Local population density estimates of *Glossina pallidipes* in Somalia

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RÉSUMÉ

Estimation de la densité d'une population localisée de *Glossina pallidipes* en Somalie

Des captures continues de *Glossina pallidipes* ont été effectuées sur 1,2 ha le long de la rivière Shebeli, en Somalie, au moyen de pièges biconiques. La densité relative (D.R.), représentée par le nombre de mouches capturées par un piège en un jour, a diminué pendant 5 jours, puis s'est brusquement accrue en 24 h pour diminuer à nouveau pendant les 3 jours suivants.

En appliquant à ces deux périodes les principes de la soustraction par piégeage, les densités de tsétsé sont respectivement estimées à 967 ± 251 et 953 ± 208 mâles, et à 1 865 ± 186 et 2 483 ± 128 femelles par hectare. Le principal facteur qui a probablement provoqué cette modification de la D.R. est l'apparition de fortes pluies entre les 2 périodes de capture. Ces pluies ont affecté directement la disponibilité des mouches pour les pièges, ou indirectement en modifiant le comportement des phacochères qui, d'après les résultats de 123 analyses de repas de sang, constituent leur hôte préférentiel. On a également établi une relation avec les maximums journaliers de température, mais elle ne suffit pas à expliquer les variations de la D.R.

Mots clés : Densité — Capture — Piège — Mouche tsé—tsé — *Glossina pallidipes* — Somalie.

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Summary. — Biconical traps were used to capture continuously *Glossina pallidipes* in 1.2 ha along the river Shebeli, in Somalia. Relative density (R.D.) indicated by number of flies/trap/day declined over 5 days with a sudden increase followed by a 3 day decline.

Applying the principles of removal trapping to both periods estimated tsetse density as 967 ± 251 and 953 ± 208 males and 1 865 ± 186 and 2 483 ± 128 females per hectare respectively. The major factor throught to have caused the R.D. change is heavy rainfall between the periods effecting the availability of tsetse to traps directly or indirectly by altering the behaviour of warthog, which after 123 analysis of blood meal is their preferred hosts'. A relationship with maximum daily temperature was found but is not sufficient to explain the R.D. changes.

Key words : Density — Capture — Trap — Tsetse fly — *Glossina pallidipes* — Somalia.

INTRODUCTION

RYAN *et al.*, (9) demonstrated trapping out effects against *Glossina palpalis* s.l. in Ivory Coast and *G. morsitans centralis* in Zambia. Removal trapping in addition to being potentially useful for controlling tsetse, may also be used to estimate population density (12). In this paper, population estimates for *G. pallidipes* in Somalia are derived from relative density data.

MATERIALS AND METHODS

Biconical traps (2, 8) were used to capture *G. pallidipes* continuously in the vegetation fringing the River Shebeli between Balad and Afgoi, Somalia (2°16′N, 45°12′W) between 3-10 November, 1981. Six biconical traps were used in 1.2 ha, since traps were 50 m apart and previous studies have shown no overlap of the sphere of influence of traps at this density. Traps were emptied daily and a record kept of total numbers of males and females.

Estimates of population size and density were made by applying the principles of removal trapping (11, 12, 13).

Subsamples of freshly killed female flies were dissected for ovarian age (10, 1) and blood smears were made from suitable flies captured from traps and oxen.

Temperature recordings were made every 15 minutes at 1 m height using thermistors, psychrometers and an automatic data logger.
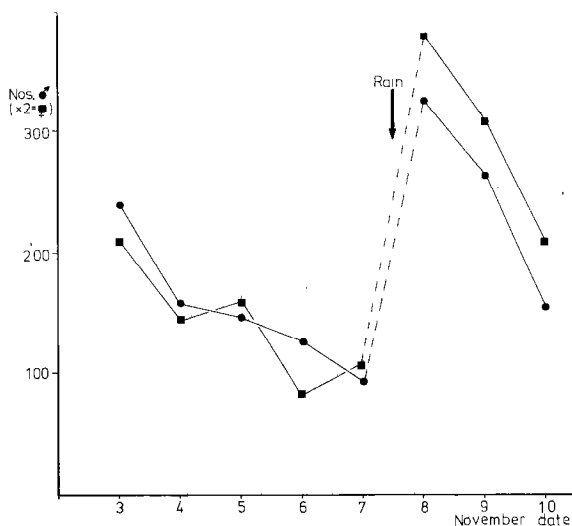

Figure 1. — The daily catch of *G. pallidipes* in 6 biconical traps between 3-10 November 1981 in Somalia.

RESULTS

The daily catch of *G. pallidipes* (Figure 1) declined by 50 % over the first 5 sampling days. This was followed by an almost 4-fold increase with a subsequent 50 % reduction in 3 days. Heavy rainfall was experienced at the study site between 16.00 hrs 7th November and 05.00 hrs 8th November. Estimates of population size were made treating the data as two separate 5 and 3 day studies, by regression (Figure 2) and by Zippin's method and were
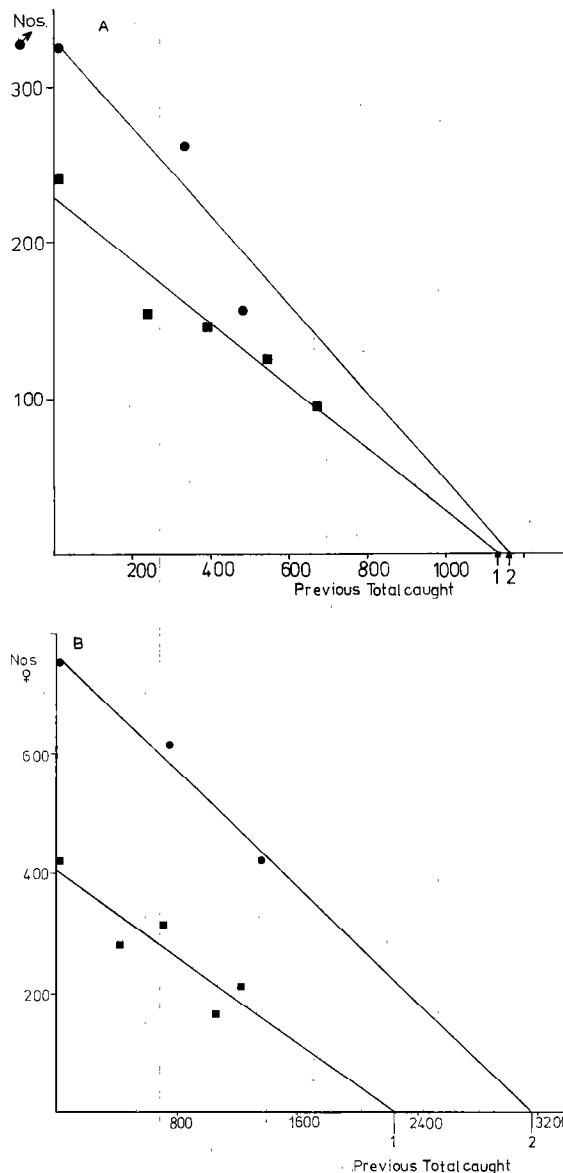

Figure 2. — The estimation of A. male and B. female *G. pallidipes* population size by removal trapping, numbers caught per sampling occasion against previous total caught. Estimates from the 5 and 3 day samples are (1, ■, 2, ●) 1.133 and 1.172 males and 2.215 and 3.158 females respectively.

(± 2 S.E.) 967 ± 251 and 953 ± 208 males and 1.865 ± 186 females respectively.

This would indicate a 12 % and 20 % removal per day (respectively) if we ignore emerging flies. In order to account for emergence, we may estimate puparial numbers produced per hectare (7) which will lower the daily removal, assuming no puparial mortality, to 8 % and 15 % respectively.

The age-structure of the population samples was determined before and after the rains (Figure 3) and it is a combination of these two that are used above to estimate numbers of puparia.
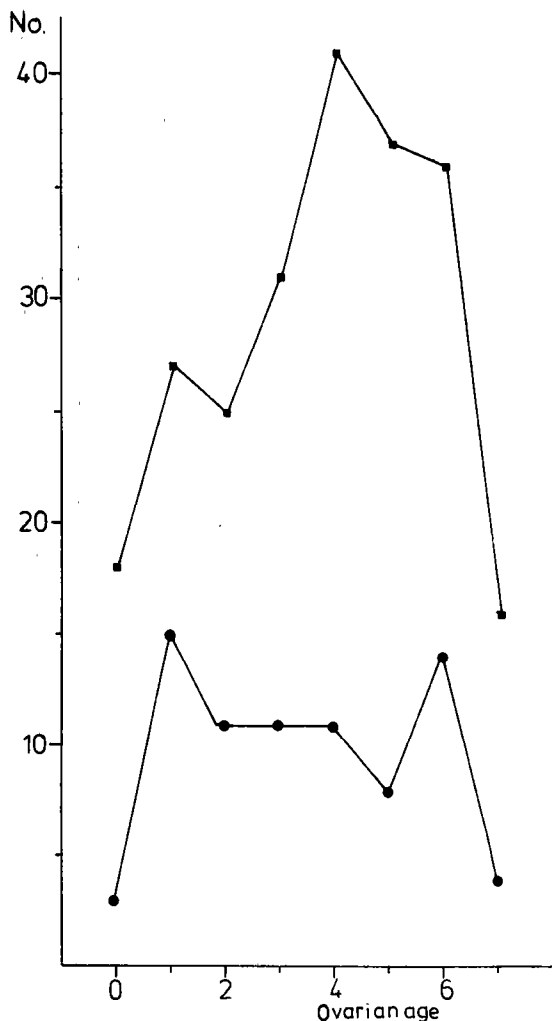

Figure 3. — The age-structure (no. flies/age category) of *G. pallidipes* captured by biconical traps between 3-7 November (■) and 8-10 November 1981. (●).

A relationship was also noted between maximum daily temperature and total catch as shown in Figure 4.

A summary of the 123 identifiable blood meals is presented in Table 1.

TABLE 1-Identifiable blood meals from *G. pallidipes* in Somalia

meal taken from :	% meals and (number) ♂	♀
Warthog	47 (21)	71 (55)
Suidae	16 (7)	5 (4)
Bushpig	2 (1)	1 (1)
Man	2 (1)	-
Bovine	20 (9)	15 (12)
Ruminant	13 (6)	6 (5)
Civet	-	1 (1)

DISCUSSION

Maximum daily temperature during the study period fell within the range 29.3-31.0 °C and was linearly related to the total catch (Figure 4). This agrees with Hargrove's (3) findings, however in this case the catch declines with increasing temperature. This relationship is clearly insufficient to account for the difference between the 2 sampling periods and days 4 and 8 specifically.

The large variation in apparent density has been overcome, using the removal trapping technique to give coincidental absolute density estimates. The numbers of *G. pallidipes* per hectare are known to be high relative to *G. morsitans* s.l., *G. palpalis* s.l. and *G. tachinoides* (9). However these results for *G. pallidipes* in Somalia compare favourably with results from Zimbabwe (6, 3, uncorrected ZIPPIN ; RYAN, unpublished).

The large increase of trap efficiency, of 8 % to 15 % average daily removal is thought to be due to some factor effected by the rains. A candidate reason could be the changed behaviour of preferred hosts. As shown in Table 1, warthog is the preferred host and these appeared in the open rather than concealed in thicket far more frequently after the rains. However, this is only one of many possible explanations for the increased trap efficiency.

The age structures of the 5 and 3 day samples (Figure 3) and their mean ages (at a recorded mean temperature of 26 °C) of 36 and 34 days respectively are sufficiently similar
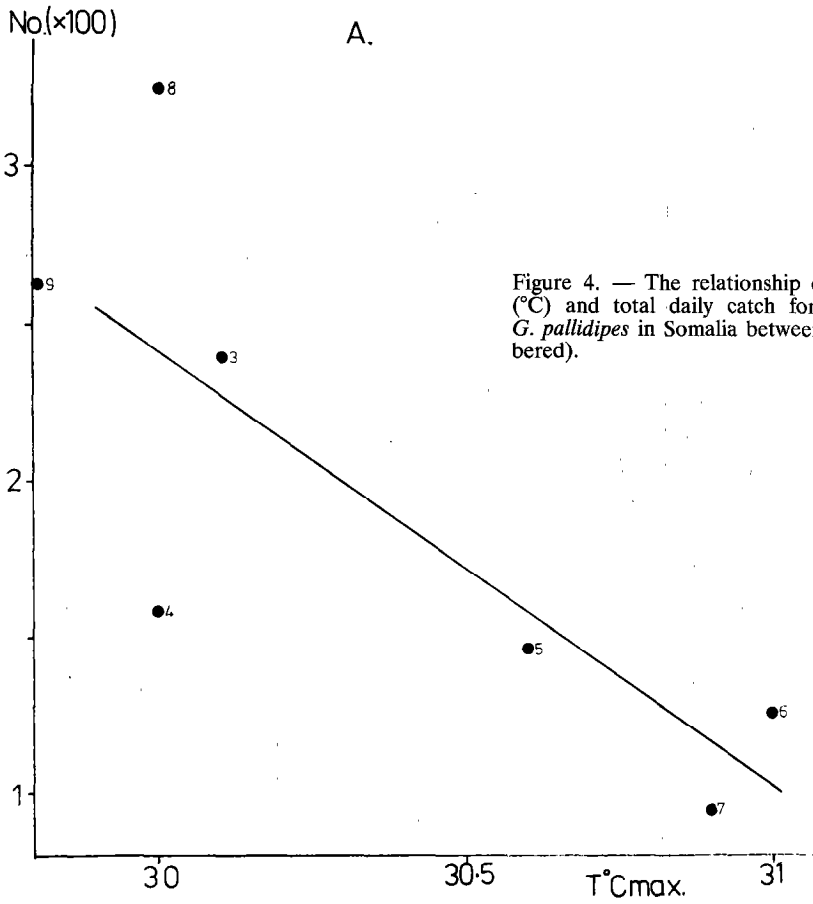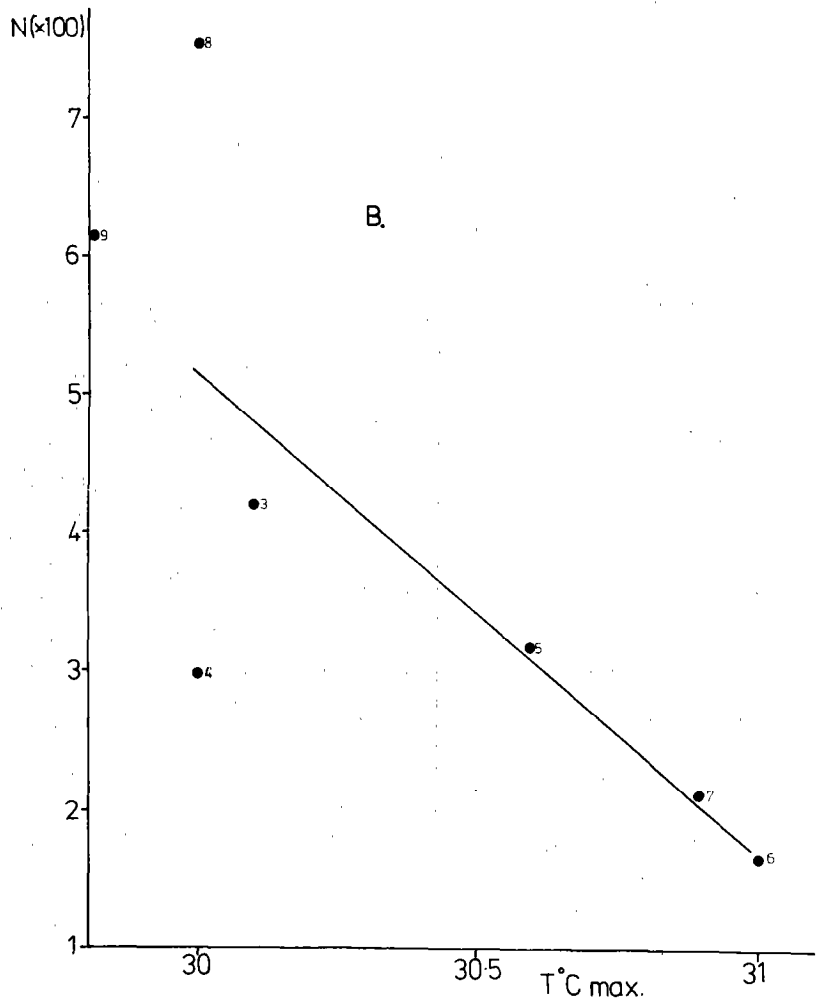
Figure 4. — The relationship of maximum temperature (°C) and total daily catch for A. male and B. female *G. pallidipes* in Somalia between 3-9 November (as numbered).

to discount as the cause for the increased catch.

A certain amount of immigration into the trapping area has also clearly occurred since the two periods estimated similar populations, whereas the 2nd period should have indicated the previous 8 % per day reduction. However the clear trapping out effects of this study along with others (9) indicate the reliability of these results. Larger scale studies that reduce immigration will give a greater and more sustained reduction (4, 5). This type of study may lead to improved trap design, once the reasons for increased efficiency are understood.

Clearly the ability to monitor absolute density, by these simplistic methods, is an improvement on relative density both for studying tsetse ecology and the timing of control efforts.

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Resumen. — Se efectuaron capturas continuas de *Glossina pallidipes* en 1,2 ha a lo largo del rio shebili, en Somalia, por medio de trampas bicónicas. La densidad relativa (D.R.), representada por el número de moscas capturadas por una trampa en un d_{ia}, ha disminuido de nuevo durante los 3 días siguientes.

Al aplicar a estos dos periodos los principios de la sustracción por captura, se estiman respectivamente las densidades de tse-tsé a 967 ± 251 y 953 ± 208 machos y a $1\,865 \pm 186$ y $2\,483 \pm 128$ hembras por hectárea.

Es el principal factor que probablemente ha provocado esta modificación de la D.R. la aparición de lluvias fuertes entre los dos periodos de captura. Dichas lluvias han tenido influencia sobre la disponibilidad de las moscas para las trampas, o indirectamente al moficar el comportamiento de los facoqueros que, según los resultados de 123 analisís de la sangre ingerida por las moscas, constituyen su húesped preferencial. Se ha establecido también una relación con los maximos diarios de temperatura, pero no es suficiente para explicar las variaciones de la D.R.

Palabras claves : Densidad — Captura — Trampa — Mosca tse-tsé — *Glossina pallidipes* — Somalía.

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