing to the danger of its presence in tobacco premises. Two licences were temporarily suspended and five warehouses were placed under temporary quarantine during the year.

Under Part II. of the Act, small amounts of tobacco re-growth were found on many farms, and eight owners were cautioned for having re-growth on their lands after the fixed date. In each case proper clearing was effected, and five of the premises concerned were re-inspected by the B.S.A. Police.

The Tobacco Whitefly, *Bemisia rhodesiaensis*, Corb., was not abundant.

Number of Licences granted and Inspections made.

	1936.	1935.
Licences	595	586
Inspections	624	633

Importation of Plant Regulation Ordinance, 1904:

Number of Consignments of Plants, Fruits, etc., dealt with by the Plant Inspectors at the various Ports of Entry.

	1936.	1935.
Salisbury	2,343	2,719
Bulawayo	12,159	11,922
Umtali	837	765
Gwelo	1,062	882
Plumtree...	626	721
Beitbridge (to end Sept.)	40	7
	17,077	17,016

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

	1936.	1935.
Special permits	214	143
Annual permits	60	60

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

Number of Certificates of Cleanliness issued in respect of Plants, etc., intended for export to other countries.

	1936.	1935.
Certificates	56	58

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

Injurious Substances and Animals Ordinance, 1909.

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

	1936.	1935.
Foundation comb	—	1
Beeswax	3	1

It should be noted that the above permits are in respect of importation from overseas only. Beeswax and foundation comb accepted into the Union of South Africa may be imported from that country without further permit.

Nurseries Ordinance, 1909.

Number of Nurseries Registered and Inspected.

	1936.	1935.
Registered nurseries...	16	18
Inspections...	12	19

GENERAL.

Farms Visited.—Eighty-five farms were visited and in many cases advice given on insect pest control, besides the six hundred and twenty-four inspections made under the Tobacco Pest Suppression Act, 1933.

Lectures and Demonstrations.—A lecture on "Insects" was delivered to scholars of a Salisbury school, and a demonstration in poison baiting against locust hoppers was given to farmers by members of my staff. One lecture on Ticks was given to the B.S.A. Police.

Acknowledgments.—*Assistance from other Departments and Divisions.*—I have pleasure in acknowledging the usual cordial co-operation of the Native Department and the B.S.A. Police in connection with tsetse fly operations during the past year, and also of the Native and Law Departments in connection with the locust invasion.

Assistance in reference to Tsetse Fly Research has been received from the Division of Chemistry and the Meteorologists, of which grateful acknowledgment is made. The Public Works Department has also been most obliging and helpful in connection with the same undertaking.