

SIREX NOCTILIO - SEARCH & DESTROY

by

Roger F. Burke

The life of a Sirex Woodwasp in Victoria is a far cry from the peaceful existence the species knew in Europe. A wasp grub may be barely hatched from his egg when he is confronted by a predator which proceeds to devour him. If he escapes this fate he may be but a month old when another parasite inserts a long sting, with unerring accuracy, into his body as he quietly chews through a tree. This sting lays an egg which hatches into a hungry larva which proceeds to gnaw at the vitals of its host until it kills the unfortunate Sirex.

Even if he survives this perilous infancy there is still a good chance of a tiny worm entering his body and sterilizing him - depriving him of any joy he may have derived from his short two weeks of adult life!

ORIGIN & HISTORY

Sirex noctilio is originally a native of Europe, where it is a comparatively uncommon insect and is not regarded as a threat to forests. In this climate its life cycle is 2-3 years. About 1905 it appeared in New Zealand but caused no alarm in the following years as it was generally held to be an attacker of only weakened and dying trees.

But in 1946-50 it reached epidemic proportions due to several years of high summer rainfall followed by a series of droughts. In the overcrowded *P. radiata* forests the mortality was high with a proportion of the dominant trees being killed as well as the suppressed trees.

In 1952 *Sirex* was found near Cambridge Airport in Tasmania. It appeared to have been present for several years and there were reports of wasps "buzzing around the tops of trees like bees...." From Tasmania it was only a short step to Victoria and this occurred in 1961 with *Sirex* being discovered in a suburb of Melbourne. This led to the setting up of the National *Sirex* Fund in 1962, financed by contributions from the Commonwealth, State Forest Services and private forestry. The contributions were in proportion to the area of Pine Forest and were matched pound for pound by the Commonwealth.

THE WASP

As well as *P. radiata*, *Sirex* has been found in *Pinus taeda*, *elliottii*, *patula*, *echinata*, *muricata*, *ponderosa*, *nigra*, *canariensis* and *pinaster*, also *Larix decidua* and *Picea sitchensis*. It has been observed ovipositing into Rimu, Miro, Kauri, Douglas Fir, *E. globulus* and farm gate post!

The insect is primarily a secondary attacker of weakened or suppressed trees but healthy trees can be killed if the attack is heavy or consistent. *Sirex* seems to be able to detect by some means the trees which will be satisfactory for oviposition; resin smell is one method in the case of damaged trees and broken branches, the latter being a frequent object of attack.

Tops left from logging can be attacked after a couple of days when the moisture content drops to between 70 and 100 per cent; also trees pruned during summer by virtue of the resin smell and the slight weakening of the tree.

The urge to lay eggs is exceedingly strong in the adult *Sirex*, hence the recorded oviposition in the gate post and in *E. globulus*. A wasp may lay up to 400 eggs - depending on its size, and with each oviposition, spores of a symbiotic fungus are injected from a sac near the base of the wasp's ovipositor.

Frequently 3 punctures in the wood are made through one bark puncture by altering the angle of the ovipositor; with an egg being laid in only one hole. The other two punctures are thought to be for the injection of fungal spores only. Wasps will rarely drill through more than 4 mm of bark.

The egg may take from 2 weeks up to 2 months to hatch - depending on temperature. The larva then starts to tunnel upward or downward and toward the centre of the tree and then outwards again early in summer. When the grub is within a couple of inches of the surface it pupates and rests until late December or early January when the weather is hot enough and then it tunnels the remaining distance and emerges.

Emergence takes place from December to about May, depending on the rate of development of the grubs. If a grub does not emerge in this time it remains in the wood until the following summer. Mating takes place as soon as the *Sirex* finds a partner and the female then begins her search for suitable trees. It is thought the wasp can fly up to 15 miles in its short 2 week life after emergence. The size of an adult *Sirex* varies from .5 inches to 1.5 inches long.

THE FUNGUS

Sirex Woodwasp can only survive through an association with a symbiotic fungus - *Amylostereum chailletii*. Fungal arthrospores are carried in a sac near the base of the ovipositor and injected with each oviposition.

It is this fungus that actually kills the tree, by causing a rapid moisture content drop and its conditioning of the wood for the grub to eat. Fungus infected wood is usually very white, pulpy or brittle and has a M.C. of around 25-30%. Also it loses most or all of its pine smell.

If the wood around the oviposition tunnel becomes infected with blue stain before the Sirex fungus gets a hold, the blue stain can overcome the *Amylostereum* and the larva dies. However if the Sirex fungus is established well first it will win the battle.

Similarly if blue stain is in one part of the tree and Sirex in another, the larva will die if it tunnels into "blue" wood, although after pupation a couple of instances are known where adults tunneled through a couple of inches of "blue" wood - one assumes they grimaced all the way!

CONTROL

Control measures of Sirex in Victoria are twofold; a) physical search and destruction and b) biological control, with the former gradually being phased out by the latter.

The search is carried out continually on the fringe of the known infested area, and involved personal inspection of all pines on private property, farms and plantations. When Sirex is found the affected trees are felled or limbed and burnt, and the remaining trees are quarantined for three years.

BIOLOGICAL CONTROL

This is being achieved by the use of insect parasites and a nematode worm. Parasites are bred at Melbourne and Traralgon for release in Sirex infested areas.

MEGARHYSSA NORTONI NORTONI AND RHYSSA PERSUASORIA

Originating in North America and Europe, these insects are larval parasites. They operate from September to November by locating the Sirex grub and inserting a long ovipositor through the wood and into the grub and laying an egg into it.

This egg hatches and the parasite grub kills the Sirex and emerges after about 12 months. Mating then takes place and the cycle begins again.

IBALIA LEUCOSPOIDES AND IBALIA ENSIGER

These two parasites are from Europe and North America respectively; they are very similar and are closely related - probably both having descended from the same forbears in Europe.

The Ibalia species are one egg parasites - as distinct from larval parasites like the Rhyssenes. They are active at the same time as the Sirex; the female Ibalia locates the fresh Sirex oviposition - inserts her own ovipositor down the same tunnel and lays an egg into the Sirex egg or sometimes the grub.

The Ibalia egg hatches and the grub actually lives inside the Sirex until just before the Sirex pupates. It then kills the Sirex, pupates itself and bores its way out. When a Sirex grub has Ibalia inside it - the parasite can actually be seen moving inside the Sirex, and can be separated on bisection of the Sirex.

The parasites used in Victoria have been selected from about 22 species of insects in the world which parasitise the Siricidae family. They parasitise that family exclusively and as the Sirex population diminishes so the parasite numbers follow on down in a similar curve.

THE NEMATODE WORMS

These show the most promise in ultimate Sirex control. In areas of New Zealand they are claimed to have been 98% effective in eradicating the wasp.

Nematodes used are 4 strains of *Deladenus siricidicola*, originating in Europe; they take the form of tiny worms, barely visible to the naked eye. The worms live on the Sirex Fungus (*Amylostereum chailletii*) and in this way move right through the infected trees. When they encounter a Sirex grub or pupa the nematode enters the Sirex and attacks the testes or ovaries, causing sterility but otherwise not affecting the Sirex.

In due course the Sirex emerges as an adult and in the case of a female lays eggs containing nematodes, or in a male when mating takes place he affects the "clean" female with nematodes.

Both cases results in nematodes being laid into trees with each new oviposition by the female, and in this way the larva of uninfected Sirex, which have laid into the same tree, become sterilized by the insidious worm.

Nematodes are bred by the Forests Commission and Sirex infested trees are cut into short billets and inoculated with nematodes by making small cuts in the wood and adding water containing nematodes.

The billets are then placed near trees discovered by the search parties to have Sirex in the larval stages. Sterile wasps emerge from the billets and mate with wasps emerging from the trees, as well as infecting most of the trees suitable for the following summer's ovipositions.

The 4 strains of Deladenus used have been selected because they do not sterilize the other insect parasites used in the control programme as many other strains do.

THE FUTURE

It would appear that the main threat to our forests from Sirex is past, as the parasite and nematode population increases, but this increase will reach a high point and then take a downward turn as the wasp population is decimated.

Thus it follows we will always have a small population of Sirex being preyed on by a small population of parasites. The best insurance against Sirex is healthy, vigorous forests and as long as these are maintained and isolated patches of trees are not allowed to build up a Sirex population, the wasp will never become a real problem again.

VOICE FROM THE PAST

A Government order printed in N.S.W. in 1822 concerns pilsawn timber cut by convicts. It gives the official price of the finished product as "7/6 per 100 feet" and goes on to say:

"Any ticket of leave man who shall exact higher payment shall forfeit his ticket of leave. Anyone refusing to work at such payment shall be placed in the penitentiary".

This advice is passed on for the benefit of DFO'S who may wish to employ a similar line of persuasion when discussing piecework rates with their pine mill crews.