SEASONAL CYCLES OF ELDANA BORER IN RELATION TO AVAILABLE CONTROL MEASURES

By P. R. ATKINSON

South African Sugar Association Experiment Station, Mount Edgecombe

Abstract

Field management, whether in the form of early cutting, pre-trashing or burning, is at present the only means of reducing the incidence of eldana. Seasonal cycles of larvae, pupae and moths are examined to decide on the best times of the year to practise field management. The population seems to be at its most vulnerable during winter and spring.

Introduction

Eldana breeds continuously throughout the year but there are times when, because of the seasons, a particular stage predominates. Existing and proposed measures of control may be enhanced by timing them to coincide with the stages at which they are aimed. The seasonal cycles of larvae, pupae and moths are illustrated in this paper and control measures in relation

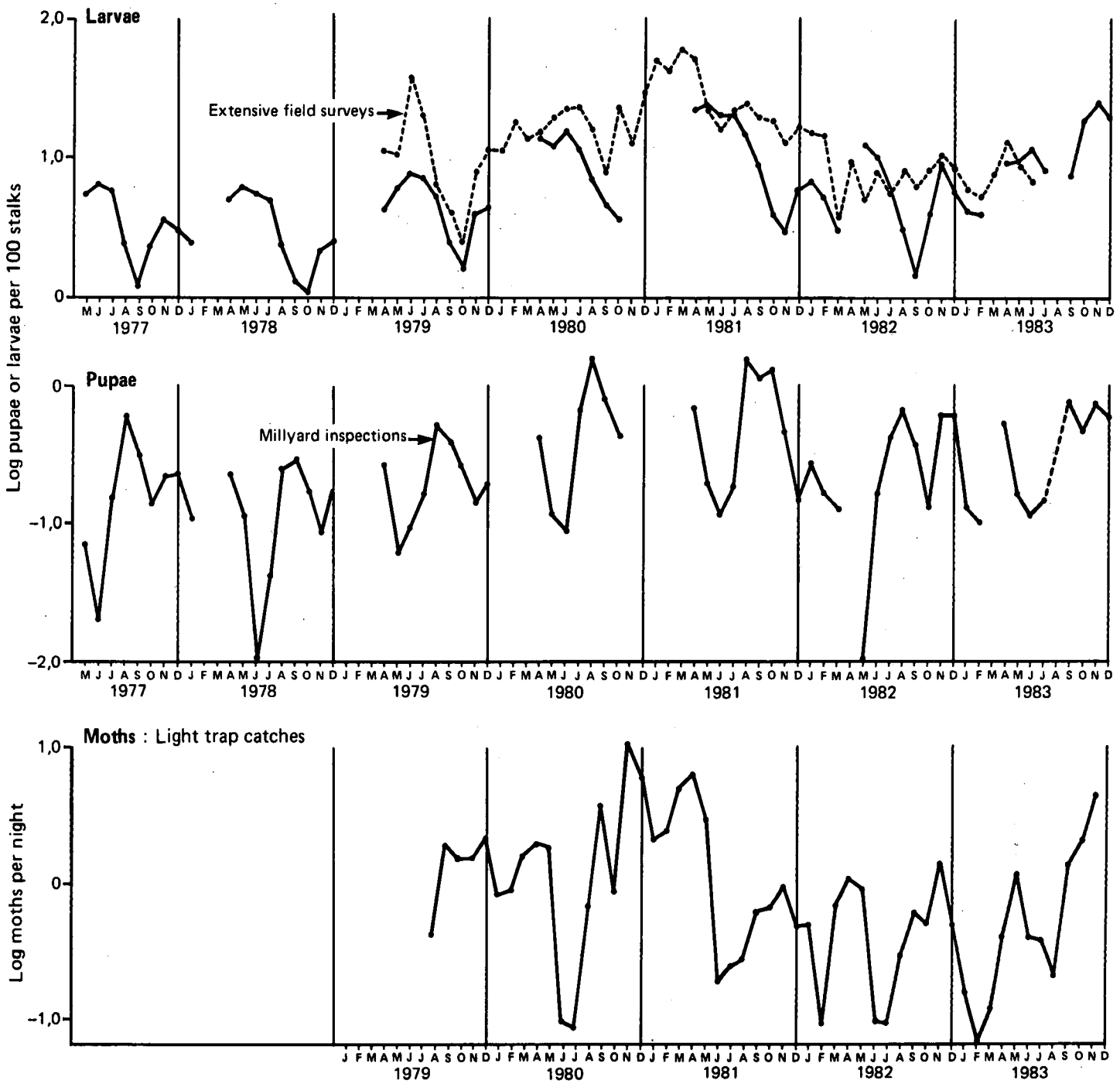

FIGURE 1 Logarithmic plots of intensities of larvae, pupae and moths in the Amitikulu mill area from mill yard inspections, extensive field surveys and geometric means of catches from four light traps.

to them are discussed. The data examined pertain to the Amatikulu mill area because that is where eldana infestations of sugarcane have tended to be highest, but there is evidence to suggest that the seasonal cycles should be similar as far north as Malelane.

Methods

At Amatikulu the eldana population has been sampled for several years by three methods: mill yard inspections of sugarcane consignments from growers, extensive field surveys, and light trap catches which sample moths.

Mill yard inspections from May 1977 onwards (7 years) constitute the largest and most extensive set of data. The surveys which were originally instituted to advise growers whether or not eldana was present in their cane, are conducted as follows: samples of 20 stalks are removed from cane consignments being processed at all times of the day and night. On average 250 growers' cane is sampled per month, which represents 2 400 consignments or 48 000 stalks. The data are not continuous throughout the year because the mill closes for at least a month, usually between January and April. Consequently such months are poorly represented in the data. Furthermore, seasonal cycles of larvae and pupae indicated by these samples may be biased by a tendency to harvest more highly infested cane early in the milling season (May, June) or towards the end (December) so as to remove such cane from the land. On the other hand, the samples are large and all growing regions within the mill area are represented each month so there should be no bias arising from the geographical distribution of the insect.

Extensive field surveys have been conducted in the Amatikulu mill area since April 1979 (nearly 5 years) to assist growers to detect high infestations of eldana. Samples of 100 stalks per field are taken from about 200 fields per month. This represents more than 20 properties. The data are continuous throughout the year and although the sample size of 20 000 stalks is large, the regions within the mill area which are covered each month are not the same and this gives rise to variation which is not seasonal.

Two light traps with 100 W incandescent lamps are sited within the Amatikulu mill area, a third at Empangeni to the north and a fourth on the Tugela river bordering the south of the area. These four traps, all sited in sugarcane, have been operated throughout the year since August 1979 (4½ years). Each trap samples a very local area (approximately 50 m radius), but the samples presumably contain immigrants from outside this radius. Geometric mean catches were calculated from the four traps. There is no reason to suppose that there is any consistent bias in the means which might obscure seasonal changes in numbers.

Results

The three sets of data are plotted in Figure 1. Larvae and pupae counted at mill yard inspections have been plotted separately. It was not possible to separate larvae from pupae in the extensive field survey data (broken line) and in any case the seasonal cycle is obscured in these data by other variations.

TABLE 1

Percentage of eldana in the pupal stage each month in mill yard surveys. Data are means of seven,[1] five[2] and three[3] years

Area	A	M	J	J	A	S	O	N	D	J	F
Malelane[1]	8,1	1,6	0,9	2,6	18,3	20,6	14,9	4,7	4,9	0,4	—
Pongola[1]	8,5	1,5	0,2	1,0	4,8	12,6	10,4	6,7	5,7	1,6	—
Umfolozi[1]	—	0,5	0,4	1,7	7,4	12,6	9,0	6,9	4,9	5,9	2,1
Amatikulu[1]	4,1	1,1	0,8	2,8	13,1	14,4	10,3	5,8	5,9	3,7	2,8
Maidstone[2]	—	1,5	0,7	2,1	12,6	15,0	6,3	5,9	6,7	6,4	2,5
Glendale[3]	—	4,6	3,8	7,5	26,7	21,1	9,5	8,3	15,4	8,4	—

Data from mill yard inspections and light trap catches show clear seasonal cycles. That the changes in eldana numbers in mill yard samples constitute a seasonal cycle and are not a result of the tendency to mill more highly infested cane first and last during the milling season, is supported by the increasing proportion of eldana in the pupal stage during August and September each year (Table 1).

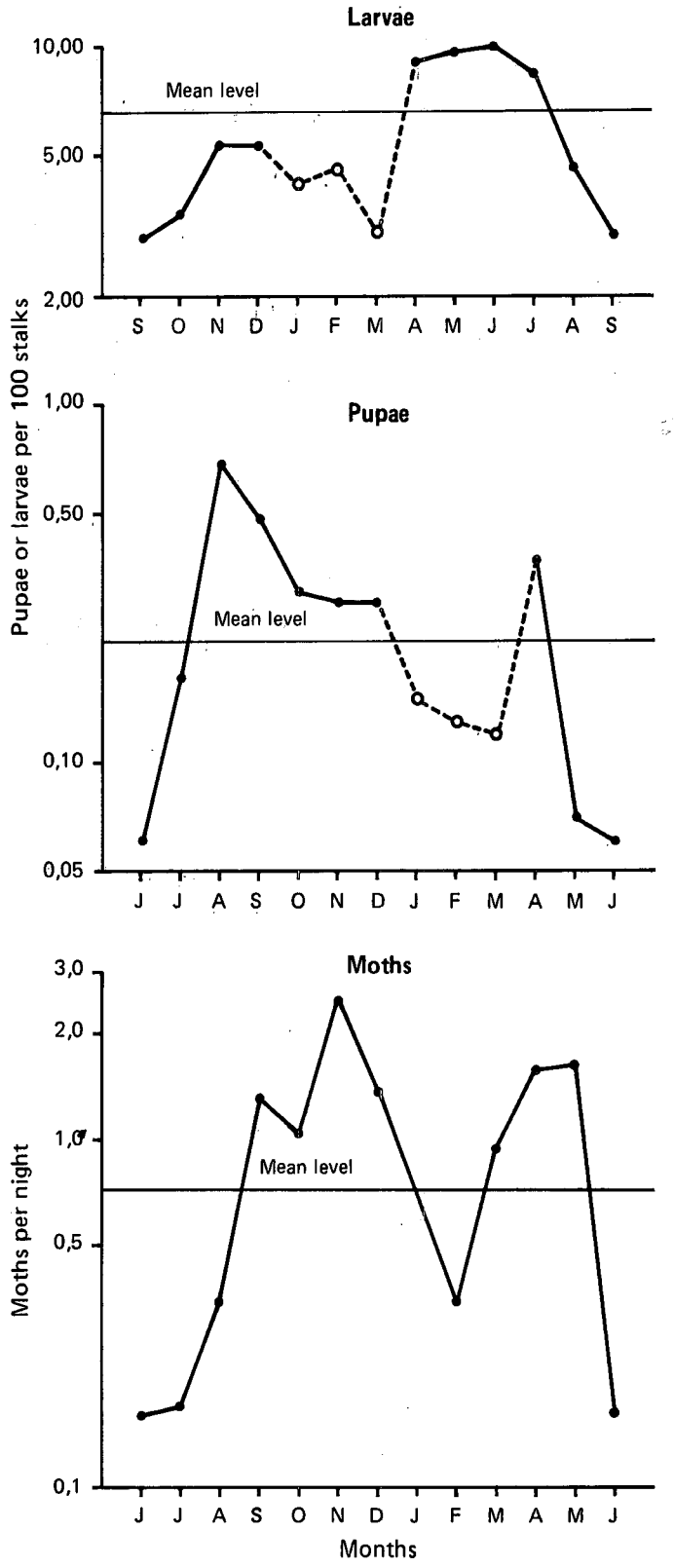

FIGURE 2 Geometric mean numbers of larvae and pupae in each month from mill yard inspections, and of moths from light traps. Encircled data points in January, February and March are from only 3, 2 and 1 years of data respectively.

From Table 1 there is no evidence that the spring pupation occurs earlier in the north of the cane belt than in the south, nor is pupation later inland at higher altitudes than at the coast. Consequently the timing of the seasonal cycle seems to be similar throughout the cane belt.

In Figure 2, data from mill yard inspections and light trap catches are averaged over years and the seasonal cycles of larvae, pupae and moths appear to be bimodal. However, the troughs in numbers of larvae and pupae between January and March are based on very few data from mill yard inspections and cannot be confirmed by extensive field survey data, which are too variable to be of value. Larvae are particularly numerous during winter, pupae during spring, and moths during summer and autumn. There is an unexpected dearth of moths in late summer.

Discussion

Existing control measures consist of cutting cane when it is young to reduce the eldana population over the entire mill area, and of pretrashing.

Cutting infested cane as early as possible in the milling season, perhaps starting in April instead of May, should help to reduce the major, winter larval-peak (Figure 2). However the apparent difference in size between winter and summer peaks in Figure 2 is partly due to different development rates in these seasons. Whereas in winter larvae develop slowly and accumulate until spring, during summer there is a more rapid population turnover making fewer larvae available to sample at any given time. Nevertheless, from May to July almost the entire eldana population is in the larval stage and in August it pupates. Therefore control measures directed at these stages should be effective during winter.

It is not clear which stages are affected by pretrashing. The moth oviposits in trash but stripping the trash also removes shelter for the small larvae and may cause the stalk rind to harden. Pretrashing probably affects all of the early part of the life cycle, from the egg to the larva penetrating the stalk, so it should be timed to coincide with moth peaks. The most important moth peak is in spring when almost the entire eldana population emerges from the stalk. Control measures such as pretrashing and inundative releases of egg parasites should be more effective at this time than at others, but a second opportunity exists in April, when the winter population of larvae is laid down.

During early summer of 1983, there were many instances of ratoon failure where cane had been cut during the winter. These were apparently caused by a combination of drought, shallow or poor soil and by eldana. Such instances were associated with trashing, being rare where cane had been burnt. The problem extended from Umfolozi to Durban and was not noticeably worse in any one mill area. Because of the drought, there was very little mature cane on the land in spring, and it seems likely that the moths which emerged in spring oviposited in trash covering the young shoots. In addition, the trash blanket may have inhibited the shoots from growing away from the eldana damage. Since the cane was harvested mainly during the winter it seems unlikely that the young shoots were infested from the stubble three to four months earlier. Under drought conditions therefore, winter burning should be effective in protecting the early summer ratoon, but there is no evidence that it makes any difference in normal rainfall years.

Conclusion

Sufficient is now known about eldana that crop management practices can be timed to the greatest effect. Measures aimed at the larval stage should succeed well during winter, whereas the moth stage can most effectively be attacked during spring, and to a lesser extent in autumn (April).