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APPENDIX A

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PROGRESS REPORT TO FOREST OWNERS ASSOCIATION: 1997/98

THE BIOLOGICAL CONTROL OF *THE SIREX NOCTILIO* WOODWASP

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THE BIOLOGICAL CONTROL OF THE *SIREX NOCTILIO* – WOODWASP

Introduction

The most important pest with which the forestry industry is faced remains the woodwasp *Sirex noctilio,* that has an Eurasian and North African distribution. Although 76% of the distribution of *Sirex noctilio* is in the Mediterranean Basin with its winter rainfall climate, the consensus amongst the Australian experts who have studied *Sirex* for over 50 years is that the woodwasp will eventually be found wherever its host plants may be grown. Notwithstanding that prediction, *Sirex* initially managed to get a foothold in the winter rainfall (or all year rainfall) areas of New Zealand, Australia, Brazil and South Africa.

Sirex noctilio is not a pest in its native habitat where it tends to attack only moribund trees. Its effect, however, on the Monterey Pine (*Pinus radiata*) in New Zealand and Australia was devastating, with over 50% of attacked trees in a plantation dying. Originating in California, *P. radiata* presumably is more susceptible to the European woodwasp but the effect of the woodwasp was also initially devastating because the absense of its natural enemies allowed it unbridled freedom on new continents. From host tree records in South Africa since the discovery of S. *noctilio* in the Cape Peninsula in April 1994 there appears to be no true preferences shown between *Pinus* species. *Sirex* has attacked the following species in South Africa: *P. radiata, P. elliottii, P. pinaster, P. pinea. P. patula* and *P.taeda* have been recorded as hosts in the literature.

SAFCOL paid for the license to use the virulent Kamona strain of the parasitic nematode *Deladenus siricidicola,* produced by the CSIRO in Australia. The cost was R110 000 for the use of the nematode in the Cape provinces (below latitude 32°S). It would be necessary to renegotiate to use the Kamona strain once the *Sirex* wasp moves into the summer rainfall areas. To put this cost into perspective, an analysis of an 8ha compartment at Tokai in 1996 revealed that almost R20 000 worth of timber (costed by the forester) had been lost to *Sirex.*

Although the parasitic nematode released in the 90 km radius around Cape Town where *Sirex* was present in 1995 and 1996 will eventually disperse to wherever Sirex is found, this dispersal is slow. Over 70% of a plantation could be lost in the first two years after the arrival of *Sirex* in on unaffected area. This is why *D. siricidicola* is still being cultured in Australia and released in the "front" as the woodwasp migrates further north even after 50 years.

Present status

Initially two surveys were conducted in 1996 to determine whether *Sirex* had dispersed beyond its known distribution range of a 90 km arc around Cape Town. These surveys concentrated on the major forestry plantations from Hogsback southwards and westwards to Algeria on the west coast. These surveys were comprehensive with advance warning to the foresters of the various plantations who would then direct us to any dead or dying trees. Any dead or dying tree enroute to these plantations (on private farms etc) were also inspected, yet no *Sirex* were encountered.

However, Dr. Tim Rypstra of the Stellenbosch University Forestry Faculty reported that he had seen *Sirex* emergence holes in logs at Woodline outside Stellenbosch, which were being treated with creosate for use as poles. These were traced to a woodlot at De Berg near Clanwilliam and a visit was made to this farm. In the unthinned woodlot the numbers of dead trees and trees dying from *Sirex* were very high, which showed that they had been there for perhaps almost as long as those at Tokai, which is regarded as the epicentre of the *Sirex* outbreak in South Africa. A survey was conducted on other farms in this region with the help of the forest contractors and it was found that *Sirex* occurred in woodlots and windbreaks within the coastal plain, but had not followed the mountainous route to Algeria forestry station. The possibility that *Sirex* had entered the country through the port of Saldanha and then moved both north and south was investigated but found to be incorrect. From all available evidence the spread of *Sirex* followed the coastal route from Tokai moving between widely dispersed woodlots and windbreaks as designated on the map (fig. 1.) Samples of wasps from the Clanwilliam district have shown that parasitic nematode has yet to reach this area.

Following from the discovery of *Sirex* on private farms along the west coast, similar surveys were conducted along the southern coast. A similar result was found. *Sirex* had dispersed along the coastal plain to just beyond Swellendam at the farm Rolandsdale. It has yet to be located in Swellendam or Gargia plantations. Now that the mountain barrier has been crossed the movement of *Sirex* can be expected to accelerate. The key to its speed of dispersal remains the number of suitably stressed trees which are available for colonization.

There is a possibility that poles treated with creosate and especially copper-chrome-arsenate (CCA) may not be effective in killing the dispersal of Sirex artificially. The *Sirex* wasp does not feed and thus insecticides tested previously by spraying them onto logs did not kill the emerging wasp. With the co-operation of Woodline and a Somerset West firm, *Sirex* infested logs were treated with both creosote and CCA and placed in cages at Rosebank. Although still early in the season, preliminary results show no emergence from the creosote treated logs and one wasp from the CCA treated logs. Once the emergence season is over (at the end of March) these logs will be dissected and the effect on the *Sirex* pupae/larvae combined with the penetrability of the two chemicals into the pressure treated logs will be determined. There are however, small pole producing companies in the Clanwilliam district which sell poles to farmers, which have merely been sprayed with insecticide.

Sirex has thus spread almost equidistant up both the West coast (205 km) and southern coast (202 km).

Importation of Parasitoids: Although *Deladenus siricidicola* is an effective biological control agent, successful control in both New Zealand and Australia was as a result of the important of an additional seven species of *Hymenoptera* parasitoids. Of these two were selected for importation into South Africa; -the early-instar larval parasitoid, *Ibalia leucospoides,* and the late-instar larval parasitoid, *Megarhyssa nortoni.* Dr. John Madden of the University of Tasmania, who was one of the pioneers of the biological control of *Sirex* in Australia, confirmed the choice of these two species as the most cost effective, but also insisted that the Ichneumonid, *Rhyssa persuasoria (L.)* be introduced. *Rhyssa persuasoria* complements *Megarhyssa nortoni* in that the former parasitises late larvae/pupae in the

thinner barked branches and stems within the canopy while the latter parasitises those in the thicker barked lower stumps.

The proposal is to import one of these parasitoid species each year. If they can be imported from a Southern Hemisphere country a great deal of time could be saved because importations would be made between countries in the same season. The timing of the importations is crucial to ensure that the parasitoids are available in sufficient numbers when their hosts in South Africa are at the right stage for parasitism. Laboratory studies at Rosebank have determined that *Sirex* emerges between December and April with their peak in March. The Australian dates concur with ours and although the published data from Brazil indicate an earlier peak in December, it was decided to import the first species, *Ibalia leucospoides*, on 1 February 1998.

An agreement has been reached with entomologists in Uruguay to conduct an exchange of biological control agents. Judy Moore will exchange the *Avetianella longoi* parasitoid of the eucalyptus borer, *Phoracantha semipunctata* for I. *leucospoides*. She has agreed to get *A. longoi* established in quarantine in Uruguay and will be returning with *Ibalia* wasps. The alternative was to buy these parasitoids from Australia for $100 per female. An added advantage in his cooperation venture is the future exchange of additional biocontrol agents for forestry.

The logistics involved with this importation included the establishment of a nematode free *Sirex* culture at Rosebank. For this purpose logs from the Clanwilliam sites containing *Sirex* larvae were brought to Rosebank. Quarantine regulation requires that the parasitoids be reared in an insect proof quarantine facility for at least one generation. One generation in the case of *I. leucospoides* (and the other hymenopterous parasitoid species still to be introduced) is one year. Hence Ibalia will only be released in January/February 1999. A quarantine facility has been made out of two rooms at the Rosebank labs which comply with the requirements laid down by the Division of Plant and Quality Control. This quarantine will be used continuously for the next four years to complete the biological control project on *Sirex* and possibly also for larval parasitoids of *Phoracantha spp.*

According to data published in Australia, I. *leucospoides* is able to detect the oviposition tunnel into the wood and in turn uses this tunnel down which she sticks her ovipositor to lay her egg, either in an egg or in a first instar larva of *Sirex*. The most opportune time to lay these eggs was found to be after 14 days and the oviposition tunnel was located from the odours arising from the germinating symbiotic fungus, *Amylostereum areolatum*, which is deposited first before the *Sirex* eggs are laid.

Future outlook:

1. *Sirex* will steadily increase its range each year – possibly by as much as 50 km. The possibility exists that *Sirex* may inadvertedly be carried from its present locations by man.
2. The spread of *Sirex* may necessitate the curtailment of the movement of logs from one region to another. This aspect should be discussed between the Forestry Industry and the Directorate Plant and Quality Control.
3. Once *Sirex* moves north of 32° latitude S. PPRI will be bound by the terms of our contract with the CSIRO and will not be allowed to release the *Kamona* strain of *Deladenus siricidicola* north of this line. A new contract will have to be negotiated with CSIRO.
4. The hymenopterous parasitoids will disperse readily and rapidly throughout the Southern African region where *Sirex* is found and this dispersal can be accelerated by physically transporting parasitoids to areas of new infestation. There are no contractual restrictions on artificially dispersing the hymnopterous parasitoids.
5. Each parasitoid species will have to remain in quarantine for one generation (=one year) before it can be released. Hence *Ibalia leucospoides* will only begin its biological control function in January 1999.

Once the hymenopterous parasitoid species have become established it will be necessary to ensure that the parasitic nematode, D. *siricidicola*, is distributed throughout the plantations where *Sirex* occurs, south of 32° S. These nematodes will have to be purchased from the CSIRO as this is cost effective.

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Dispersal of Sirex noctilio