

can be obtained by examination of the larval tunnels and detecting the points at which they enlarge. Search of the frass in this region may result in a collection of exuviae which can then be counted. From such evidence it would appear that *S. noctilio* has usually 7 instars. It would appear that the number of instars is variable because of the evidence from rearings in tubes. Further support for this contention was obtained by finding as many as 9 exuviae in some larval mines. Stillwell (personal communication) working on *Sirex* sp. in New Brunswick, has found as many as 11 exuviae, but the usual condition is 5 or 6. Much more work of this kind is necessary. The sexes may be distinguished in larvae by the presence of hypopleural organs in females. These organs are situated in the posterolateral region of the first abdominal segment below and behind the spiracle (Parkin, 1941; Rawlings, 1951). Two small sclerites on the terminal abdominal sternite of female larvae is an additional reliable character. Male larvae have no hypopleural organs and 3 ventral sclerites on the terminal sternite.

PUPA. Following a prepupal period which is variable in length but usually completed in less than 4 weeks, the pupal period occupies 20–28 days. The moult from the prepupa is characterised by the retention of the exuviae as a cap over the terminal third of the abdomen. After the next ecdysis the terminal cap, now including the pupal exuviae, is retained by the teneral adult. This cap is lost at the time the adult commences to emerge. The period over which it is retained by the adult, however, is about 15 days on the average. It has been shown (Francke-Grossmann, 1939; Rawlings, 1951) that this terminal cap is important to the satisfactory inoculation of female siricids with the symbiotic fungus *Amylostereum chailletii* (see also Stillwell, 1960; Talbot, 1964).

SUMMARY

In examining the life history of *Sirex noctilio* we have made additions to the knowledge of its biology and of the post-emergence behaviour of the adult insect. Preliminary tests have indicated that the moisture content of the wood influences oviposition. The optimal range for oviposition appears to be between 40 and 75 per cent of the over-dry weight of the wood, and it seems probable that this is concerned with both the development of the fungal symbiont and the growth of the immature stages. The effect of moisture on the larval stages will be discussed in a subsequent paper. The number of larval instars is apparently variable, but averages 7. Variability in the number of instars may be related to moisture content of the wood, fewer stages of development being present where the wood is of low moisture content (below about 50% oven-dry weight). Female larvae may have more instars than male larvae under some circumstances.

Woodwasp attack on host trees has been recorded over a wide range of both localities and age classes of the hosts. These indicate that aggregations of the host-plant, large enough to induce severe competition for available resources at some time in the growth of the stands, are important to significant increases in the number of woodwasps. Such aggregations are not vital to the establishment of siricids as they are apparently capable of maintaining small numbers in moribund and broken branches, in and around damaged parts of the trunk as well as in wind-thrown trees and trees dying from other causes such as root rots, water-logging of roots and drought.

Dispersal of woodwasps probably occurs in the first few days after emergence of individual females. Male insects do not appear to move far from the area of emergence by their own efforts, the main ways in which long distances are covered are probably by transfer of infested material by man or floods and by transfer of adults by wind. Female *S. noctilio* show a marked tendency to fly away from the area of emergence in the first 5 days of life outside of the wood. The main factor which might retain females in the area of emergence is the availability of highly attractive host material.