Experimental set ups

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In the Far East the principal pest species are the mosquito bugs *Helopeltis theivora* and *H. bradyi* (and *H. clavifer* in Papua New Guinea).

In West Africa *Sahlbergella singularis* is usually the most widespread and abundant species with *Distantiella theobroma* often as numerous not only in Ghana. Several species of mosquito bugs (principally *Helopeltis corbisieri, H. lalandei,* and *H. seredensis*) also feed on pods and shoots.

The relative importance of *Helopeltis* spp. as shoot feeders in West Africa is uncertain.

Layout of mirid mass-trapping experiment at Acherensua, Ghana

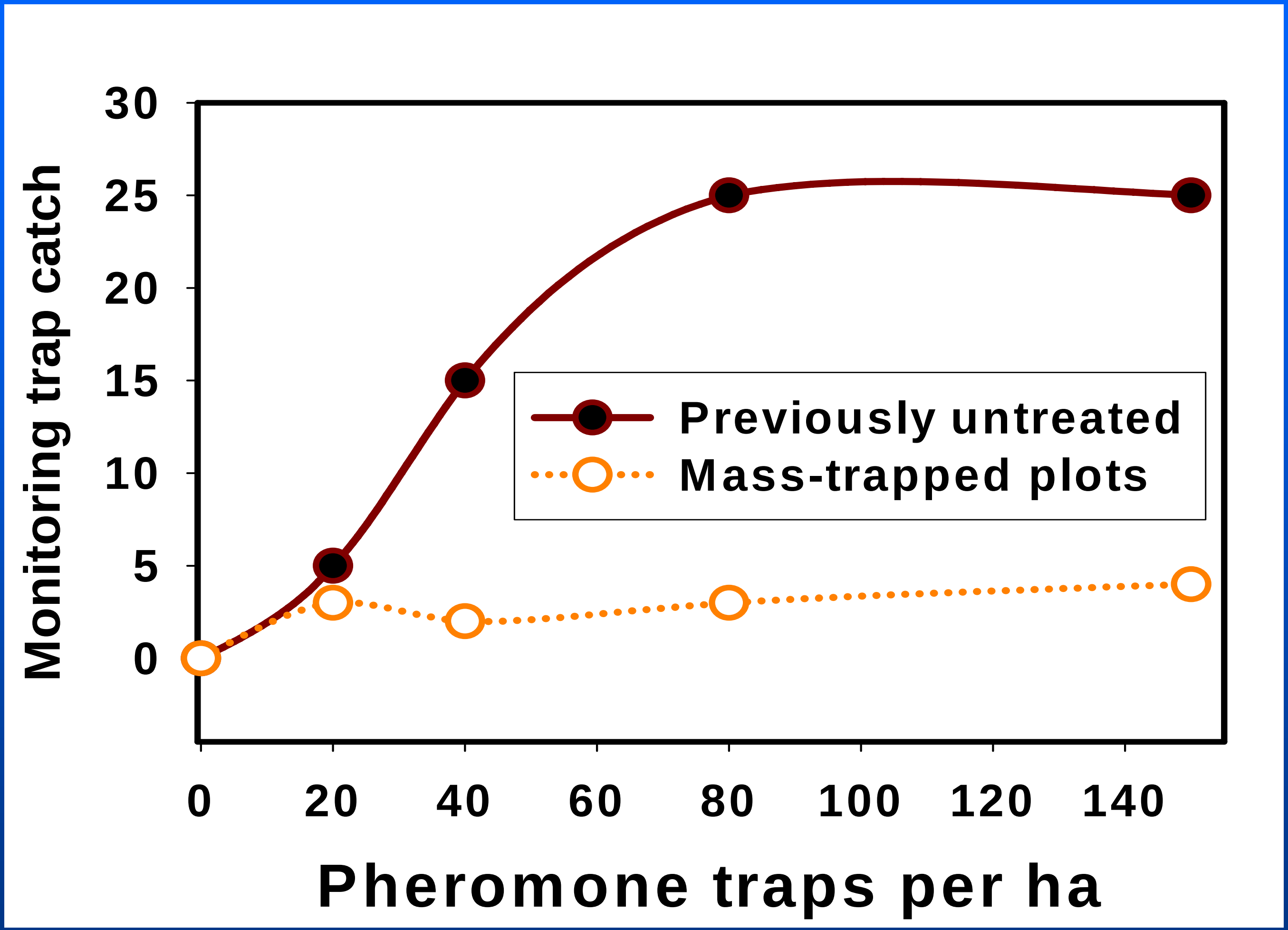
I VII

b	*d*	*a*	a	e	*d*	a	*a*
c	*b*	*e*	b	a	*b*	e	*c*
a	*c*	*b*	d	b	*a*	d	*e*
d	*a*	*c*	e	d	*e*	c	*b*
e	*e*	d	c	c	*c*	b	*d*
d	a	a	*e*	d	*d*	e	*c*
a	c	c	*b*	a	*e*	c	*a*
b	d	e	*c*	e	*c*	b	*e*
e	e	d	*d*	b	*b*	a	*d*
c	b	b	*a*	c	*a*	d	*b*

II VIII

Randomised blocks split-plots design with 0.5 ha Whole Plots
Whole Plot treatments: Pheromone treated (150 traps per ha) (plain font)
Untreated control (italic font)
Sub-plot treatments:
a-e are geometrically increasing numbers of monitoring traps (0 - 150 per ha)

Predicted outcome



I VII

b	*d*	*a*	a	e	*d*	a	*a*
c	*b*	*e*	b	a	*b*	e	*c*
a	*c*	*b*	d	b	*a*	d	*e*
d	*a*		e	d	*e*	c	
e	*e*	d	c	c		b	*d*
d	a	a	*e*	d	*d*	e	*c*
a	c	c	*b*	a	*e*	c	*a*
	d	e		e		b	*e*
e	e	d	*d*	b	*b*	a	*d*
	b	b	*a*	c	*a*	d	*b*

II VIII

7 Sub-plots have caught fewer than 3 mirids to date and 5 of those are treatment *c*

The experimental design is sound, but could the experimental set-up be bettered?

The major problems are:

1. Seasonal population fluctuations.

2. Distribution of mirids between trees is patchy.

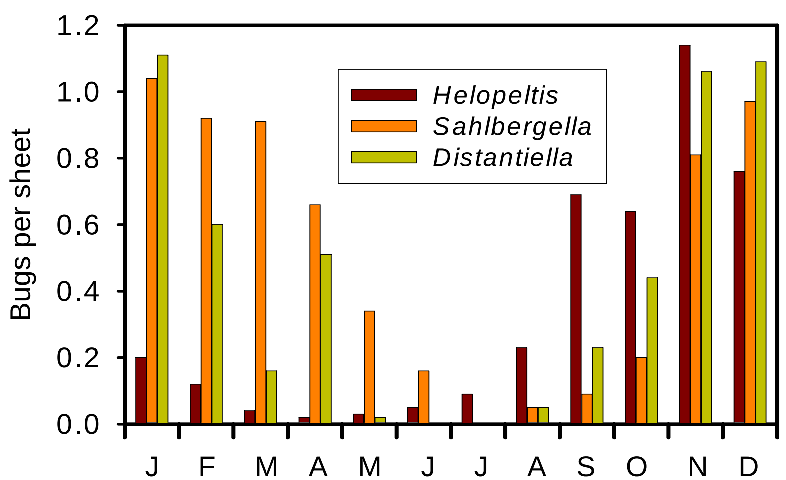
3. Fluctuating species composition.

4. Ss and *Dt* are cryptic, nocturnal and low density.

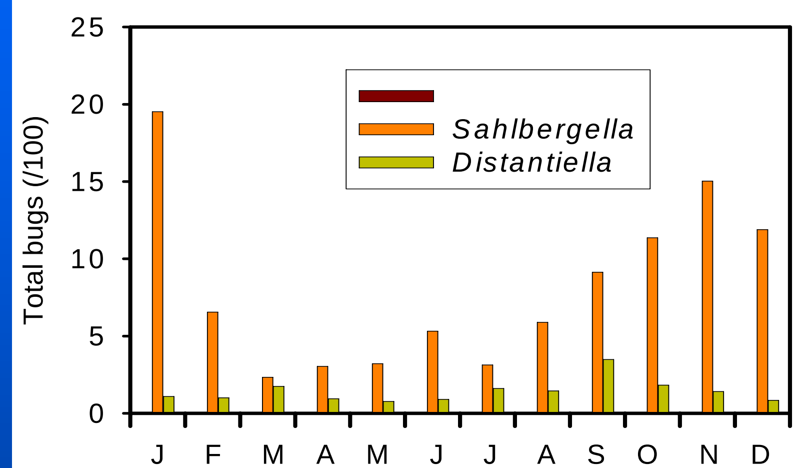
Possible/probable solutions:

- Experimental Block lay-out to include census data by matching plots for mirid numbers or damage.
  - Are insect counts necessary or would damage assessment suffice?

Seasonal population fluctuations:
(pyrethrum knockdown samples)



Data:
Gibbs & Leston (1970)
Gibbs, Picket & Leston (1968)



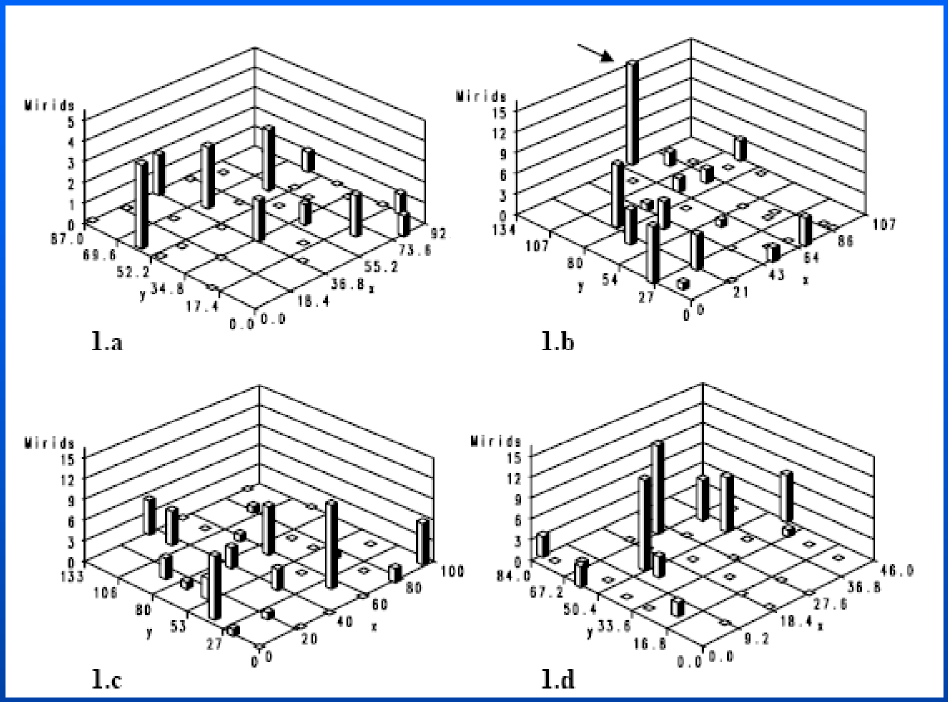
Data:
Lavabre, Decelle & Debord (1963)
(*Distantiella* = Olibribouou (77% Dt))
(*Sahlbergella* = Zephreghe (99.5% Ss))

Ghana 1966-7

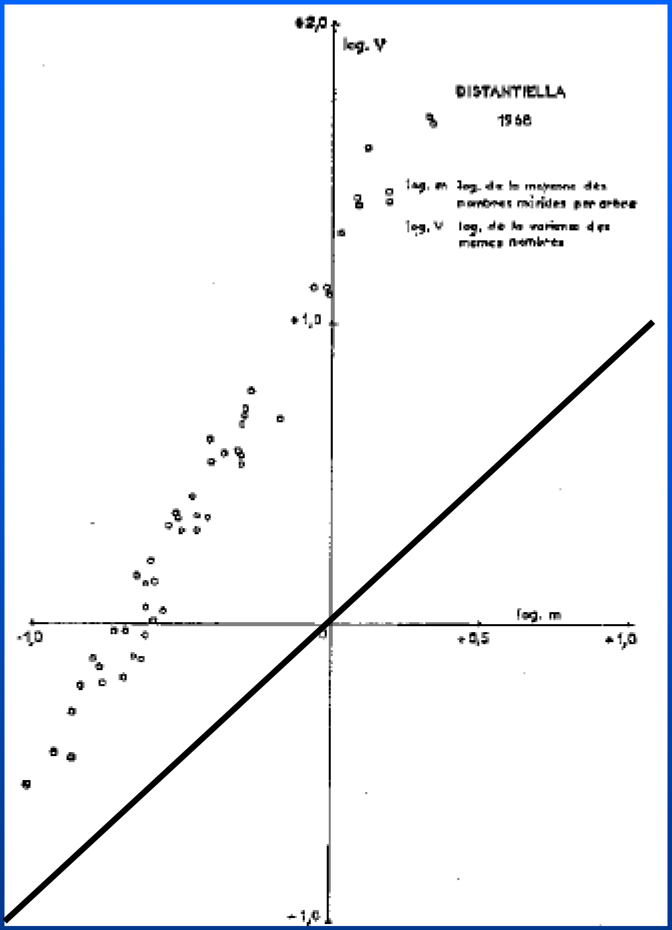
Ivory Coast 1961-2

Tan (1974) reports populations of *H. theivora* peaking in October and at a minimum in April-May.

Patchy population distributions.

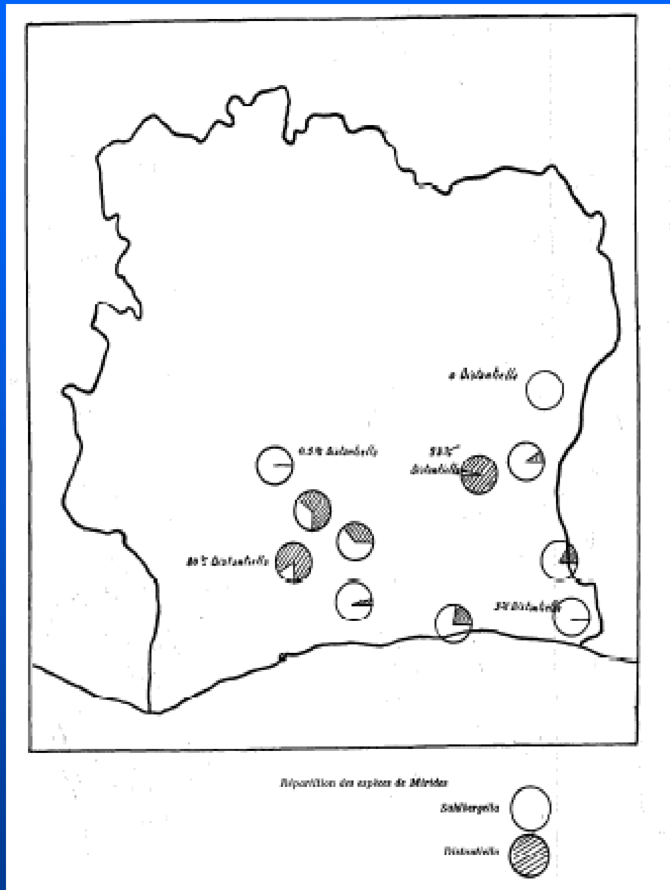


Spatial distribution of *S. singularis* on individual trees in 4 plots in Cameroon (Babin *et al.*, date?)

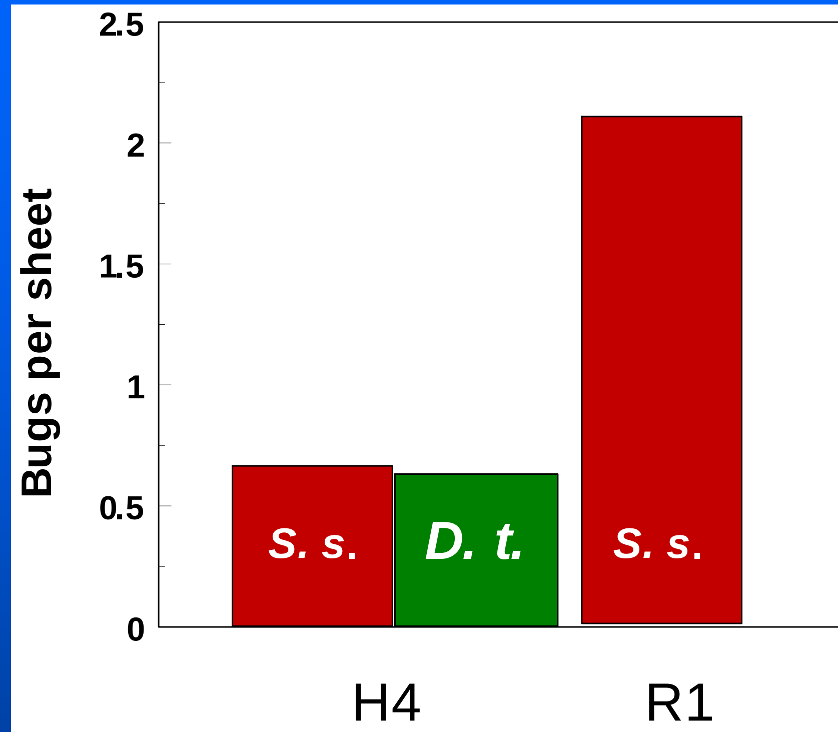


Mean:variance off *D. theobroma* in Cameroon (Lotode, 1969). Thick line = random distribution.

Fluctuating species composition.



Distributions of *S. singularis* and *D. theobroma* between sites in Cote d’Ivoire (Lavabre *et al.*, 1963)



Numbers of *S. singularis* and *D. theobroma* in plots H4 and R1 at Tafo, Ghana (Gibbs *et al.*, 1968)

Assessment methods:

For experiments, we need plots with high numbers of mirids – but these are also the plots most difficult to rehabilitate. Currently we exploit knowledge of mirid behaviour and ecology to choose the best sites, but how can we best match plots within sites?

Insect counts or damage incidence?

Counts:

Collingwood (1971) showed good correlations between counts to eye-level and spray knockdown at several spatial scales. (53-76% of variance explained).

Assessment methods:

Insect counts or damage incidence?

Counts:

In Malaysia, Wills (1986) counted *Helopeltis* on grids of 5.5 x 4-tree plots per ha, inspected at 18 day intervals, and spraying if a threshold was exceeded.

- **The census depends on the spatial coincidence of a mirid aggregation with a grid-plot.**

Damage incidence:

Johnson (1971) found that the assessment of new canopy damage gave more consistent results than counting mirids. Williams (1953) explained 45% of variance in a regression of lesions on mirid numbers.

Assessment methods: damage incidence

In Malaysia, Chung & Wood (1989) censused fresh *Helopeltis* damage on 1/100 tree plot to trigger alternative spray strategies and upped yields 2-3x

Their study is relevant to mirid experiments in West Africa because cherelle and pod damage censuses did not reflect the damage to canopy shoots.

- **The importance of *Helopeltis* spp. to canopy condition in West Africa is unknown.**
- **Any canopy damage by *Helopeltis* risks being misinterpreted once *Ss* and *Dt* are managed by pheromones or host-specific pathogens.**

Conclusions:

- **Grouping plots matched for pest numbers or damage incidence is likely to improve the precision of Randomised Blocks design field experiments.**

- **Monitoring the incidence of recent damage is less error prone than counting mirids and should give more consistent results. Ideally, whole-plot damage scores would be used as a covariate.**

- **In order to maximise treatment differences and minimise plot-to-plot variability, high counts are needed, so proper timing of experiments is vital.**

References

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