Everybody knows about termites, but what about the other species of wood-eating insects? Dr Ian Abbott, leader of CALM's Entomology Research Program, tells you what they are, and what to do about...

MORE BORING INSECTS

WOOD-EATING insects have a bad image because some species damage wood (such as karri trees, floorboards, furniture) of value to sawmillers or householders. Nevertheless, these insects are simply doing what they have done for millions of years - helping to decay unhealthy trees and to break down dead wood in forests and woodland. In doing so, they return nutrients to the soil. Subterranean termites also mix and improve the structure of soil.

During the past 20 years, some 80 species of insects have been recorded in association with wood in south-western Australia. Most of these produce well-defined tunnels within wood, and are known as 'borers'. The only exception are termites, which do not produce clearly defined tunnels.

Eight of these wood-eating species are accidental introductions, and, not surprisingly, six of these are associated with pine wood.

Healthy living trees can defend themselves against wood-eating insects because wood contains phenols or resins toxic to insects. When a tree experiences prolonged moisture stress, however, or is damaged by mechanical injury or fire, wood-eating insects may colonise the tree following the disruption of its chemical defences. Healthy trees are often immune to termite infestation, in contrast to the seasoned timber derived from them.

Adult female borers either tunnel into wood to lay their eggs or remain on the surface and pierce the wood with an ovipositor. The larvae that hatch remain within the wood and digest the sugars in the wood consumed. Undigested wood is often known as 'borer dust' or 'frass', and may fill the tunnel behind the larva. Once maximum size is attained, the larva transforms into a non-feeding stage (pupa), after which the adult insect emerges. (Termites in contrast do not live such a solitary life and have a different type of life history - see 'Quiet Achievers', *Landscope*, Winter Edition, 1988).

When you see signs of wood-eating insects, don't panic and assume that the floor or ceiling is about to collapse. With a better grasp of basic facts you can confidently attempt your own diagnosis. Examine carefully the damaged wood, and then with the help of Table 1 (p.44) identify the insect species responsible.

- Determine if the wood sample is from a living tree / freshly felled log, or of partly moist / partly dry wood, or of dry seasoned wood.
- Determine if the wood is a hardwood (e.g. eucalypt) or softwood (e.g. pine).
- Determine the part of the wood eaten - cambium, sapwood, heartwood.
- Measure the diameter of any 'exit holes' (from which adults have left the wood) or of the tunnels.
- Rub a sample of frass between your fingers and note the texture - is is gritty or smooth like flour?
- Compare any adult insects found with the photographs and drawings in this article.

The insects which should most concern householders are those infesting drying wood or dry seasoned wood. They can re-infest wood already damaged, and over a period of time virtually destroy it. These species are *Lyctus brunneus, Anobium punctatum, Ernobius mollis,* and termites. The three beetle species will honeycomb parts of timber with their larval tunnels.

Lyctus brunneus Lyctidae (above). Average length 5 mm.

The frass of *Lyctus* has a fine flour-like texture, whereas that of *Anobium* and *Ernobius* is gritty. *Ernobius* is unlike *Anobium* in that it requires the presence of pine bark on seasoned pine before it will infest. Therefore, *Ernobius* will not be a problem if pine timber with small pieces of bark attached are avoided. CALM records indicate that *Anobium punctatum* is extremely uncommon in south-western Australia.

Lyctus is widespread, but will not cause problems if resistant hardwoods (e.g. jarrah, old growth karri) or susceptible hardwoods from which all sapwood has been removed are used. Insecticide treatment of timber in use which is infested by these borers is difficult and rarely effective.
In south-western Australia the termite species present require more moisture than is available in air-dried wood; this additional moisture is usually obtained from soil. These subterranean termites, as they are known, destroy wood by infesting it from the ground or from other timber already in contact. These species can be prevented from gaining entry to buildings if the soil beneath is treated with poison and if timber naturally resistant or treated with preservative is used.

IPS GRANDICOLLIS -

an American beetle living in Western Australian pine plantations for over 40 years.

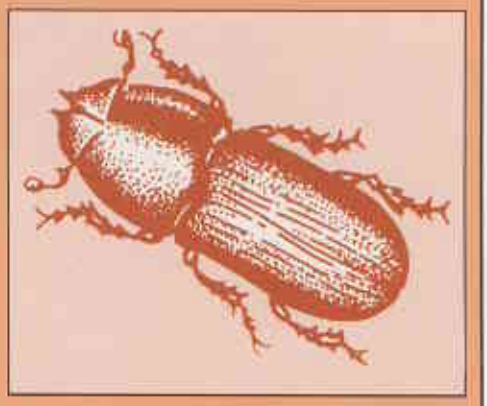
These small beetles (4mm long) can be readily found under the bark of infested pine trees or logging debris in plantations. Two types of attack can occur. In a breeding attack, usually in logs or slash, the male first tunnels through the bark and makes a chamber in the cambium into which the female is attracted. After mating, the female tunnels farther within the cambium and lays eggs. The larvae, hatched from the eggs, feed in the cambium but their tunnels, which resemble an engraving, do not degrade the wood.

A blue stain fungus is introduced by the adult beetle into the cambium and spreads to the sapwood. If there is enough fungus, the water conducting system of the tree is disrupted, causing browning of the tree crown and sometimes death of the tree.

In a feeding attack, which occurs when beetle populations are large, trees may be killed after being infested by adult beetles of either sex. Both bark and sapwood are heavily damaged along the upper bole and branches. The tree is then ring-barked by the insects.

Pine trees that have experienced drought, competition from adjacent trees, damage from lightning or fire are prone to infestation by *Ips.*

Departmental records indicate that *Ips* had been present in the south-western plantations for 20-30 years before becoming a problem in March 1970, and again in 1973, 1980, and since 1986 particularly in the Blackwood Valley. These outbreaks reflect severe winter droughts which are predicted to worsen during the next 50 years.



Mature *Ips* beetle (above).

Fortunately, a program of importing parasitoid and predator species of *Ips* from North America to South Australia began in 1981 (with the approval of the Australian Plant Quarantine Service). One of these species is now definitely established there. In 1984 controlled releases of three of these species were made in Gnangara plantation. In May 1988 Dr David Morgan, former forest entomologist at the Waite Institute in South Australia and consultant to the Woods and Forests Department there, visited the Gnangara release site and found that *Roptrocerus xylophagorum*, a parasitic wasp, had established. This species was also found to have established in plantations in the Blackwood Valley.

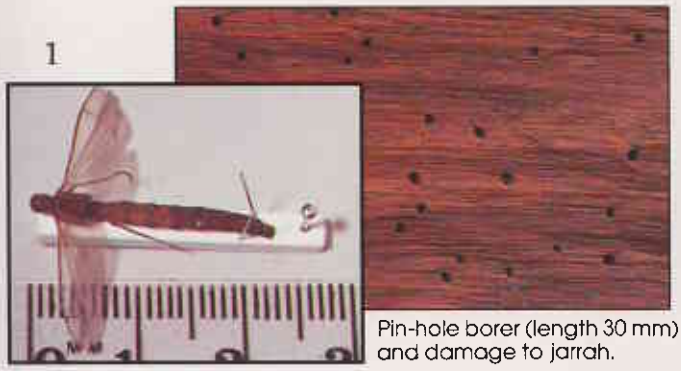
Dr Morgan also arranged for a fourth species, the predatory beetle *Temnochila virescens*, to be released in the Pinjar and Ferndale plantations. CALM plans to accelerate releases of these beneficial insects in other plantations during the next few years. The benefits should take about 10 years to become evident.

Using beneficial (parasitic or predatory) insects to minimise damage by a pest insect is known as biological control. After intensive testing to ensure there are no undesirable side-effects, it is a method far safer and more cost-effective than resorting to spraying trees with insecticides.

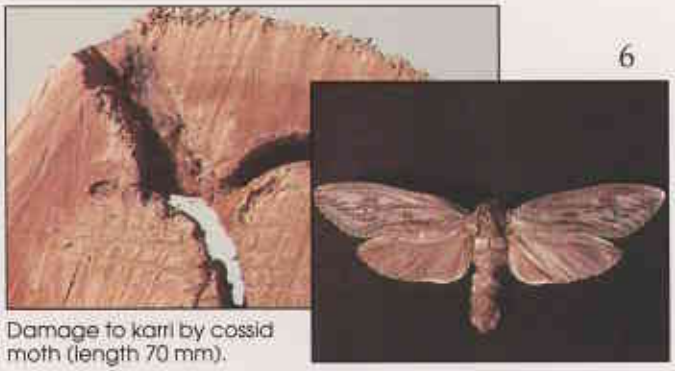
TABLE 1
DIAGNOSIS OF INSECT DAMAGE TO WOOD IN SOUTH-WESTERN AUSTRALIA

		INSECT SPECIES/GROUP	TYPE OF WOOD INFESTED	PART OF WOOD INFESTED	DIMENSION OF EXIT HOLES(MM)	INJURIOUS PART OF LIFE CYCLE
PESTS OF LIVING TREE, FRESHLY-FELLED LOG OR GREEN TIMBER	1	Pinhole borer *Atractocerus kreuslerae*	Hardwood	Cambium Sapwood Heartwood	< 1	Larva
	2	Longhorn borer *Phoracantha, Tryphocaria* spp.	Hardwood	Cambium Sapwood Heartwood	8-12 x 4	Larva
	3	Cypress Jewel beetle *Diadoxus erythrurus*	Softwood	Cambium Sapwood	3 x 2	Larva
	4	*Ips* bark beetle* *Ips grandicollis*	Softwood	Cambium	2	Adult Larva
		Ambrosia beetle *Xyleborus saxeseni*	Softwood	Sapwood	< 1	Adult
	5	Gregarious Gall weevil *Strongylorhinus ochraceus*	Hardwood	Cambium Sapwood Heartwood	7	Larva
	6	Cossid moth *Xyleutes* sp.	Hardwood	Sapwood Heartwood	25 x 15	Larva
		Termites	Hardwood Softwood	Sapwood Heartwood	-	Worker
	7	Xyloryctid moth *Cryptophaga unipunctata*	Hardwood	Sapwood Heartwood	5	Larva
PESTS OF MOIST AND PARTLY DRY WOOD		Auger beetle *Bostrychopsis jesuita*	Hardwood	Sapwood	3-6	Adult Larva
		Termites	Hardwood Softwood	Sapwood Heartwood	-	Worker
PESTS OF DRY SEASONED WOOD	8	Powder post beetle *Lyctus brunneus* *	Hardwood	Sapwood	1-2	Larva
	9	Furniture beetle *Anobium punctatum**	Softwood (Hardwood rarely)	Sapwood Heartwood	1.5-2	Larva
	10	Pine Anobiid beetle *Ernobius mollis* *	Softwood	Sapwood Heartwood	1.5-2	Larva
		Termites	Hardwood Softwood	Sapwood Heartwood	-	Worker

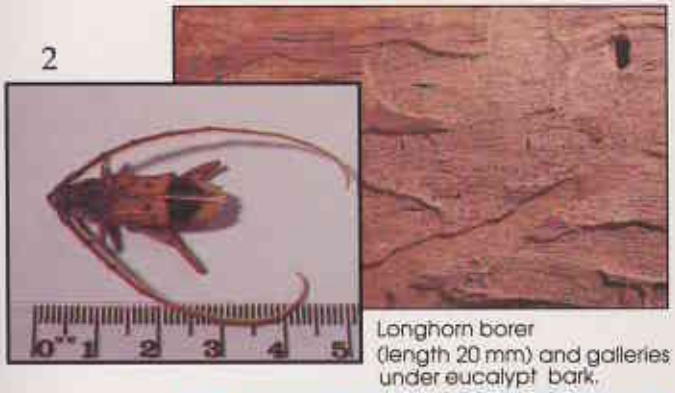
☆: Introduced



1 Pin-hole borer (length 30 mm) and damage to jarrah.



6 Damage to karri by cossid moth (length 70 mm).

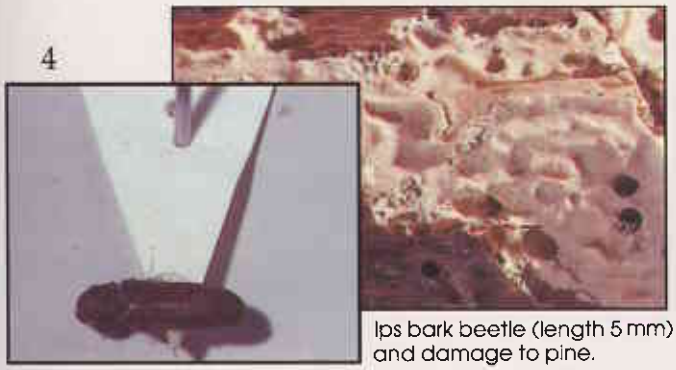


2 Longhorn borer (length 20 mm) and galleries under eucalypt bark.

7 Tuart sapling attacked by *Cryptophaga* moth (length 10 mm).

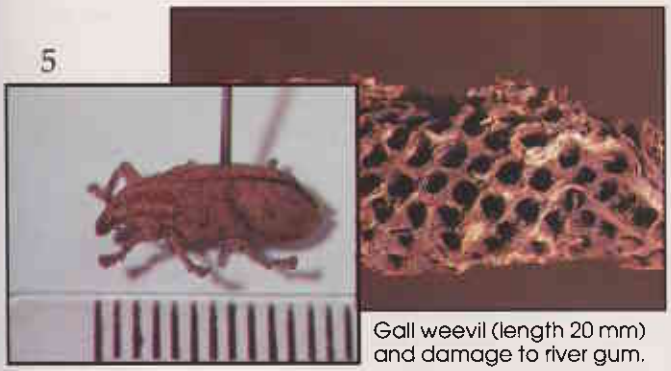
3 Jewel beetle species (length 13 mm) and damage to native cypress.

8 Sheoak furniture eaten by powder post beetle (length 5 mm).

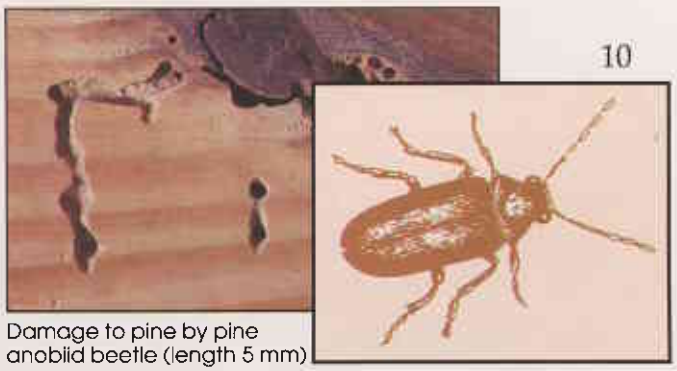


4 Ips bark beetle (length 5 mm) and damage to pine.

9 Damage to plywood by furniture beetle (length 4 mm).



5 Gall weevil (length 20 mm) and damage to river gum.



10 Damage to pine by pine anobiid beetle (length 5 mm).

KEEP OUT OF W.A.

Wood Wasp *(Sirex noctilio)*

This wasp has been accidentally introduced from Europe to New Zealand and from there to Tasmania, Victoria, South Australia and New South Wales. Occasionally, it has been intercepted on ships arriving at Fremantle, but surveys of pine plantations carried out in the 1960s and in 1986-7 have failed to find it in W.A.

During oviposition the female introduces the spores of a wood-rotting fungus on which its larvae feed. This fungus spreads through the cambial layer and ringbarks and kills the pine tree.

Fortunately, effective ways of controlling Sirex have been found, so if it did establish in south-western Australia nematodes and parasitic wasps could be quickly introduced from eastern Australia as counter measures.

Pine stand in Blackwood Valley - drought affected and infested by Ips bark beetle.

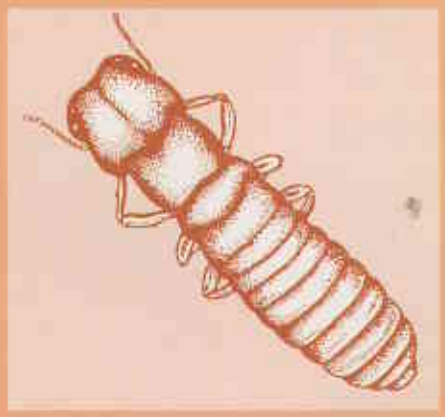
Larvae, adult female and adult male wood wasp (length of female 30 mm).

Dennis Haugen

West Indian Drywood Termite *(Cryptotermes brevis)*

This species, the world's most destructive drywood termite, has been accidentally introduced to Queensland and New South Wales. It can enter wood directly from the air (in contrast to subterranean termites), and its small colonies can easily be transported in single items of furniture and crates. They can tolerate relatively low moisture conditions for lengthy periods and obtain their water from the wood in which they feed.

Once established, drywood termites are very expensive to control (in contrast to subterranean termites): fumigation is the only effective option. Although W.A. has one native species of drywood termite, this species is not known to be a pest.



Cryptotermes brevis, soldier (length 6 mm).

Hylotrupes bajulus (length 15 mm).

European House Borer *(Hylotrupes bajulus)*

In Europe this longhorn borer was originally an inhabitant of forest but is now a common domestic pest. It was accidentally introduced to eastern Australia in the 1950s, but all known infestations were destroyed by fumigation. This borer has the reputation of being the world's most destructive pest of seasoned softwood. The damage superficially resembles that caused by *Lyctus* in hardwood in that the sapwood is completely powdered beneath a thin veneer of apparently sound wood. When this species infests a roof, the first sign of its presence is the collapse of the infested structure.

W.A. relies on the vigilance of the quarantine authorities to keep this State free of these pests.

LANDSCOPE

Volume 4, No.1
Spring Edition/September 1988

EDITORIAL

In W.A. the concept of marine conservation reserves was firmly established in 1984 when the CALM Act was passed, with provision for Marine Parks and Marine Nature Reserves, vested in the National Parks and Nature Conservation Authority.

Since 1984 two major Marine Parks have been declared in W.A: Marmion and Ningaloo.

This is a new field in W.A., and there are no local precedents to guide us in resolving the many management issues which have emerged.

A first consideration has been that fishing is already controlled under the Fisheries Act. It would be foolish for CALM to attempt to establish itself as a fisheries management agency. A policy decision has been made that any fisheries in Marine Parks will be regulated under the Fisheries Act.

A more philosophical problem has been that many citizens, although generally sympathetic to the conservation cause, are unaccustomed to the idea of having parks and reserves in the sea. The idea that the sea is a public common where anything and everything goes is still well entrenched in public attitudes. Yet there are many terrible examples around the world where coastal environments and their resources have been devastated by excessive and improper use. In W.A. we have not reached that point.

W.A. can be proud of its fisheries management record, based on the principle of sustainable use for posterity. Development of a marine parks and reserves system along our coast is another essential part of the overall objective. It is to be hoped, then, that our first initiatives in this direction will receive public support.

PINES

How can less than four per cent of the State's area supply us with all our timber needs, and save the hardwood forests at the same time? *Details on* ***page 28.***

BORERS

Now you ***can*** *be sure there are no borers in the door. Well, if they are there, at least you'll know what to call them after reading the article on* ***page 42.***

TROUBLED WATERS

Does the very word pollution make you feel powerless? Discover what you can do to help the wildlife victims on ***page 20.***

WALL OF MOUTHS

It's a fish-eat-coral world, but what do the coral eat? Find out on ***page 32.***

FOREST RENEWAL

What is the connection between the poets' of the First World War and W.A's forests? Find out on ***page 56.***

Jewel Of The Kimberley

What do you mean frog? In my home I am a prince. After all, Prince Regent is the only mainland reserve where all of the original animal species remain. Meet the rest of them on ***page 47.***

Hills' Belles

When Perth looks out its backdoor in spring the Hills are ablaze with colour. Your field guide to some of our glorious wildflowers starts on ***page 4.***

Gather No Moss

The trouble with lichen is that up until recently it wasn't protected flora. Now lichen and their relatives - mosses, liverworts and algae - have joined the rest of the State's flora. See ***page 54.***

Right On Track

Is a high-tech wilderness trek a contradiction in terms? Find out how 4WDs and conservation can co-exist peacefully on ***page 12.***

ATTENTION ADULTS!

Sick of taking the anklebiters to the same old national parks and camping spots? Put them to work for you. If they enter the kids' competition on ***page 63*** they could win two beautiful books on all the best picnic and camping spots between Perth and Eucla.

Cover Photo

Magpie Geese take off from the Ord River.

Photo: Richard Woldendorp.

CONTENTS

Managing Editor: Sweton Stewart
Editor: Liana Christensen
Designer: Robyn Mundy
Production: Carlene Pearson/Karen Addison
Offset plates by The Colour Set
Printed in Western Australia by Kaleidoscope

Published by Dr S Shea, Executive Director, Department of Conservation and Land Management, 50 Hayman Road, Como, W.A. 6152