

# Insect Pests of *Eucalyptus* in Australia

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Extensive plantations of *Eucalyptus* have been created in many countries because of the ability of certain species of this genus to thrive in a wide range of sites and because of their capacity for making rapid growth. While these plantations have, with a few notable exceptions, suffered relatively little from insect damage, the establishment of large plantations of one or more species of *Eucalyptus* creates a hazard that may result in serious setbacks to the use of these highly adaptable species. This paper provides a brief account of those insect pests of *Eucalyptus* in Australia which may become of concern to overseas countries in the future.

## *Defoliating insects*

The insects which cause the most obvious damage are the defoliators. In severe infestations defoliation interferes with the elaboration and translocation of food, and with transpiration, resulting in a check to growth. Reduction of vitality due to defoliation may render trees susceptible to attack by other insects, such as borers. In Australia, the most important defoliators of *Eucalyptus* belong to four orders — the Orthoptera, Coleoptera, Hymenoptera, and Lepidoptera. Sucking insects of the family Psyllidae (Hemiptera) could also be classed as defoliators, as attack by them may result in severe defoliation.

*Orthopterous defoliators of Eucalyptus.* The only economic forms are in the family Phasmatidae. Phasmatids are important defoliators and they are extremely wasteful feeders, destroying nearly as much foliage by cutting it off and allowing it to fall to the ground as they actually consume. Populations of four species — *Didymuria violescens*

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(Leach), *Podacanthus wilkinsoni* Macl., *Ctenomorphodes tessulata* (Gray), and *Podacanthus viridoroseus* Gray have been recorded as reaching epidemic proportions in Australia.

*Didymuria violescens* occurs from Victoria to Queensland in the wet sclerophyll forests of the eastern highlands. There are apparently two forms, with one and two-year life cycles. *D. violescens* feeds mainly on *Eucalyptus* and in the southern alps has caused widespread defoliation of *Eucalyptus delegatensis* R. T. Baker (formerly *E. gigantea* Hook. f.). Other *Eucalyptus* species known to be attacked include *E. radiata* Sieb., *E. viminalis* Labill., *E. bicostata* Maiden, Blakely and Simmonds, *E. pauciflora* Sieb., *E. dives* Schauer, *E. dalrympleana* Maiden and *E. fastigata* Deane and Maiden. The attack on *E. delegatensis* is probably the most serious as this species provides valuable timber and has only a limited ability to withstand defoliation. In the southern Alps the role of trees in the protection of watersheds is extremely important. Much of the forested country that has been attacked is situated on the easily-erodable watersheds above important hydro-electricity installations, and any increase in soil movement due to breaks in the *Eucalyptus* cover will affect the economic life of these projects. Some forestry workers have suggested that, in the alpine forests, protection from fires and silvicultural treatment designed to favour *E. delegatensis* have aggravated the problem by concentrating the host plants into almost pure stands, and by providing abundant food in the form of young regeneration.

*Podacanthus wilkinsoni* occurs in the summer and transitional rainfall areas of the eastern highlands and is associated with *D. violescens* on the central and northern highlands of New South Wales. In most localities it has a two-year life cycle but a large population of one-year forms occurs at Mt. Warming in the extreme north-east corner of New South Wales. The known hosts of *P. wilkinsoni* include those species of *Eucalyptus* attacked by *D. violescens*, and, in addition, *E. huberiana* Naudin and *E. obliqua* L'Her.

*Ctenomorphodes tessulata* is an insect of the coastal sclerophyll forests of New South Wales and generally has a one-year life cycle. Its hosts include *Syncarpia glomulifera* Sm. (formerly *S. laurifolia* Ten.), *Acacia* spp. and other leguminous shrubs, as well as *E. paniculata* Sm., *E. gummifera* (Gaertn.) Hoch., *E. maculata* Hook., *E. resinifera* Sm., *E. acmeneoides* Schauer and *E. pilularis* Sm.

*Podacanthus viridoroseus* occurs with *D. violescens* in the subtropical highland *Eucalyptus* forest.

*Coleopterous defoliators of Eucalyptus.* Defoliators occur in the families Chrysomelidae, Curculionidae and Scarabidae. The family Chrysomelidae includes many species which attack *Eucalyptus*, most of them belonging to the tribe *Paropsini*. Adults and larvae are both leaf-feeders and a wide range of *Eucalyptus* species are affected. However, damage caused by chrysomelids is not usually extensive in Australia. One species *Paropsis dilatata* Er., was introduced into New Zealand in 1916 where it has attacked *E. globulus* Labill., *E. radiata* and *E. viminalis*.

The *Eucalyptus* snout weevils (*Gonipterus* spp.) are probably the most important curculionid defoliators of *Eucalyptus* in Australia. Snout weevils can be found without difficulty on most species of *Eucalyptus*, but they do not appear to cause much economic loss as their numbers are regulated reasonably well by natural enemies. Adults and larvae both eat foliage and following a severe infestation, trees develop a stag-headed appearance due to the continued destruction of their young shoots. That these weevils can cause serious damage when accidentally introduced into new environments overseas is well-known. *Gonipterus scutellatae* Gylh. introduced into New Zealand and South Africa has caused widespread defoliation of *E. viminalis*, *E. punctata* D.C., and *E. globulus*. A wasp egg parasite (*Anaphoidea nitens* Gir.) was imported by both countries from Australia and has successfully controlled this defoliator.

Another weevil of some economic importance in Australia is *Haplonyx tibialis* Lea, the tuart bud weevil, which occurs in Western Australia and causes a loss in the seed crop of *E. gomphocephala* D.C. by destroying the unopened flower buds. This weevil is controlled to a certain extent by a braconid wasp, *Iphiaulax* sp.

Many scarab beetles, notably *Anoplognathus*, *Liparetrus* and *Heteronyx* spp., feed on *Eucalyptus* foliage. In more or less undisturbed forest scarabs rarely, if ever, became sufficiently numerous to cause serious defoliation. This may be due to the limited area of suitable breeding ground for the larval stages, most of which feed on the roots of pasture plants. In extensively cleared pastoral districts and in naturally occurring savannah woodland the extent of grassland suitable for larval feeding is much greater; and the emerging beetles congregate and feed upon the relatively few trees that remain. Available information on the ecology of scarab defoliators suggests that, short of using insecticides, almost nothing can be done to protect existing stands of susceptible trees.

*Hymenopterous defoliators of Eucalyptus.* The only serious hymenopterous defoliators of *Eucalyptus* are the sawflies in the family

Pergidae. Australia possesses a large fauna of sawflies which attack *Eucalyptus*, but fortunately they are fairly well controlled by a number of hymenopterous and dipterous parasites. The larvae feed upon the foliage, often completely stripping young trees, and in planted areas overseas they might very readily become serious forest pests. *Pterygophorus analis* Costa is one species which occasionally appears in damaging numbers on the ironbark *E. melanophloia* F. Muell., in south-western Queensland. *Perga affinis* Kirby has also been recorded as exhibiting extraordinary fluctuations of abundance and in years of outbreak, defoliation of its main host species (*E. blakelyi* Maiden and *E. melliodora* A. Cunn.) occurs over a wide expanse of country. Similar fluctuations are known to occur with other sawflies.

*Lepidopterous defoliators of Eucalyptus.* The order Lepidoptera contains a variety of leaf-eating forms of which *Roeselia lugens* (Walk.) (Nolidae), the gum leaf skeletoniser, is probably the most important. The larvae of this small moth have for many years been known as a pest of *E. camaldulensis* Dehn, in the Murray valley and have caused complete defoliation of this important species at least four times during the past 25 years. Major defoliation of *E. camaldulensis* in this area occurred in 1957 and 1958 but the insect population almost vanished in 1959. The causes of the population crash are not known with certainty, but it was probably brought about by a complex of insect viruses, bacteria, fungi and parasites.

Species in the family Limacodidae (Cup moths) are amongst the most common insects on *Eucalyptus*, both in woodland and in forests. They are usually present in small or moderate numbers but when outbreaks occur, whole sections of forest may be completely defoliated. *Doratifera vulnerans* (Lew.) has been known to defoliate thousands of acres of *E. camaldulensis*.

Other lepidopterous defoliators of *Eucalyptus* belong to the families Psychidae, Lymantriidae and Saturnidae.

*Psyllid defoliators of Eucalyptus.* Another group of insects which is responsible for extensive damage to *Eucalyptus* forest is included in the family Psyllidae (Hemiptera). Although psyllids (or «lerp insects») are true bugs with sucking mouthparts, their feeding often results in leaf drop and so they are here classified as defoliators.

The importance of *Cardiaspina vittiformis* (Frogg.) the white lace lerp, as a pest of ironbark in New South Wales was recognized a long time ago although outbreaks have not occurred in recent years. This psyllid was reputed to have killed many trees in the forests and undoubtedly it has been responsible for retarding the growth of many more.

Other species of *Cardiaspina* are present in plague numbers on trees of inland areas, namely, *E. blakelyi* and *E. camaldulensis*.

In recent years a psyllid, *Spondyliaspis* sp., has attacked *E. saligna* Sm., *E. acmeniodes*, *E. paniculata* and *E. propinqua* Deane and Maiden in the Wyong district of New South Wales. Reports from Victoria indicate that several other species of psyllid are responsible for two types of damage to *Eucalyptus*. Firstly, the buds and seed capsules are damaged to such an extent that seeding is greatly reduced, and secondly, for the same reason nectar secretion is affected so that the honey yield is reduced. Several species are said to be involved.

#### *Insects other than Defoliators*

Although the defoliators are responsible for a great portion of the known damage to *Eucalyptus* in Australia, some injury is affected by sap-sucking insects, insects that attack meristem tissues and insects that destroy wood tissue.

*Sap-sucking insects.* The effect of sap-sucking insects is generally not as serious as that of defoliators. Injury results from feeding, which deprives the plant of food and water, and from the spreading of plant diseases. The most important families, as far as *Eucalyptus* is concerned, are the Psyllidae (which have already been dealt with in the section on defoliators) Coccidae, Coreidae, Jassidae, and Cicadidae.

*Eriococcus coriaceus* Mak., the gum tree scale, is a very common coccid on a wide variety of *Eucalyptus* seedlings and coppice in Australia. It is possible that this scale insect is an important primary pest here, although casual observation suggests that it thrives best on trees which have been weakened by other agencies. This particular scale insect is well known for its damage to *E. globulus*, *E. viminalis*, *E. gunnii* Hook., and *E. macarthuri* Deane and Maiden in New Zealand. The limitation of its abundance by the coccinellid *Rhizobius ventralis* Er., is one example of successful biological control. Other coccids, for example *Apiomorpha* spp., are responsible for the formation of galls; those formed by *A. dupliix* (Schrad.), each with a pair of long leaf-like appendages, sometimes measure more than a foot in length.

Coreid and jassid bugs, such as *Mictis profana* F. and *Eurymela* spp., are frequently found on the foliage of young *Eucalyptus* but the damage caused by them has never really been assessed.

Populations of some species of cicadas have been known to reach epidemic proportions and under these conditions the punctures caused by feeding and oviposition have caused severe damage to *E. camaldulensis*.

*Insects attacking the meristem tissues.* The meristem tissues of *Eucalyptus* are high in protein and are favoured by a wide variety of insect species. Included in this group are various gall forming insects, such as species of chalcid wasps and thrips. Cambium-wood insects, many of which attack dying trees and cut logs, can also be included here. These spend part of their life in the cambium before they penetrate into the wood, and their feeding results in mechanical weakening and a reduction in grade. The economically important forms belong to the Cerambycidae, Buprestidae and Lepidoptera, but little is known of their biology or ecology. Damage caused by cerambycids is probably the most frequent. Two species, *Phoracantha recurva* Newn. and *P. semipunctata* (F.), have extended their range beyond Australia and caused considerable damage, particularly, in the case of *P. semipunctata*, to felled trees and standing trees in poor condition. *Tryphocaria hamata* (Newn.) is a primary borer of *E. calophylla* R.Br., in Western Australia, and the larvae of *Bethelium munda* Blackb. are responsible for detaching large numbers of foliage-bearing branchlets from *E. novae-anglica* Deane and Maiden on the northern tablelands of New South Wales.

The formation of gum veins, which are tangential sheets or pockets of kino, is often associated with attacks by those insects which injure the wood cambium. There are numerous species which live in the phloem tissues and tunnel tangentially around the living bark. If they approach the wood cambium, extensive gum veins may be formed. The result is a reduction in the resistance of the wood to longitudinal shrinkage and a deterioration in its appearance.

*Insects destroying wood tissue.* Of the wood-destroying insects, *Coptotermes acinaciformis* Frogg. (Rhinotermitidae, Isoptera) is by far the most important, particularly in the coastal forests of New South Wales and Queensland. It has been shown that termites from a colony within one living tree can attack other living tree within a radius of up to 120 feet. Attack by this termite results in a central core of the trunk being completely eaten out. This core may be up to 18 inches in diameter in large trees. Species attacked include *E. pilularis* F. Muell., *E. resinifera*, *E. paniculata*, *E. siderophloia* Benth., and *E. hemiphloia* F. Muell., ex Benth.

Attack by another termite, *C. frenchi* Hill, is similar to that by *C. acinaciformis*, but while *C. acinaciformis* is more common in the coastal areas, *C. frenchi* is the dominant species above 2,000 feet. Species of *Eucalyptus* attacked by *C. frenchi* include those attacked by *C. acinaci-*

*formis* but in addition *E. radiata*, *E. robertsoni* Blakely, *E. dalrympleana*, *E. viminalis* and *E. macrorrhyncha* F. Muell.

A major pest of alpine forests in New South Wales, Tasmania and Victoria is the termite *Porotermes adamsoni* Frogg. (Hodotermitidae). Attack is initiated in decayed parts of fire-scarred or damaged trees. However, the colonies develop slowly and extensive damage is the result of many years of attack. There is some evidence that there is less attack in well-managed forests, where trees are protected from fire, and are felled before they become overmature.

The only other termite of economic significance, so far as *Eucalyptus* is concerned, is *Neotermes insularis* (Walker) (Kalotermitidae) which attacks the upper part of the trunks of some species. The greatest loss caused by this termite occurs when logs felled for special requirements, such as long girders, are found to be infested at the crown end of the trunk.

Beetles of four families, the Scolytidae, Platypodidae, Lymexylidae and Bostrychidae, are also classified as wood-destroying insects. Species in these families tunnel through the bark into the wood. In addition to causing obvious mechanical damage, such attacks frequently lead to the formation of gum veins where the cambium has been injured. However, the veins are usually less extensive than those caused by the cambium-wood insects.

The adults and larvae of the Scolytidae bore into the bark and wood, and one species, *Xyleborus truncatus* Er., may be instrumental in infecting *E. saligna* with a fungal pathogen, *Ceratocystis* sp., capable of killing trees. Another species, *X. solidus* Eichhoff, attacks the sapwood of *E. maculata*, *E. saligna*, *E. dalrympleana*, *E. delegatensis* and *E. camaldulensis*, but its economic importance in Australia is not great.

The family Platypodidae is fairly well represented in Australia and although most species are limited to the coastal rainforests, some attack *Eucalyptus*. *Platypus omnivorus* Lea and *P. semigranosus* Samps., have been recorded from dying *E. saligna*.

Included in the Lymexylidae is *Atractocerus kreuslerae* Pasc., a pest of *Eucalyptus* in Western Australia. The larvae bore in the wood and continually push out a thin thread of excrement which accumulates at the base of the tree. Larval development may occupy up to two years and pupation takes place close to the surface of the trunk. The damage is serious only where the holes are abundant and localised. The descending order of susceptibility of species in *E. patens* Benth., *E. gomphocephala*, *E. marginata* Sm., *E. redunca* Schau., *E. rudis* Endl., and *E. calophylla*.

Bostrychids attack sickly trees, freshly-felled trees and drying logs, to which they appear to be attracted by the fermenting sap. *Bostrychopsis jesuita* (F.) is an omnivorous feeder and included in its food plants are various species of *Eucalyptus*. *Xylodeleis obsipa* (Germar) occurs on the south coast of New South Wales where it attacks *E. maculata*. *Xylion collaris* (Erich). occurs from Tasmania to Queensland and the larvae burrow extensively in the sapwood of *Eucalyptus* spp., including *E. maculata* and *E. saligna*. Another species, *X. cylindricus* (MacI.) attacks *E. maculata*, *E. camaldulensis*, *E. saligna* and *E. macrorrhyncha*.

This paper has dealt briefly with some of the more important insect pests of *Eucalyptus* in Australia. In their native habitat these pests are controlled by complexes of predators, parasites and diseases, but should they be introduced into overseas countries without these controlling agents, many would undoubtedly become serious pests. There are already examples of this in the case of *Gonipterus scutellatus* in South Africa and New Zealand and *Paropsis dilatata* and *Eriococcus coriaceus* in New Zealand. The planting of large areas to a single species also brings with it some of the hazards known to accompany any form of monoculture. For instance, the present silvicultural treatment of the mixed wet sclerophyll forests in the southern highlands so as to favour dominance by *E. delegatensis* is regarded by some Australian entomologists as having contributed to the rise of phasmatids to primary pest status.

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## INSECTES NUISIBLES DES EUCALYPTUS EN AUSTRALIE

### Resumé

Le document traite brièvement de quelques-uns des plus importants insectes des eucalyptus en Australie. Dans leur aire naturelle ces insectes sont contrôlés par une variété de prédateurs, de parasites et de maladies, mais s'ils venaient à être introduits dans des pays d'outre-mer sans ces agents de contrôle, beaucoup d'entre eux deviendraient sans doute des fléaux sérieux.

Les insectes nuisibles peuvent être classifiés en différentes catégories: Ceux qui sucent la sève, ceux qui attaquent les tissus du méristème et ceux qui détruisent les tissus du bois. Il a aussi d'innombrables espèces qui épuisent, ce qui semble être une partie insignifiante de la forêt, mais qui, en s'accumulant, causeront une perte appréciable dans l'accroissement ou dans la qualité du bois.

## INSECTOS PERJUDICIALES A LOS EUCALIPTOS EN LA AUSTRALIA

### Resumen

El trabajo trata brevemente de algunos de los más importantes daños causados por los insectos a los eucaliptos en Australia. En su habitat natural esas plagas son controladas por diversos devoradores de insectos, parasitos y enfermedades, pero si fueren introducidos en países de ultramar sin aquellos agentes controladores, podrán sin duda transformarse en peligrosas plagas.

Las plagas de insectos pueden ser clasificadas en insectos deshojadores, chupadores de savia, insectos que atacan los tejidos meristemáticos y insectos que destruyen la madera del árbol. Hay también innumerables especies que explotan lo que parece ser una insignificante fracción de la foresta, pero que cumulativamente puedan causar una apreciable pérdida en el incremento ó en la calidad de la madera.

## INSETOS PREJUDICIAIS AOS EUCALIPTOS NA AUSTRÁLIA

*Resumo*

O trabalho trata resumidamente de algumas pragas mais importantes dos eucaliptos na Austrália. Em seu meio nativo, essas pragas são controladas por diversos predadores, parasitas e moléstias, mas se fôrem introduzidas em outros países sem tais agentes controladores, muitas delas se tornariam, indubitavelmente, pragas sérias.

Os insetos danosos podem ser divididos em insetos que desfolham, insetos que sugam a seiva, insetos que atacam os tecidos do meristema e insetos que destroem o tecido da madeira. Existem também inúmeras espécies que exigem um sacrifício aparentemente insignificante da floresta, mas que, cumulativamente, podem causar uma apreciável perda no crescimento ou na qualidade da madeira.