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Experiments with Tsetse Fly Traps against *Glossina Morsitans* in Southern Rhodesia

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EXPERIMENTS WITH TSETSE FLY TRAPS AGAINST *GLOSSINA MORSITANS* IN SOUTHERN RHODESIA.

By R. W. Jack, Chief Entomologist.

Reports of successful trapping of tsetse flies (*Glossina pallidipes*, Aust.) in Zululand by Mr. R. H. Harris in the year 1930 led to experiments being conducted in Southern Rhodesia with traps against the Common Tsetse (*Glossina morsitans*, Westw.).

At first, owing to Mr. Harris' intention to patent his trap, no information concerning its principle or construction could be obtained and the writer was, therefore, obliged to start the investigation on a completely independent basis.

The fact that tsetse flies have long been known to be more or less shade-loving insects led to trial of traps constructed on the principle of attracting the flies into a shady enclosure and preventing their escape by further attracting them from the dark into a light portion of the trap. Two models were constructed on this basis before the publication in September, 1930, of Mr. Harris' application for patent rights in Southern Rhodesia afforded the opportunity of studying the construction and principle of his trap.

Although the construction was different the general principle of the writer's traps was obviously very much the same as that utilised by Mr. Harris.

In November, 1930, the writer visited Zululand on the invitation of the Natal Provincial Government and was privileged to see the Harris trap in action against *pallidipes*.

The demonstration was decidedly impressive and there is no doubt that the Harris trap is highly efficient against that species of tsetse fly under Zululand conditions.

From and including the year 1930 a number of different models of traps, including several of the typical Harris type, have been tested against *morsitans* in this Colony and a number of very interesting facts have emerged.

It is hoped shortly to publish in the scientific Press a comprehensive paper dealing with these experiments and the deductions they have led to, but a brief summary of the more salient points may be of interest to the readers of this journal.

In the first place it was found that none of the models attracted *morsitans* in the locality of the tests in anything approaching the same numbers as the Harris traps attract *pallidipes* in Zululand. It may be stated that this has also been the experience of investigators in Nyasaland, Tanganyika, Nigeria and elsewhere.

It was also found that meteorological conditions greatly influenced the attractiveness of the traps to *morsitans*, the results being much better in warm, dry weather (August, September and to a less extent October) than in either cool, dry weather (May, June and July) or in the wet season. In fact during three quarters of the year the catches were more or less negligible.

A further discovery referred to the colour of the main body of the trap. Harris' traps are covered with hessian and the first models of this trap tested in the Colony were covered with this material. These traps gave poor results. It was found, however, that substitution of dark blue or black greatly increased the catch. Incidentally a black or dark blue *screen* was found to constitute a great attraction, being far more attractive than a range of other colours, including khaki, tested. Khaki had previously been regarded as probably the most attractive colour to this species, but it made a very poor showing in these tests in competition with the dark blue and black. A dark blue screen in fact attracted considerably more tsetse flies than a live donkey.

Another point which was quickly obvious was that the flies would attack man or be attracted to a moving car in numbers under meteorological conditions which rendered the traps practically inoperative.

It has been generally considered that an oblong trap like the Harris trap or an oblong screen attracts tsetse and other flies because to the eyes of the insects it more or less resembles an animal or source of food.

The experiments conducted appear to demonstrate very clearly that this is not the case.

It should be noted that the body of the Harris trap has the sides sloping inwards from top to bottom, so that at least one side is in shade and frequently both. When Mr. Harris first experimented with these traps the sides were vertical and this trap did not give the same results as the models with the sides sloping inwards.

The writer's deduction from available data is that the attraction to all these traps is altogether independent of any resemblance of the traps to animals, that in fact it is not a food reaction at all, but a reaction to shade. Attraction to shade is presumably a visual reaction, and a dark patch, whether composed of actual shade or of a dark coloured screen, should have the same effect on the eyes of the fly. The interior of the first two models of traps constructed by the writer was painted dull black and was very dark indeed, with no light visible beyond. Under suitable conditions the flies would make their way into these traps through a slit as narrow as one quarter of an inch, a striking demonstration of their strong tendency to enter dark places.

The fact that flies were attracted strongly to moving man and vehicle at a time when they were hardly attracted to the traps at all appears in itself a sufficient proof of the difference in the attraction. Full-fed flies were also caught in the traps and these certainly could not have been seeking food.

Tsetse flies are forest insects. They are shade loving (sciaphilous). Being shade loving they are also shade seeking (sciatropic). Some species are, however, more shade loving than others. This attribute would appear to be correlated with the degree of ability of the particular species to resist desiccating influences. *G. pallidipes* is a species which apparently needs thickets in its habitat. It is presumably more shade loving or shade needing than *morsitans*. It occurs in some places in dense forest which *morsitans* definitely avoids. *Pallidipes'* association with thicket indicates a special

attraction to low patches of shade on the landscape, whereas the shade cast by the open forest trees, with which *morsitans* is associated, has a different appearance to the eye.

It appears probable that the relatively weak attraction exercised by the Harris traps on *morsitans* in comparison with *pallidipes* is due to these two factors, namely—(1) less need for entering shade frequently during the greater part of the year and (2) less attraction to the particular type of shade presented by the traps.

In either cool or wet weather, when the rate of evaporation is low, *morsitans* does not appear to be very strongly shade seeking and these conditions are also associated with a superabundance of shade in the forest. As the evaporation rate increases *morsitans* finds frequent shade more necessary and these conditions are associated with leaf-fall and diminished shade. It is under these conditions that the traps are most attractive. It may be noted that from Mr. Harris' published records the traps function better against *pallidipes* in Zululand when the wind is from a dry quarter (north) than a wet quarter (south). Mr. Harris' "dummies" from which his traps were developed apparently exercised no attraction on *pallidipes* in cloudy weather.

It would seem that in order to confine themselves to the forest tsetse flies must be guided in their flights by something which is confined to forest and the picture is that they consistently fly from one patch of shade to another. As far as *morsitans* is concerned if the weather be cool or humid the shade-seeking tendency is probably weak, but sufficient to keep the flies from wandering into the open far from the forest. A highly evaporating environment such as prevails in the latter part of the dry season, however, makes them much more dependent upon shade and their ranging flights under these conditions are probably strictly controlled by the occurrence of patches of shade in reasonably close proximity to one another. They keep to forest still in foliage at this time of year.

The shade-seeking nature of the fly's movements is more or less generally recognised in the fact that clearings are regarded as more effective barriers if forest is not visible on

the further side. Under certain conditions the fly will, however, cross quite a wide open space if there is a shady objective in view.

Attraction to an object casting a horizontal shade may incidentally lead a tsetse fly to a source of food, such as a large quadruped, but there is little doubt that at least in the case of *morsitants* the primary hunger reaction from a distance that is the *visual* reaction is towards *movement*. A hungry fly is very strongly attracted to any moving object, be it man, animal or vehicle. For this attraction the term *kinetropism* is suggested. It is usually a stronger attraction than shade to hungry flies and also to the non-hungry males of *morsitans*, but is generally considered to be in abeyance in the case of non-hungry females. Under conditions of an excessively high evaporation rate, such as occurs in the hot October days, however, the need for shade is stronger than the desire for food and even very hungry flies may fail to be attracted to moving objects under these conditions.

From short distances hungry flies are probably attracted also by *scent*.

Under these circumstances it should be comparatively easy to devise a trap on the basis of *movement* which would catch *morsitans* in large numbers. It is, in fact, reported that this has been achieved in Tanganyika Territory. Movement, however, means power and even using the wind as a source of power it would hardly be possible to make such traps in large numbers very cheaply. Moreover, experience during the past season in trying to use arsenite of soda powder as a dust against locust swarms has shown what long periods may occur in this Colony without sufficient wind even to distribute a fine powder. During the wet season especially, traps needing wind for their operation would be liable to stand idle for considerable periods.

There is a considerable number of very interesting deductions from the experience with shade traps in this Colony, but it is not proposed to deal in this short article with more than have been summarised above.

The practical point is that the Harris trap and traps acting on the same principle have not proved of any real use against *morsitans* in Southern Rhodesia and, if the

writer's deductions are correct, a totally different principle will need to be used if success is to be attained in trapping this species.

Finally, it may be pointed out that, whilst a really effective trap would undoubtedly be very useful in getting rid of tsetse flies in a restricted habitat, as for instance the sleeping sickness tsetse, *G. palpallis*, which is confined to lake shores and river banks, or such tsetse flies as *morsitans* and *pallidipes* in sufficiently limited areas isolated from invasion by flies from without, its usefulness in connection with the problem in this Colony is not so obvious. Unfortunately, in Southern Rhodesia, although some six districts are more or less involved, there is now only one vast fly area, within which the distribution of the insect is practically continuous, at least during the wet season and first half of the dry season. To use traps effectively it would probably be necessary artificially to isolate the portion of the fly area to be dealt with and feasible means of doing this are at present still to seek. The prospect of bringing about retrogression of the fly over a wide front by any form of trapping, or of stopping the general spread of the pest, which involves a front of about 600 miles, by such means alone appears very slight.