ELDANA SACCHARINA (LEPIDOPTERA: PYRALIDAE): TEN YEARS OF LIGHT TRAPPING

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Abstract

During the past 20 years, Robinson-type insect light traps have been used in the sugar industry to record various crop spoilers. During the past 10 years, records of the stalk borer *Eldana saccharina* Walker have been of particular interest. These are discussed, and for traps both in areas of sugarcane and in areas of indigenous host plants, various peak periods in moth numbers are identified. Population fluctuations can be associated with changing weather patterns.

Introduction

Since 1969 the Experiment Station has used insect light traps to record the presence of various crop spoilers. The original objective was to study the population dynamics and activity patterns of the various so-called trash caterpillars. These have an active moth stage, which serves to spread the infestation and which is attracted to light (Carnegie[9]). Then, for some years the Experiment Station was a member of the Southern Africa Light Trap Grid, which recorded insect pests of many crops and exchanged data between other members in South Africa, Zimbabwe, Mocambique, Botswana, Malawi, Kenya, Angola and Swaziland. This grid was associated with SARCCUS (The Southern African Regional Committee for the Conservation and Utilisation of the Soil). One of the most important insects recorded by the grid was the armyworm *Spodoptera exempta* Walker, a wide-ranging migrant which damages monocotyledonous crops, including young plant cane.

Light traps are suitable for sampling only those flying insects that are attracted to the light source being used. When, in 1970, the pyralid borer *Eldana saccharina* Walker reappeared in the industry (Carnegie[7]) it was not immediately included in light trap records. The standard light source then used was a mercury-vapour 125W (MB/U) globe which, for eldana borer, was a poor attractant. Moths were attracted to white walls in the vicinity of the trap, but not to the trap itself. From experiments with alternative light sources, it was found that moderately bright sources were more attractive than very bright or dim sources (Atkinson[1]). A normal domestic tungsten globe (100W, 1200 lumens) proved suitable.

The SARCCUS light trap grid was disbanded but, as the eldana borer problem increased, a network of light traps was established in the sugar industry (Atkinson,[2,3] Atkinson and Carnegie,[4] Atkinson *et al.*[6]). The network comprised up to 22 traps, and extended from Swaziland in the north to near Hibberdene on the south coast. There were two main objectives. It was hoped that, as with armyworm, any mass movement of moths might be detected and any "invasion" anticipated; and it was hoped to demonstrate any moth movement between natural vegetation and sugarcane. Those objectives were not met, although the traps have served several useful purposes in demonstrating relative moth abundance in different areas and at different seasons. These figures have corresponded well with records of the immature stages of eldana obtained during millyard and field surveys, which have become a routine method of population assessment (Carnegie,[8] Paxton[10]). Detailed results have been given in the literature cited above.

The purpose of this paper is to present figures for eldana moth populations over a 10 year period, as reflected by catches from 11 long-standing traps in different parts of the industry.

Methods

Robinson-type traps (Robinson & Robinson[11]) were distributed as shown in Fig 1. Most were in one place throughout the period, but some were moved slightly as necessary, their position being determined by the availability of a power source. Most traps were placed in or near sugarcane fields, but three were surrounded by natural vegetation including known host plants of eldana, e.g. *Cyperus papyrus* L and *C. dives* Delile. Photoelectric cells switched the lights on and off, and each morning the catch was removed from the trap and kept for sorting.

Between 1982 and 1983 the 100 W tungsten globes were replaced by similar 200 W globes, and in a paper on eldana population dynamics (Atkinson and Carnegie[4]) an arbitrary allowance was made for possible catch increases and their effects on mortality calculations. In the present paper, which aims at indicating broad trends, no such allowance has been made, neither has any been made for possible effects of wind speed or moonlight (which, over large time periods should be minimal). Results for individual traps showed that use of a brighter light source was not necessarily followed by greater numbers of moths being caught; in some traps numbers fell.

The light traps discussed in this paper have been considered as constituting four groups, according to locality. Group 1 comprises three traps (Numbers 1, 2 and 3 in Fig 1) which are all remote from sugarcane, and which attract their catches from various indigenous wetland host plants. Group 2 is

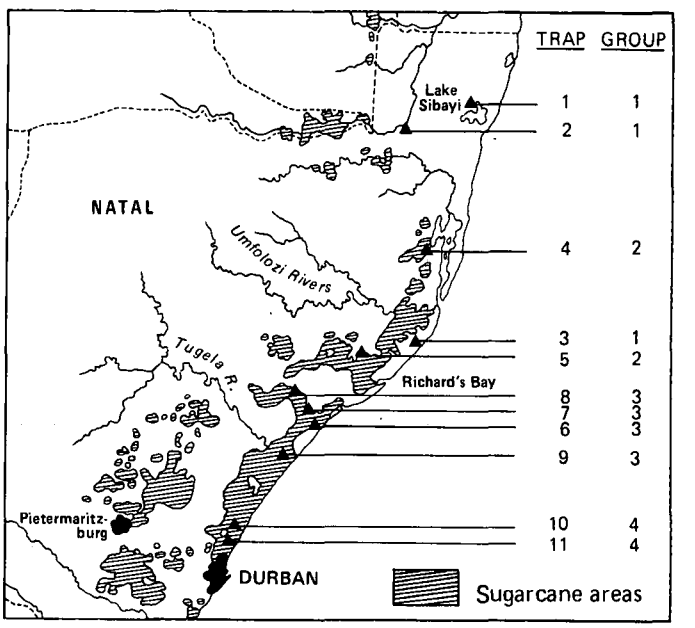

FIGURE 1 Location of 11 light traps

made up of traps 4 and 5 and is the most northerly in sugarcane. Further south is Group 3, comprising traps 6, 7, 8 and 9, and further south still is Group 4, which comprises traps 10 and 11.

A general linear model was fitted using least squares, because not every trap operated for the entire period. The means plotted in Figs 2, 3, 4, 5 and 7 are the least squares means.

Results and discussion

Relative moth numbers

Mean numbers of moths caught in the eleven traps, over the 10-year period, are shown in Fig 2. Numbers varied greatly, with traps in indigenous vegetation (Group 1) generally trapping fewer moths than those in sugarcane.

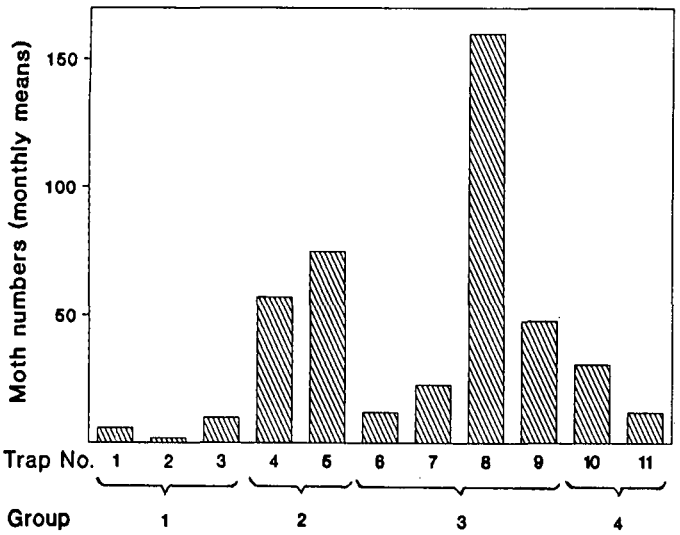

FIGURE 2 Number of *Eldana saccharina* moths from 11 light traps, from 1979 to 1989

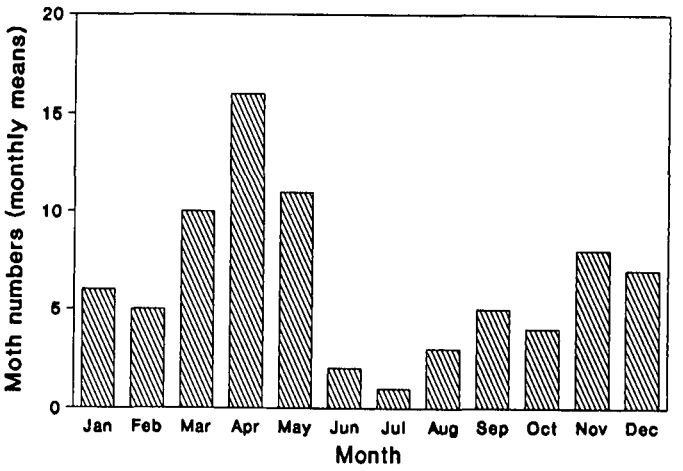

FIGURE 3 *Eldana saccharina* moths trapped monthly from 1979 to 1989: traps among indigenous host plants

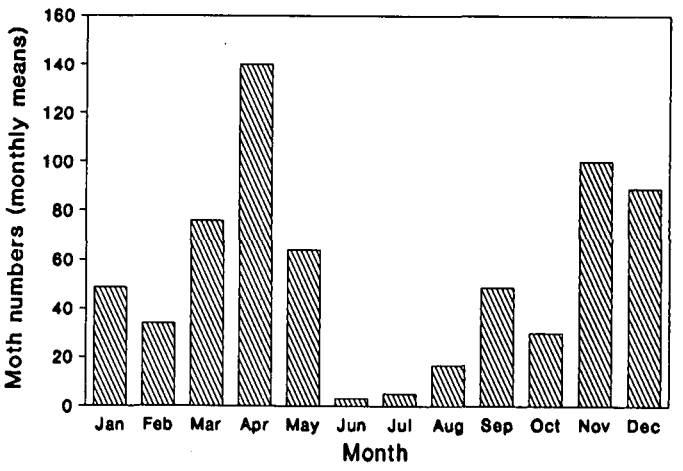

FIGURE 4 *Eldana saccharina* moths trapped monthly from 1979 to 1989: traps in sugarcane

Even in an area where an insect is known to be abundant, the position of a trap largely determines the numbers caught. Trap No 8, for example, (Figs 1 and 2) was in a particularly good position, on a hilltop commanding a panorama of sugarcane in a heavily infested area. It consistently attracted relatively large numbers. Of necessity, the siting of a permanent trap is determined by power availability, which seldom coincides with an ideal location. Comparisons of catches at different times from one particular trap, or from a group of traps can be reliable; but comparisons between traps should be made with caution, because differences recorded may not be a reflection of numbers present in that general area.

Seasonal fluctuations

From light trap records, supported by millyard surveys of immature stages, it has been apparent for some years that seasonal peaks in moth numbers occur. From limited records, Atkinson[2] in 1982 suggested three periods of marked abundance: in September, November/December, and in March/May. It has since become customary to speak of two annual "moth peaks", in April and November, and to anticipate them in implementing control measures, such as the pre-trashing of sugarcane.

In Figs 3 and 4 the mean monthly moth catches are shown for the 10-year period, for Group 1 and for the remaining groups combined. The peak periods are clear. Their occurrence in Group 1, which comprised traps in indigenous vegetation only, suggests that the population cycles are natural and not a result of crop management. High borer numbers encountered at the beginning of the cutting season, in April and May (Carnegie,[8] Atkinson and Carnegie[4]) have been attributed to the large areas of stand-over cane then present; but apparently there are other factors involved. The traps of Group 1 are at least 35 km from cultivated sugarcane and it is unlikely that trapped moths had migrated from those fields.

Numbers of moths trapped during the cooler winter months were relatively low.

Annual fluctuations

For the four groups, the monthly figures were averaged for each of the ten years (Fig 5).

Unpublished records from millyard surveys show that, in recent years there has been a decrease in numbers of eldana larvae recorded in cane from most mill group areas. This reduction is reflected at least to some extent in the figures for Groups 2, 3 and 4 in Figure 5. No pronounced decrease is apparent for Group 1, which suggests that the reduction may be restricted to sugarcane.

Three traps of Group 3 are in the Amatikulu mill area, which was previously heavily infested, and it is of interest to compare figures for eldana larvae recorded in millyard surveys over the 10-year period (Fig 6). The pattern is similar to that for moths, but with a more pronounced decline in numbers in recent years. The high moth numbers for

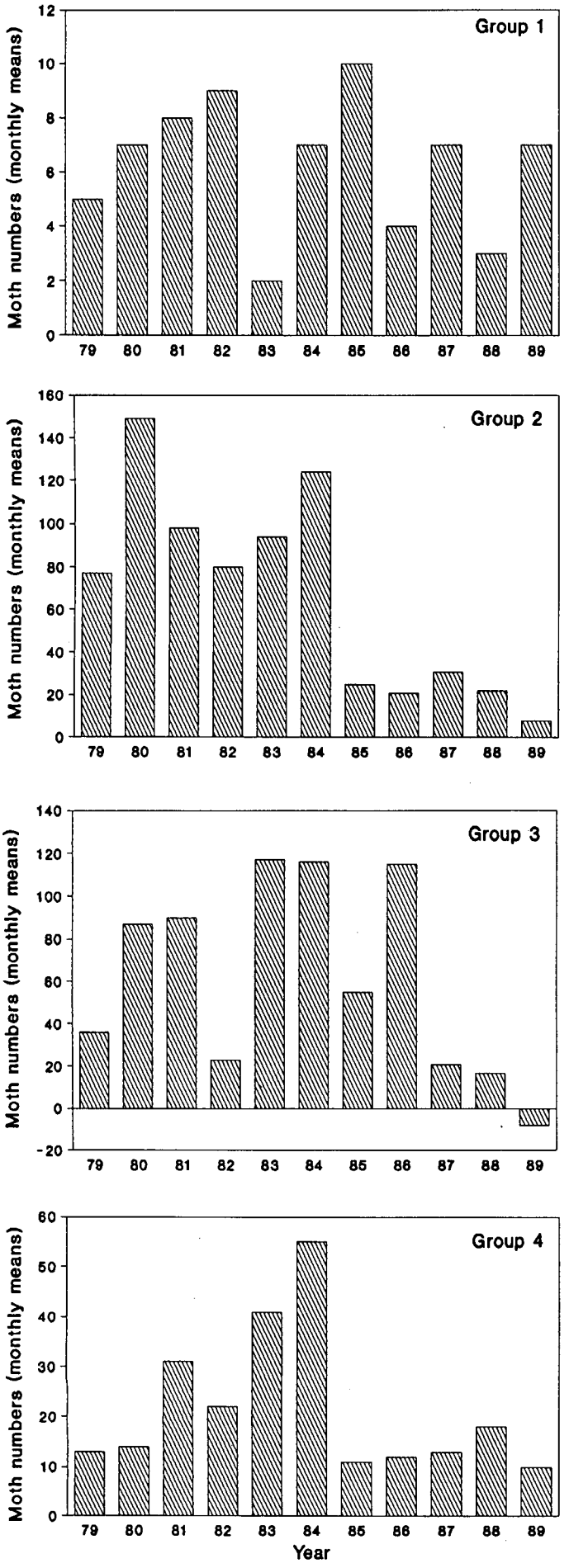

FIGURE 5 *Eldana saccharina* moths from four groups of traps: 1979 to 1989

Group 3 in 1986 (Fig 5) were boosted by exceptional catches in Trap No 8.

In Fig 7, the records for all traps for the 10-year period have been combined. On it is superimposed a line for annual rainfall. From 1979, the pattern indicates that periods of low rainfall were followed by high numbers of moths; and that when rainfall improved, moth numbers fell. The lower figures for moths, particularly over the past three years have occurred while rainfall has been good.

It is clear that crop stress has a profound effect on infestation of sugarcane by eldana borer, and that in drought years very heavy infestations occur (Atkinson and Nuss[5]). In discussing causes of eldana outbreaks, Atkinson *et al*[6] in 1981 suggested that they may have been associated with periods of high rainfall. The suggestion offered was that under wet conditions, the hydrophytic natural host plants of eldana would become increasingly abundant and heavily infested, and that from them the sugarcane would become invaded. Certainly the relatively low figures for natural host plants (Group 1 in Fig 5) do not show a marked decrease in moth numbers with the better rainfall of recent years. However, in areas of heavy infestation, e.g. Amatikulu mill area, the increase in infestation following drought years (1983-84) was occasionally phenomenal.

The comparatively recent decline in eldana numbers in the Amatikulu mill area has been of particular interest since that was once an area of extremely severe infestations. The decline has been attributed largely to a concerted effort on the part of growers to reduce crop age at harvest. However, the reduced stress on the crop resulting from improved rainfall has undoubtedly been another important factor.

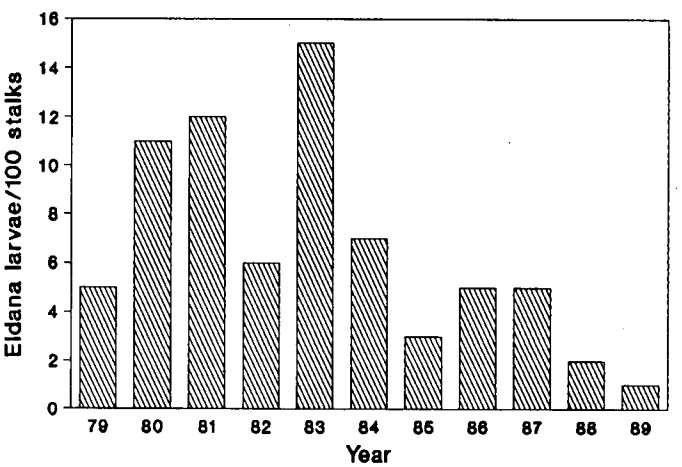

FIGURE 6 *Eldana saccharina* larvae (mean numbers per milling season) for Amatikulu mill: 1979 to 1989

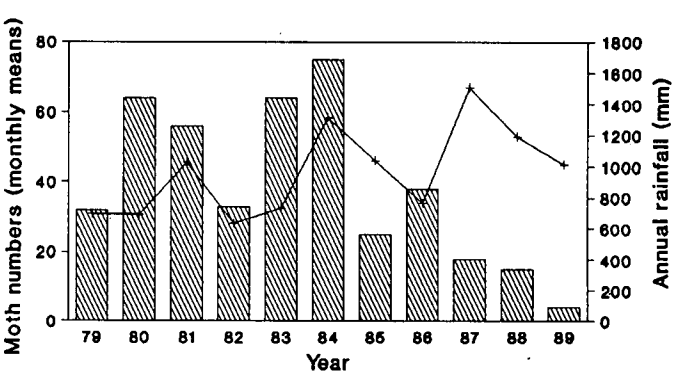

FIGURE 7 *Eldana saccharina* moths from 11 light traps combined, 1979 to 1989. Annual total rainfall (means for selected sites) over the same period.

Conclusion

Many points of interest have arisen from the network of insect light traps in the industry. Some of these have been immediate, but others have materialised only in the long term. Reliable records, which extend over a long period, are of great value in understanding an insect crop spoiler. It is evident that numbers of *E. saccharina* fluctuate seasonally, and that in recent years numbers in most sugarcane areas have declined. This decline is attributed, in part, to increased rainfall. Two clear annual peaks in moth abundance can be identified.

Acknowledgements

We are grateful to our co-operators, who agreed to have light traps on their properties and who have helped with their efficient operation. We thank Mr S Desraj for his patrolling and maintenance of the traps and for sorting the catches, and we are indebted to the Biometry Department of the Experiment Station for analysing the results.

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