IPS PROJECT MANAGEMENT COMMITTEE

INFORMATION ABOUT THE BARK BEETLE

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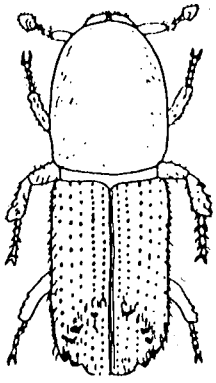
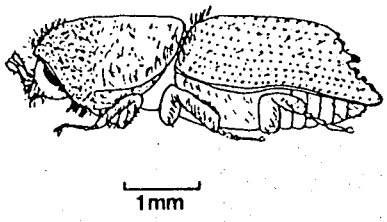
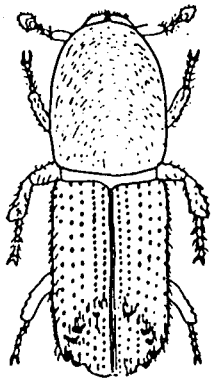
IPS GRANDICOLLIS







Introduction

The bark beetle Ips grandicollis is a well known attacker of pine trees in the Northern Hemisphere, mainly the United States, and has been introduced into Australia in two places, namely Port Pirie in South Australia and Fremantle in Western Australia.

do we know this?

From Port Pirie it escaped into pine plantations in the hills to the east of that town, and from Fremantle it escaped into plantations round Perth.

The discovery of Ips grandicollis was made in 1943 east of Port Pirie in plantations which form the Wirrabara Forest Reserve. These comprise part of the Northern Forest District of South Australia.

From there it moved south to the Central Forest District round Adelaide where it was found in 1961, then to the South-east Forest District round Mount Gambier where it was found in 1979. It has spread rapidly throughout the forests of this area and into forests across the border in Victoria.

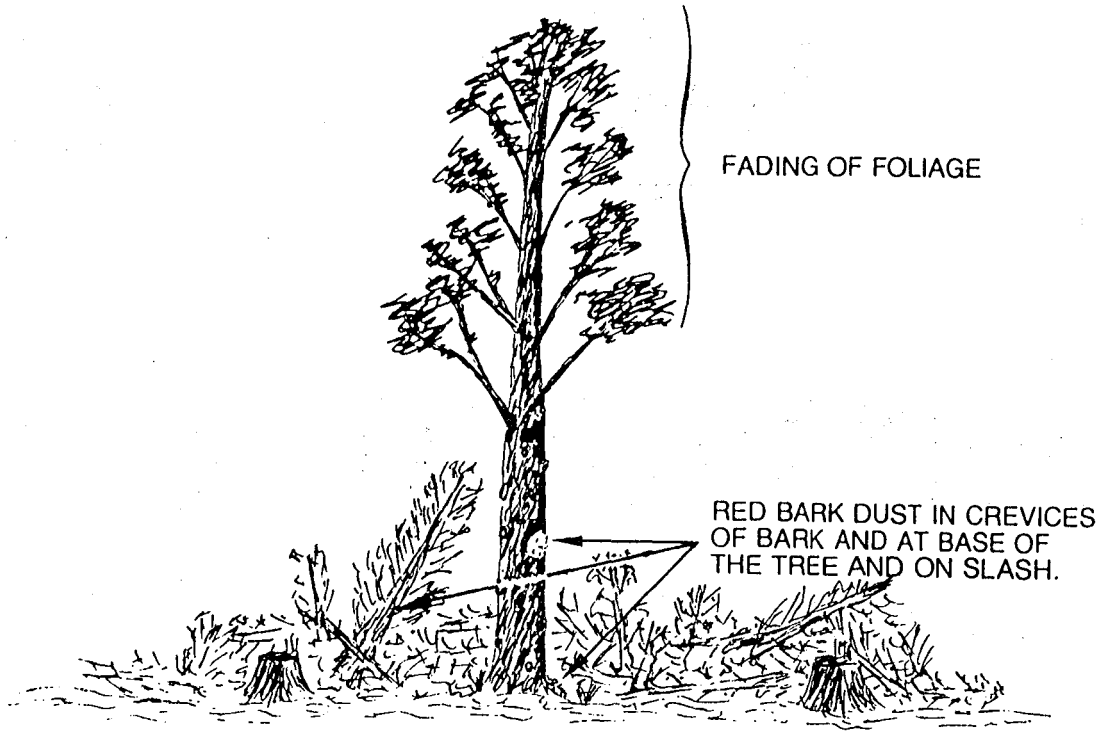
In the spring of 1982, it was discovered in Southern Queensland, its movements there being traced to logs for plywood making, sent from South Australia. Then in 1983, it was reported from Northern New South Wales.

Bark Beetle Biology

The bark beetles are members of the sub-family Scolytinae, they are small insects feeding and raising their progeny in the cambial tissues between the bark and wood of many coniferous species. Most of them introduce a fungus and in the case of Ips grandicollis, it is the blue stain fungus Ceratocystis ips.

They are mainly secondary insects, attacking trees that have been predisposed by factors such as drought or competition for moisture. Trees of low vigour may be killed by a combination of ringbarking resulting from feeding of the insects in the cambial tissue, and the upset of moisture flow in the sap wood by the fungus Ceratocystis ips.

However, large plantations of Ips breed in debris left after clear felling and thinning operations, and serious damage is caused to adjacent young plantations due to mass attack by these populations.



The attack is generally begun by the male adult which chews a small circular entry tunnel through the bark and into the cambium where a nuptial chamber is carved out. The frass (boring dust) produced, is pushed out the entry tunnel where it collects in crevices in the bark and in branch axils and at the base of the tree. It is scented with a substance from the gut of the male adult which attracts the females and other males to the tree and to the nuptial chamber. This substance is called an aggregating pheromone, and tends to attract both males and females to a tree.

Hence successful initial attacks are followed by mass attacks and it is this feature that allows apparently healthy trees to be killed and can cause significant losses in plantations.

Unhealthy trees do not have sufficient resin pressure, so are the ones most likely to be attacked successfully.

When a successful attack has taken place it is generally followed by a mass attack and with the establishment of the fungus Ceratocystis ips, the tree will rapidly lose water and the foliage wilt and fade in colour and eventually turn brown. This does not happen until three to four weeks after the beetles have entered the tree.

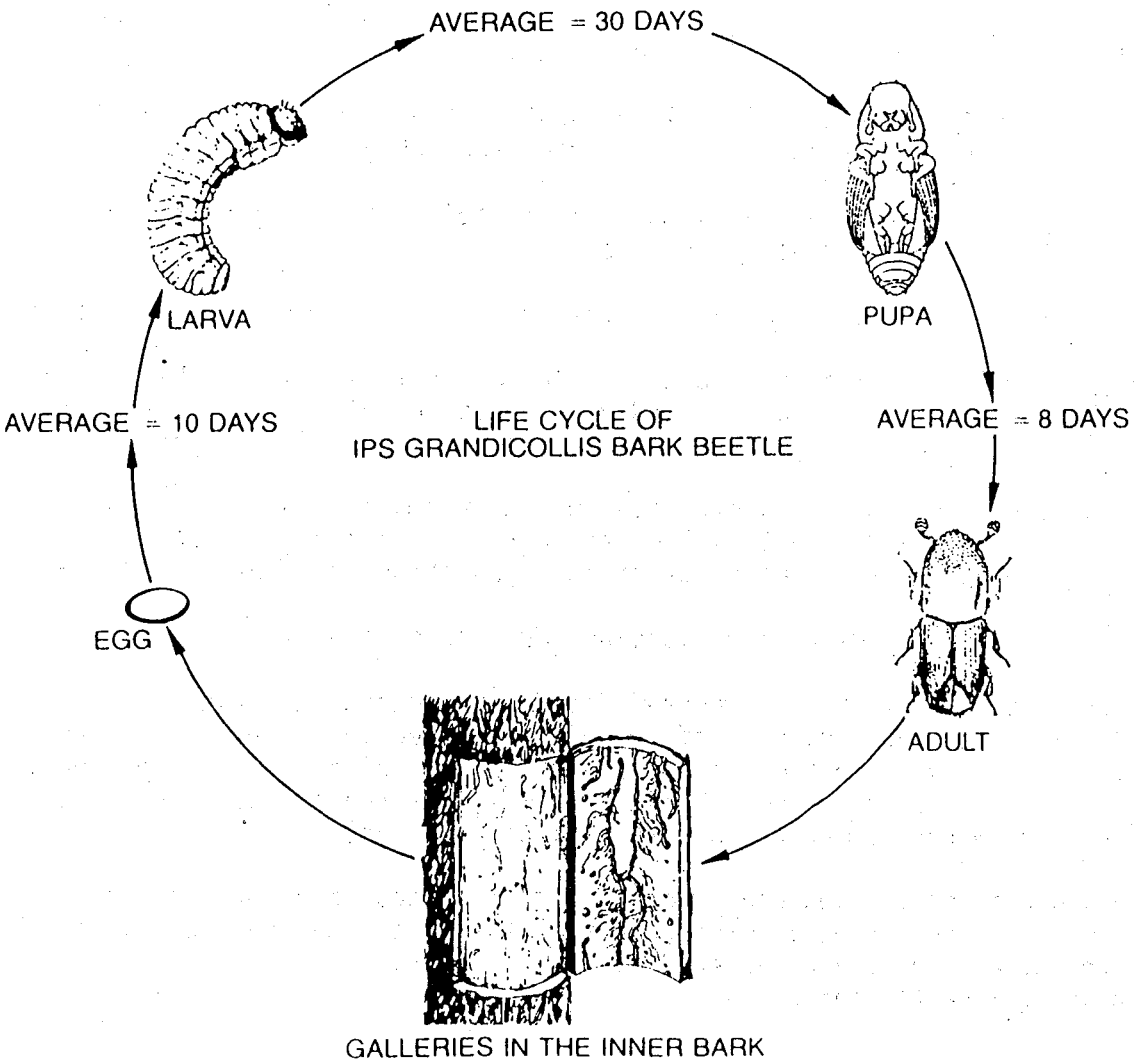
The Life Cycle of Ips

After the males and females have arrived in the nuptial chamber, mating takes place and the females chew tunnels away from the nuptial chamber. The number of tunnels radiating out varies from two to seven and along the sides of the tunnels niches are carved into which the eggs are laid. The frass produced is pushed back along the tunnel to the nuptial chamber by the female and then cleared out through the entry tunnel by the male.

When the eggs hatch in about ten days the young larvae begin feeding in the cambium away from the egg galleries and when fully fed after about thirty days, they make a pupal chamber and pupation takes place and the adult is formed which takes about eight days.

The adults then chew through the bark, emerge and begin a new attack when suitable material is found, in either standing trees, damaged trees or slash.

The life cycle may take up to forty-eight days but is often shorter than this during the hotter part of the summer. Four generations can be produced during summer, then when winter comes hibernation begins, and larvae, pupae and adults may be found hibernating under bark.



The females are capable of laying large numbers of eggs, and counts vary between 40 and 90, with an average of about 65 per female.

Survival of the young stages appears to be high but depends on the intensity of attack. Where the intensity is high the feeding by the earlier hatching larvae tends to remove the food source from the late hatchers and some die of starvation. Where intensity of attack is low then survival is high.

Bark thickness is another factor in survival of immature stages. The thicker the bark the higher the survival rate due to the higher retention of moisture in the cambial tissue.

Two forms of attack have been observed. The usual form is the "breeding attack" as previously described.

The second form is the "feeding attack", which is often observed in young thin barked trees where the intensity of attack is high. The attacking adults are so numerous that the cambial tissue is consumed before egg hatching takes place and that which is not consumed dries out rapidly due to lack of protection from the very thin bark. Some egg hatching and larval development takes place but it is minor compared with a "breeding attack".

Ways of Controlling Ips Populations

Although Ips does not produce the devastation to forest in South Australia that groups of bark beetles do in the northern hemisphere, the damage cannot be ignored or considered insignificant. Healthy, vigorously growing forests are the best defense but natural disasters such as drought, lightning and wind can upset this.

The following control methods have been tried:

1. Chemical sprays have successfully prevented attack in logs, and could be used where logs are being transported to areas where Ips is not present.

   Spraying must be carried out almost immediately after felling to prevent attack and this is not always possible.

   The widespread use of chemicals in the forest is expensive and undesirable.

2. The aggregating pheromone produced by Ips males (ipsenol) has been produced synthetically and this can be used with traps to collect a proportion of the population from areas of slash where large numbers of Ips are breeding.

   The synthetic pheromone is expensive but only small amounts are used, so although the chemical cost is low per unit area, the traps require regular monitoring and only a proportion of the population is removed.

3. Biological control using parasites and predators is being developed.

   Several species are being imported from North America and these are assessed for damage to other insects before being released in the field. If considered suitable they will be bred in large numbers and released where Ips populations are high. It is hoped that this method will eventually reduce the Ips numbers to a stage where damage to forests is insignificant.

   The project for testing the imported parasites and predators and breeding the numbers required is being carried out at the Waite Institute and is being funded by all the State Forest Services of Australia and the main Softwood producing Forestry companies.

Slash Management

In Southern Australia large populations of Ips can breed in slash from both thinnings and clear fellings. The size of the population depending on the amount of slash and its manipulation. The following factors are important:-

1. Thickness of Bark

   As bark acts as an insulator and reduces moisture loss from the cambium, crevassed thick bark provides optimal breeding sites. Hence the greater the utilization of this material and rapid removal from the forest the greater the reduction in the Ips population.

2. Time of Year

   Because of the winter hibernation by Ips, slash produced from mid May to mid September is not attacked. Slight attack only takes place from mid April to mid May and mid September to mid October.

   Slash produced from early November to late March is the most important for survival and population build up.

3. Log Exposure

   Shade improves the chances of colonisation of slash by Ips.

4. Chemical Treatment

   Insecticidal sprays using 0.3% Lindane in dieselene greatly reduces the infestation of slash.

5. Disposal

   Removal or destruction of slash by maceration or burning will prevent infestation.