THE DISTRIBUTION OF OVERWINTERING TRYPODENDRON (COLEOPTERA, SCOLYTIDAE) AROUND A SINGLE TREE IN RELATION TO FOREST LITTER VARIABILITY[1]

J. A. CHAPMAN[2]

Introduction

The occurrence of overwintering *Trypodendron lineatum* (Oliv.) in forest litter was first reported and studied by Hadorn (1933). Later investigations on the hibernating sites of this ambrosia beetle were made by Kinghorn and Chapman (1959). One of their findings was that the beetles tended to concentrate around the bases of trees.

Examinations of litter in British Columbia have shown that there is often considerable difference in numbers of beetles from similar or adjacent samples. An example of this is given by Chapman (1959). There are many factors which may contribute to forest litter variability; for example, amount of rotten wood or moss, relative contribution from various tree species, moisture, and nature of ground cover. The purpose of the present study was to secure information, within a small sample area, on obvious differences in ground cover and nature of litter in relation to numbers of overwintering beetles.

Method

It was believed that the information desired could best be secured by sampling in such small units that the approximate location of individuals could be determined, in relation to litter variability. Accordingly, in 1959, near Parksville, B.C., some time was spent sampling the litter surrounding a single tree within a stand of timber. The seasonal activity of *Trypodendron* had been studied earlier in adjacent logging settings (Chapman and Dyer, 1960) and the location of a fairly large population of overwintering beetles was known from studies by E. D. A. Dyer and J. M. Kinghorn of this Laboratory. The work was done in November and December, after the beetles were all in their overwintering quarters. The area to be sampled was marked out in 6 by 6 inch squares and, including some smaller units next to the tree, 287 samples were taken. In each square the litter and organic material which could easily be removed by hand from above the mineral soil was taken. Previous work (Kinghorn and Chapman, l.c.) had shown that most if not all of the overwintering population is located above the mineral soil. The portion of the surface covered by leaves of salal (*Gaultheria Shallon* Pursh), the common under-growth plant of the coast forest, was noted, and the amount of moss estimated for each sample. Other obvious features of the litter, as presence of bark flakes in large amounts, or surface roots or fallen branches were also noted and the volume of each sample was measured after examining it for beetles.

Immediately upon collection the samples were placed in individual plastic bags and kept at outdoor temperatures in a shaded location until they were examined, within two months. This was done by spreading the litter thinly on a warm surface under a light (Hadorn's method) and watching it for a period of time judged entirely sufficient to activate all beetles. With this method they are seen easily when they begin to crawl about and at this stage of their life they seldom fly from the warmed

[1] Contribution No. 680, Forest Biology Division, Research Branch, Department of Agriculture, Ottawa, Canada.

[2] Forest Biology Laboratory, Victoria.

litter. The litter was redistributed on the warm surface at intervals during the examination period, to increase search effectiveness. Twelve of the samples which had been stored longest and from which a total of 37 beetles had been taken using the above procedure, were next examined by a wet method which reveals dead insects also (Kinghorn and Dyer, 1960). Only three more beetles were found, giving a recovery of 92 per cent for the warm pan method. This agrees well with previous tests of beetle recovery (Kinghorn and Chapman, l.c.) and is good evidence that few had died in the interval between collection and examination of litter, or were missed by the warm pan method.

Results

The data from this study are best given as a beetle distribution map of the area sampled (Figure 1). In (A) each beetle is represented by a dot. Within any given sample unit the dots have been arranged uniformly. The two squares adjacent to the tree represent 12 x 12 inch samples taken previous to this study. It is obvious that the positions of the beetles are only approximately shown. While most of them are closer, the maximum distance they could be recorded from their true position is 8½ inches (the length of a diagonal of a 6 by 6 inch square). The portion of ground surface covered by salal leaves is shown by the diagonal lines. No distinction was made between low, dense cover and higher, more diffuse cover. The position of a small dead tree which lay across the sample area is also shown, the interrupted lines indicating contact with earth or litter, the solid-lined portion being 2 to 4 inches above the surface.

In (B) the relative abundance of surface moss is indicated by from 2 to 49 dots per sample unit, corresponding to a range of trace amount to 2/3 of the litter sample volume, in 8 steps. The relative volume of litter per sample is also indicated; the range 25-35 cubic inches, to 100-150 cubic inches per sample being shown by use of 0 to 8 horizontal lines per sample square, with five categories. No obvious relationships between numbers of beetles and presence of dead salal leaves, small twigs, shallow roots or other miscellaneous features of the litter were noted.

Discussion

Certain inferences or tentative conclusions may be based on this study. First, there appears to be no direct relationship between moss or litter volume and numbers of beetles. Secondly, although the beetles concentrate next to trees, as earlier reported by Kinghorn and Chapman, a considerable proportion occur over a foot away. Thirdly, two features of the data suggest that surface cover is a significant factor in determining the final position of overwintering beetles: 1) the apparent effect of that part of the small fallen tree lying above the surface in concentrating beetles beneath and close to it (note Fig. 1-A), and 2) the quite marked association between high density of beetles and salal cover on the southeast side of the tree. It is possible that a concentration of large trees 15-20 feet to the southeast resulted in a shading effect which contributed somewhat to the heavier population on that side of the tree. It appears, however, that the primary factor was the salal cover, which in this section of the sample area formed a dense well defined zone, contrasting with an adjacent open space. It should be said that the area of felled logs from which, presumably, most of the beetles came, lies to the north through about 200 feet of timber. Finally, it can be noted that the distribution of

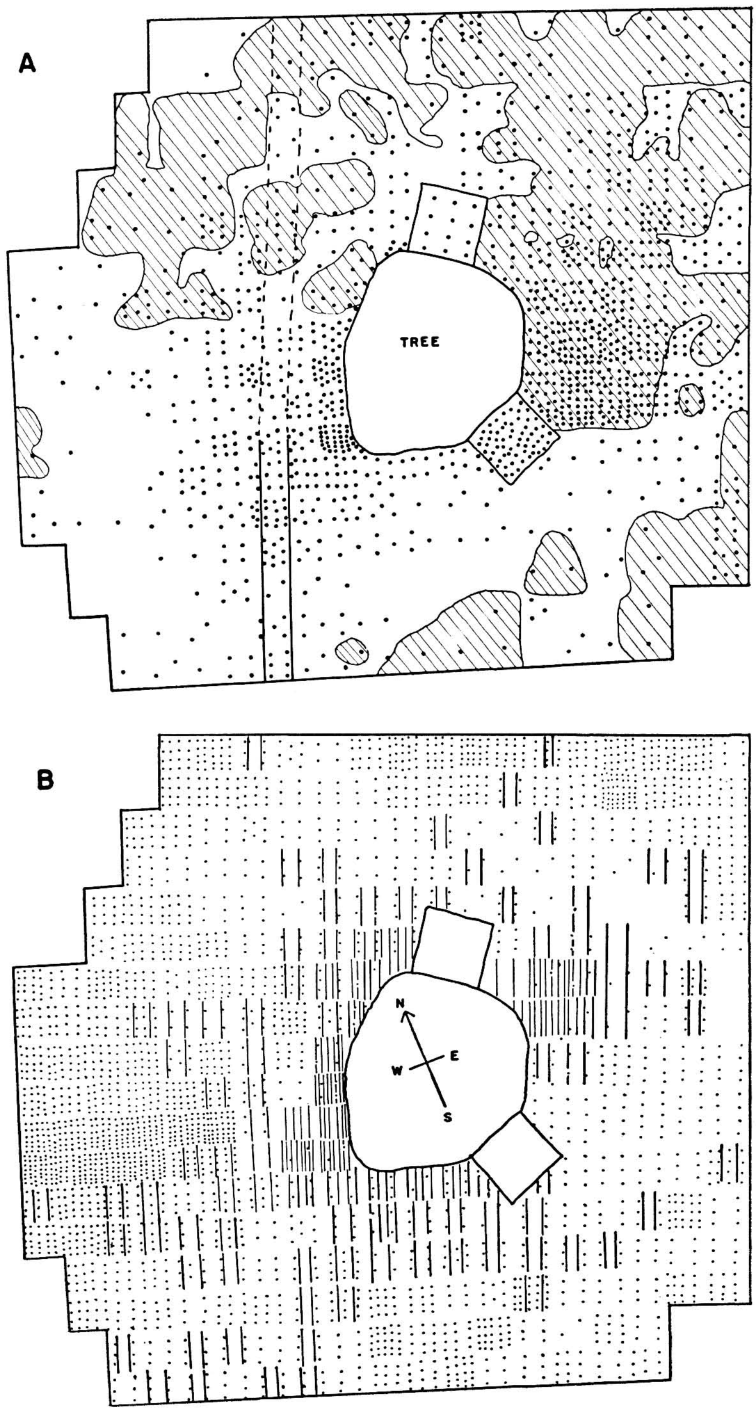

Fig. 1.—(A) Distribution of beetles (dots) around a tree in relation to salal (**Gaultheria**) undergrowth. (B) Relative amounts of moss (dots) and litter in the same area (see text).

beetles, while not random, is certainly variable enough so that a single sample anywhere around the tree would give only a rough idea of the actual population there.

Kinghorn and Dyer (1960) reported considerable numbers of *T. lineatum* overwintering in tree bark. Beetles were found not only in thick, heavily fissured bark, but also in niches bored into the relatively thin, smooth bark of smaller trees. This, together with earlier findings concerning location of overwintering beetles, suggests that it is the physical nature of a location in offering small, protected crevices within a certain general setting which influences a beetle to select its specific hibernating quarters. If this is so, then one would not expect differences in litter composition or appearance, even at the surface, to have much influence apart from the fact that most litter offers, at almost any point, relatively dark, moist, easily entered hiding places in abundance. The results of the present study are in agreement with this view and also indicate that it is factors other than those associated with obvious variations in litter itself which are of primary importance in determining location of overwintering beetles.

References

1. Chapman, J. A. 1959. Autumn-winter mortality in the ambrosia beetle. Canada Dept. Agric., For. Biol. Div., Bi-Monthly Progress Report 15(3).
2. Chapman, J. A. and E. D. A. Dyer. 1960. Seasonal flight activity of the ambrosia beetle **Trypodendron lineatum** (Oliv.), for 1959 near Parksville, B.C. Proc. Ent. Soc. B.C. 57: 30-33.
3. Hadorn, C. 1933. Recherches sur la morphologie, les stades evolutifs et l'hivernage du bostryche lisere (**Xyloterus lineatus** Oliv.). Suppl. aux org. de la Soc. forest. Suisse No. 11. Buchler and Co., Bern.
4. Kinghorn, J. M. and J. A. Chapman. 1959. The overwintering of the ambrosia beetle **Trypodendron lineatum** (Oliv.). Forest Science 5: 81-92.
5. Kinghorn, J. M. and E. D. A. Dyer. 1960. Overwintering of ambrosia beetles. Canada Dept. Agric., For. Biol. Div., Bi-Monthly Progress Report 16(1).

ADDITIONS TO THE CHECK LIST OF MACROLEPIDOPTERA OF BRITISH COLUMBIA[1]

DAVID A. ARNOTT

While investigating the cutworm species present in southern British Columbia the author used light traps at two localities to supplement data from field surveys. A trap was operated at Kamloops for 5 esasons from 1955 to 1959 and at Summerland for one season, 1956. Among the macrolepidoptera captured were thirty-two species not recorded for the Province by Llewellyn-Jones (1951), including *Laphygma exigua* Hbn., the beet armyworm, not previously known to occur in Canada. A single new record was obtained from Summerland, that of a geometrid, *Cheteoscelis bistriaria* Pack. Thirty species were recorded only at Kamloops. Adults of *L. exigua* were recorded at Kamlops in 1956 and 1958 and an adult recorded from southern Vancouver Island in 1958. The larvae of this species were also found during 1958 infesting crops of table beets and tomato at Ladner and tomato at Pavilion.

[1] Contribution No.   , Entomology Laboratory, Research Branch, Canada Department of Agriculture, Kamloops, British Columbia.