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A trap-barrier to block reinvasion of a river system by riverine tsetse species

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RÉSUMÉ

Une barrière de pièges pour empêcher la réinvasion d'un réseau hydrographique par des glossines riveraines

Une barrière constituée de 100 pièges biconiques, posés le long de la rivière Koba, empêche le passage des glossines riveraines pendant deux cycles consécutifs de saisons sèche et pluvieuse.

Une superficie de plus de 1 500 km^2 de réseau hydrographique, en amont de la barrière, peut être protégée contre la réinvasion des glossines riveraines par cette méthode simple. Des lâchers de glossines marquées donnent les informations sur les mouvements et les capacités de réinvasion.

Cette disposition linéaire des pièges s'est révélée complètement inefficace contre *G. morsitans submorsitans.*

Mots clés : Pièges — lutte contre les glossines — Haute Volta.

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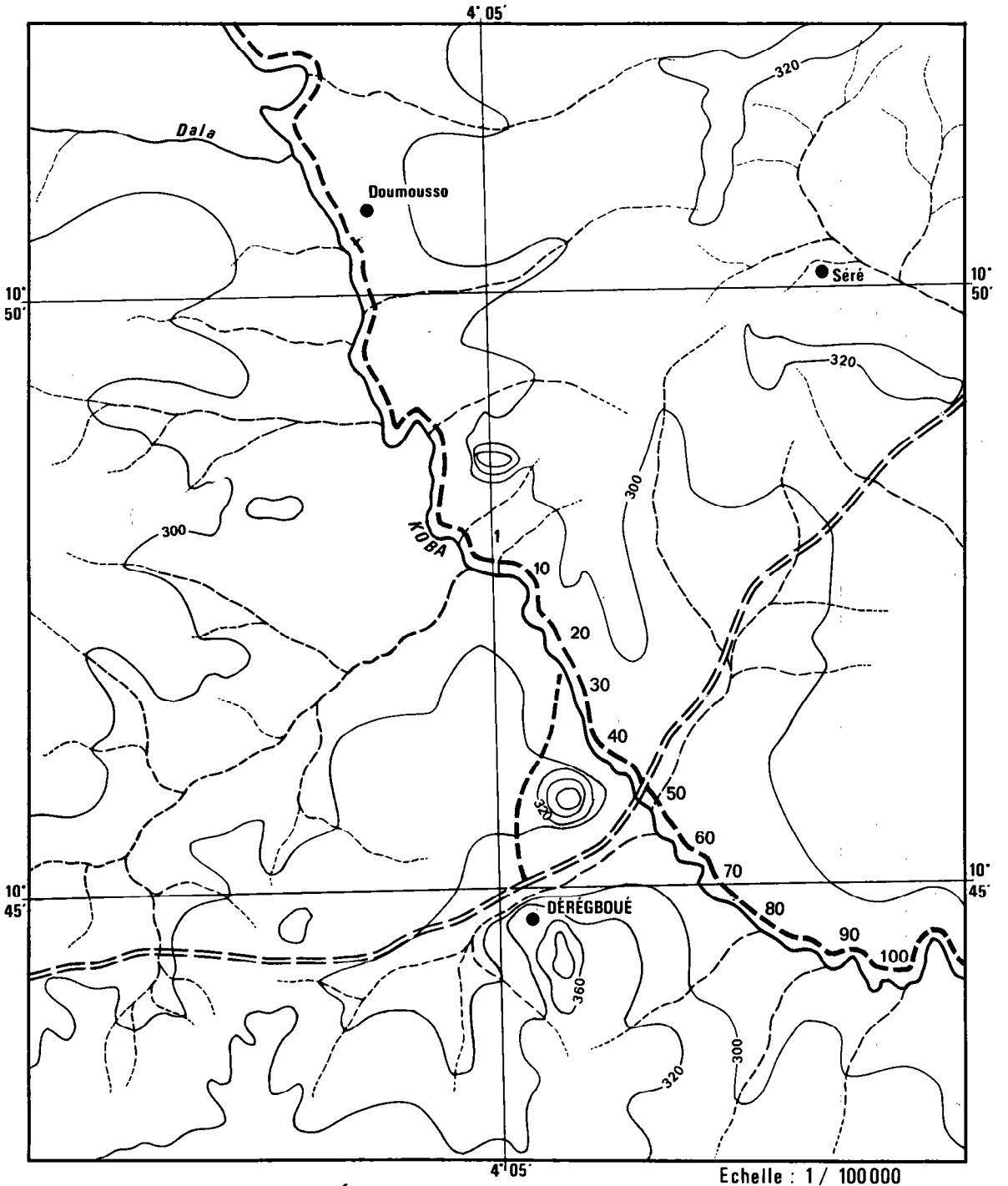
Summary. — A trap-barrier, consisting of an arrangement of 100 biconical traps along the Koba river, prevented the passage of riverine tsetse in the dry and in the wet season. An area of more than 1 500 km^2 upstream the barrier could be protected against reinvasion by riverine tsetse with this simple method. Additionally releases of marked flies gave information about fly movements and invasion capacities. This linear arrangement of traps was completely inefficient against *G. m. submorsitans.*

Key words : Trap-barrier — Glossina eradication — Upper Volta.

INTRODUCTION

Ecological studies using CHALLIER-LAVEISSIÈRE traps (2) on *G. p. gambiensis* which were carried out before and during experiments of biological control of this species by the release of sterile males, showed that non impregnated traps with a white lower cone, placed in intervals of 200 m in a gallery forest caused a remarkable drop in population density. Marking-release-recapture sessions, carried out regularly, during several years in three different river systems had revealed a relation between true and apparent density of

River Koba Area



Koba and bigger rivers

small drainage lines

motorable ways

piste to Sidéradougou

9 to 11 : 1 by this trap arrangement, calculated by the simple Lincoln index. From 1976 on, experiments to decrease natural fly populations have been carried out (short communication in Information Circular of the I.A.E.A., 1977, n° 22, Febr.) ; the results of these introduced an association of the sterile male method with a prior reduction of the fly population by trapping in order to match with the production capacity of our insectariums at that time (5). On the river Guimpy, the initial population was reduced by 50 p. 100 after 35 days of trapping before the release of the sterile males. To cope with reinvasion problems, traps were also used in the barriers with considerable success, although their main purpose was to monitor fly movements.

DESCRIPTION OF THE EXPERIMENTAL AREA

The river Koba represents the main drainage system of the agropastoral zone of Sideradougou south of Bobo Dioulasso. In the upper part of the section, chosen for the barrier, only a series of stagnant water pools remains in the dry season. In the lower part, the Koba forms a permanent water course of very variable width (10-50 m). The gallery forest does normally not exceed 5-10 m with some exceptions on the inner sides of river bends where it can become up to 50 m wide. *Syzygium guineense* is the predominant tree in the gallery whilst some low lying plains outside the gallery are covered with *Mitragyna inermis,* forming very favourable sites for *G. tachinoides* in the wet season.

MATERIAL AND METHODS

One hundred CHALLIER-LAVEISSIÈRE traps, this time with a blue lower cone (1), were placed during two consecutive years from January to December in 1981-1982 directly on the banks of the river in intervals of 100 m. To establish the initial true density two marking-release-recapture sessions were carried out in January 1981 before the traps were installed definitively. Captures were recorded three times a week differentiated by sex and species. Depending on the dry or rainy season, the traps were moved lower or higher to assure that with rising or falling water levels they remained always at the edge of the water. No barrier clearing was carried out, except to a limited extent around the traps to increase their visibility.

The repeated marking-release-recapture sessions showed a mean true density per km of river of 38 *G. tachinoides* and 65 *G. p. gambiensis* at that period of the year (dry season). The true density of *G. m. submorsitans* could not be reliably established due to the low recapture rate (1 p. 1 000). In order to find out how quickly and how far flies could penetrate the barrier, or if they could even cross it, flies marked with acrylic paint were released at both ends of the barrier, either 100 m upstream of trap number 1 or 100 m downstream of trap number 100. All flies were fed either on rabbits or on artificial membranes before the release. To measure the delay of recapture and the distance covered before being caught, different colours were applied for each release session and each release point. Nearly 10 000 females and 29 000 males of *G. p. gambiensis* have thus been released during the dry and the rainy season. Due to our small breeding colony only 2 900 *G. tachinoides* have been released.

RESULTS AND DISCUSSION

Figures 1 and 2 present the population dynamics for the riverine species *G. p. gambiensis* and *G. tachinoides* during two years of continuous recording in two days intervals. The variations in the seasonal changes of population density between the two years (1981/1982) are due to the different climatic conditions of both years and display the same

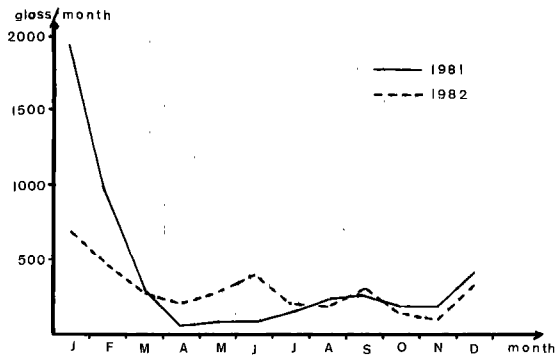


Fig 1: G.p.gambiensis: continuous capture (100 traps)

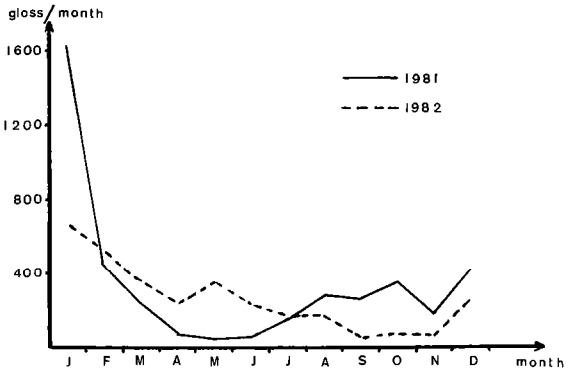


Fig 2: G. tachinoides: continuous capture (100 traps)

picture for both species. The graphs demonstrate also that the initial fly population is quickly reduced after the installation of the barrier and has never regained the original density. Due to the continuous influx from flies from the outside, captures naturally do not decrease to zero.

Figure 3 shows that although 32 204 *G. m. submorsitans* have been caught altogether, the apparent density after two years of capture is even slightly higher than before. The efficiency of the traps is concealed by the glossina arriving continuously from the savannah to the gallery forest, specially at the height of the dry season. These results are confirmed also by those of LAVEISSIÈRE (7) on the river Leraba.

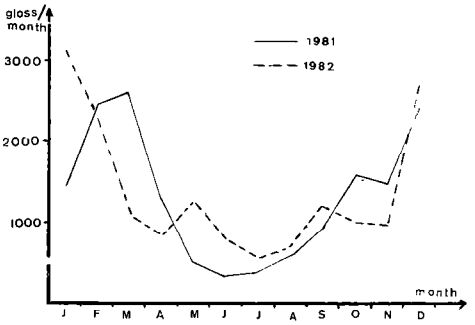


Fig 3. G.m. submorsitans: continuous capture (100 traps)

As no other method than trapping was used, captures of the traps at the outer ends were expected to give highest yields for *G. p. gambiensis* and *G. tachinoides,* which is confirmed by Figures 4 and 5. Figure 6 shows that trapping has absolutely no influence on the density of *G. m. submorsitans* in the middle of the barrier. Due to the radial dispersion and permanent reinvasion from all sides, in spite of the high yields of the traps, an effect on the population density could not be demonstrated by this linear arrangement of traps along a river.

Figures 4 and 5 clearly show the influence of continuous trapping in the middle part of the barrier on the riverine species, though population density never came down to zero in any part of it. In order to find out the origin of these remaining flies, the above mentionned experiment with the release of marked flies was started.

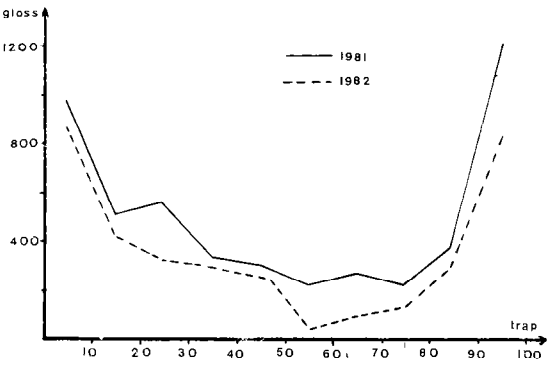


Fig. 4 G.p. gambiensis. capture per trap (grouped by 10)

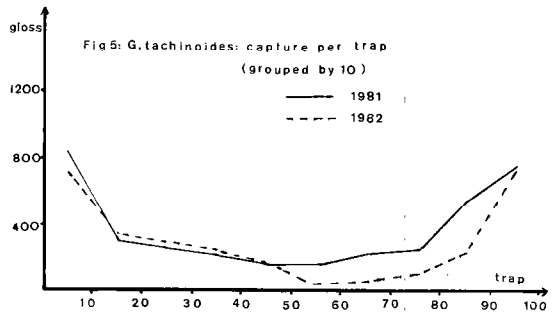


Fig 5: G. tachinoides: capture per trap (grouped by 10)

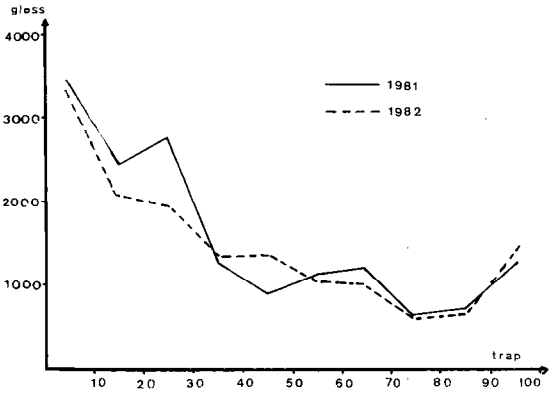


Fig 6: G.m. submorsitans: capture per trap (grouped by 10)

TABLE N°I-Number of marked flies released, compared with number and percentage of recapture

Species + Sexe	*G. p. gambiensis*		*G. tachinoides*
	♂	♀	♂
Release at trap 1			
dry season	5 537		237
wet season	8 703	3 407	1 046
Recapture			
dry season	567	0	0
p.100 recapture	8,80	–	–
wet season	349	261	80
p.100 recapture	3,36	7,66	7,65
Release at trap 100			
dry season	6 526	1 577	455
wet season	8 321	4 606	1 164
Recapture			
dry season	613	136	56
p.100 recapture	8,28	8,62	12,30
wet season	599	243	19
p.100 recapture	6,10	5,27	1,63
Total released	29 087	9 590	2 902
Total recaptured	2 128	640	155

Table I lists the number of marked flies released during dry and rainy season at both ends of the barrier and the percentage of recapture in the barrier. The overall percentage of recapture seems to be low but it has to be considered that nothing prevented the released flies going in the opposite direction, away from the barrier. The capture of one marked fly 83 days after the release at trap 83 outlines this possibility.

Figure 7 shows that the number of marked flies caught in the barrier decreases rapidly from the traps at either end and only very rarely a fly reaches the middle of the barrier (trap 50). No fly has been caught between trap 50 and 55. Two flies, having passed 68 traps, were found at a place of high human activity (camp, cattle, lumber transport), outlining the danger of uncontrolled activities across barriers. As there was apparently no difference of fly captures in the dry or rainy season, the results of all the releases are compiled in one figure. None of the more than 40 000 riverine tsetse of different sex and species that were released, were able to cross the barrier in spite of the artificial pressure created by the release of such a larger number of flies, much superior to the natural fly density.

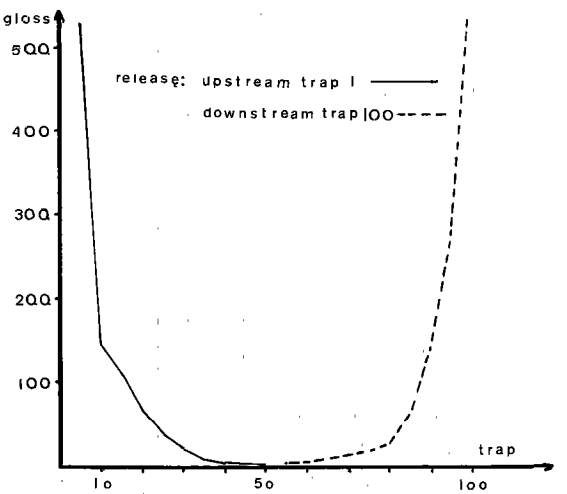


Fig.7: recapture of marked flies (grouped by 10 traps)

Table II presents the results of the delay of recaptures in percentage of the total recapture, indicating the excellent performance of the released flies and their longevity.

TABLE N°II-Delay of recapture in p.100

Day after release	Number of ♂ registered	Percentage of total
1 - 7	1 094	50,27
8 - 14	700	32,16
15 - 21	225	10,34
22 - 28	105	4,82
29 - 35	25	1,15
36 - 42	18	0,83
43 - 49	5	0,22
50 - 56	3	0,13
83	1	

CONCLUSIONS

The results prove that this barrier system of 10 km river blocks reinvasion of riverine species of tsetse and is as efficient in the dry as in the wet season. It is essential to choose a place with few or no affluents and little human activity. In this case, more than 1 500 km² can be protected permanently against reinvasion from downstream and the only costs are the 100 traps and the salaries of two technicians for maintenance, recording the captured flies and moving the traps according to the water level in the river in the different seasons. This can be really called a cheap and competitive method of protecting a cleared area. Naturally it has to be emphasized that the area to be protected against reinvasion has at its headwaters borders that can be easily protected such as watersheds, natural bounderies or areas cleared by human activities as it is the case in our chosen area.

Our experiments on the rivers Panapra and Lafigue with impregnated traps (6) showed that the number of traps can still be reduced by the use of insecticides but it would not have been possible to collect the ecological data presented by this arrangement of ordinary CHALLIER-LAVEISSIÈRE traps. To overcome the poor results for *G. m. submorsitans,* a new arrangement of traps and impregnated screens, covering a whole savannah area, has been installed, but conclusions cannot yet been drawn.

POLITZAR (H.), CUISANCE (D.). — Una barrera de trampas para detener la reinvasión de una red hidrográfica por glosinas ribereñas. *Rev. Elev. Méd. vét. Pays trop.*, 1983, **36** (4) : 364-370.

Resumen. — Una barrera constituida por 100 trampas bicónicas, puestas a lo largo del río Koba, impide el paso de las glosinas ribereñas durante dos ciclos consecutivos de estación seca y lluviosa. Dicho método sencillo puede proteger una superficie de más de 1 500 km² de red hidrográfica, más arriba de la barrera contra la reinvasión de las glosinas ribereñas. Sueltas de glosinas marcadas dan informes sobre los movimientos y las capacidades de reinvasión. Se revela totalmente ineficaz contra *G. morsitans submorsitans* esta disposición lineal de las trampas.

Palabras claves : Trampas — Lucha contra las glosinas — Alto-Volta.

BIBLIOGRAPHIE

1. CHALLIER (A.), EYRAUD (M.), LAFAYE (A.), LAVEISSIÈRE (C.). Amélioration du rendement du piège biconique pour glossines *(Diptera, glossinidae)* par l'emploi d'un cône inférieur bleu. *Cah. ORSTOM, sér. Ent. méd. Parasit.*, 1977, **15** (3) : 283-286.
2. CHALLIER (A.), LAVEISSIÈRE (C.). Un nouveau piège pour la capture des glossines *(Glossina : Diptera : Muscidea)* : description et essais sur le terrain. *Cah. ORSTOM, sér. Ent. méd. Parasit.*, 1973, **11** (4) : 251-262.
3. CUISANCE (D.), FEVRIER (J.), FILLEDIER (J.), DEJARDIN (J.). Etude sur le pouvoir de dispersion des glossines. Rapport (PNUD/Banque Mondiale/O.M.S.) de recherche et de formation concernant les maladies tropicales, 1983, 71 p.
4. CUISANCE (D.), POLITZAR (H.). Efficacité contre

les glossines riveraines d'une barrière d'écrans ou de pièges imprégnés par différents insecticides. *Rev. Elev. Méd. vét. Pays trop.*, 1983, **36** (2) : 159-168.

5. CUISANCE (D.), POLITZAR (H.), CLAIR (M.), SELLIN (E.), TAZE (Y.). Impact des lâchers de mâles stériles sur les niveaux de deux populations sauvages de *Glossina palpalis gambiensis* en Haute-Volta (sources de la Volta Noire). *Rev. Elev. Méd. vét. Pays trop.*, 1978, **31** (3) : 315-328.
6. CUISANCE (D.), POLITZAR (H.), CLAIR (M.), SELLIN (E.), TAZE (Y.), BOURDOISEAU (G.), FEVRIER (J.). La lutte contre *Glossina palpalis gambiensis* Vanderplank par lâchers de mâles stériles en Haute-Volta. Colloque int. sur l'emploi des isotopes dans l'étude et la destruction des vecteurs des maladies animales, Vienne, A.I.E.A., 7-11 mai 1979.
7. LAVEISSIÈRE (C.), COURET (D.). Lutte contre les glossines riveraines à l'aide de pièges biconiques imprégnés d'insecticides, en zone de savane humide. *Cah. ORSTOM, sér. Ent. méd. Parasit.*, 1980, **18** (3) : 201-207 ; 209-221 ; 223-228 ; 1981, **19** (1) : 41-48 ; 49-54.
8. MORRIS (K. R. S.), MORRIS (M. C.). The use of traps against tsetse in West Africa. *Bull. ent. Res.*, 1949, **39** : 491-528.
9. VALE (G. A.). The improvement of traps for tsetse flies *(Diptera : Glossinidae). Bull. ent. Res.*, 1982, **72** : 95-106.