Primary Industries Standing Committee

Forestry and Forest Products

Research Priorities and Co-ordination Committee

RESEARCH WORKING GROUP 7

FOREST HEALTH

Annual Pest and Disease Status Report for

Australia and New Zealand 2002-2003

October 2003

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INTRODUCTION

This report presents the annual statement of forest pest and disease conditions throughout Australia and New Zealand for the year 2002-2003. It comprises the fifth combined pest and disease report under RWG 7 (Forest Health). For Australia, individual state reports have been combined under relevant pest or disease headings, with a brief National Summary summarising the main points. Tabular data to assist in reporting health issues for Montreal Process as requested by the Montreal Implementation Group (Agenda Item 3.1.2, Geevston Meeting Minutes, 2000) is supplied for NSW, Queensland, Tasmania and Western Australia. The New Zealand report follows this. Where possible, names of pests and diseases have been standardised throughout this report.

PURPOSE

To communicate the annual statement of forest pest and disease conditions and quarantine situation in Australia and New Zealand to the Primary Industries Standing Committee, Forestry and Forest Products Committee, Research Priorities and Co-ordination Committee for its information, consideration and any action deemed necessary.

AUSTRALIA

1. PLANTATIONS

1.1. *Pinus* spp.

1.1.1. Pests

Sirex noctilio (Sirex wood wasp)

National Summary: Low levels of Sirex damage were observed in most areas in NSW, Victoria, Tasmania and South Australia. Higher levels of damage were observed in north-east Tasmania and northern plantations in South Australia. Queensland and Western Australia still remain free from Sirex, although Sirex is less than 100km (in NSW) from Queensland plantations. The parasitoids *Ibalia leucospoides* and *Megarhyssa nortoni* were detected from most areas where Sirex is established.

Queensland: Status unchanged – not yet detected in Queensland.

New South Wales: The incidence of Sirex was again low in the majority of plantations in NSW. There were problems with trap tree establishment in Hume Region from the previous year which were addressed at the beginning of surveys (methods used to apply herbicide and/or storage life of herbicide were discussed). Very low levels of nematodes were observed from billets collected during the survey in Hume Region. However the majority of areas had levels below 1% incidence. Similar low levels were observed across the state. Sirex was observed for the first time from trap trees at Copeton Dam State Forest south of Inverell and from a private plantation at Tenterfield. This is the northern most observation of Sirex in Australia. Evidence of Sirex has also been observed (as exit holes and packed frass) in *P. taeda* in Eden Creek State Forest south-west of Kyogle. However, despite intensive surveys there have been no observations of fresh Sirex, indicating Sirex has not been able to successfully establish in these plantations.

Levels of positive wasps emerging from billets averaged 70% in 2002-2003. *Sirex* parasitoids, *Ibalia leucospoides* and *Megarhyssa nortoni,* emerged at low to moderate frequencies in 2002/2003. Hume Region recorded moderate numbers of *Ibalia* (132 male, 73 female) and 3 female *Megarhyssa*. Monaro Region recorded low numbers of *Ibalia* (15 male, 25 female) and very low *Megarhyssa* emergences (3 male only). Northern Region recorded moderate *Ibalia* emergences (47 male, 28 female) and very low *Megarhyssa* emergences (5 male, 3 female). No information was available from Macquarie Region.

Victoria: In Victoria, the incidence of Sirex over summer 2002-2003 again remained very low. Samples of nematodes collected were forwarded to Canberra to identify the strains of nematode present and to determine their infectivity and whether additional inoculations with the preferred strain were required. No Kamona strain has been recovered, with the 'defective' and 'other' strain predominating in field samples although these defective and other strains vary greatly in their infectivity potential. Emphasis has been placed on ensuring sufficient inoculations are done using the more effective Kamona strain nematode coupled with timely surveillance and thinning of susceptible stands.

Tasmania: Increased incidence in the northeast of the State. In response, herbicide trap trees were installed in four compartments in November 2002. These trap trees will be monitored in September 2003. *Megarhyssa* and *Ibalia* larvae were detected during the initial sampling in most Sirex areas. Several other compartments in the northeast had low numbers of Sirex but will have trap tree plots installed during Spring 2003. Nematodes were introduced in one farm woodlot in southern Tasmania where a high incidence of Sirex was detected following summer pruning in 2001. Large numbers of adult *Megarhyssa* were present following inoculation of logs. We will be collecting logs from the trap tree plots to test for nematode infection levels in emerging wasps.

South Australia: In the Green Triangle Region: Sirex continues to be at a low level. There are few plantations of the right age for Sirex that have not been thinned. Sirex surveillance flights were conducted in June 2003. It was expected that given the dry seasons over the last few years, that there may have been an increase in Sirex activity. There were some brown tops and dead patches in most forests but follow-up ground inspection confirmed nearly all of these deaths were due to salt, lightning, wet conditions (due to previously dry swamps filling with water this year) etc. The only Sirex deaths occurred in Mt Burr forest where there have been small patches of Sirex for the last few years. This year nematodes were found in Sirex in areas where no inoculations have ever been done – approx 2km from the nearest inoculated site. *Ibalia* is the most common parasite of Sirex in this region.

In the Ranges Region: There is evidence of increased Sirex activity in forests at Second Valley, Kuitpo and Wirrabara (in the North). At Wirrabara trap tree plots put in but there were also a number of naturally stressed trees (due to drought). Nematodes appear to be well established at Second Valley, Mt Crawford and Bundaleer. All Sirex emerging from billets at Second Valley contained nematodes. No nematodes were recorded in Sirex from Kuitpo or Wirrabara – some concern about this as inoculation programs have been carried out in both forests.

Parasites: *Megarhyssa* is well established at Second Valley, Mt Crawford and Bundaleer, only 1 emerged from billets from Wirrabara and none from Kuitpo (those emerging from billets have been released at Kuitpo). *Ibalia* is well established at Kuitpo and Second Valley and was recorded from 1 site at Mt Crawford (those emerging from billets released at Mt Crawford and Kuitpo). *Schlettererius*: a single specimen was collected at Kuitpo. This was the first collected in the region for several years.

Western Australia: From July 2002- July 2003 no evidence of Sirex infestation was found in Western Australian pine plantations. Recently all 55 pre-existing trap tree plots were checked for any signs of Sirex. All indications suggest Sirex is not present within the FPC (Forest Products Commission) estate. This conclusion can be misleading given the number of plots closed as a result of either the trees being harvested, fallen during previous inspections or died as a result of being trap trees. Out of the 55 plots, 22 can no longer be included as part of the sample size due to all or the great majority of the trees within each plot having already died. As no replacement plots had been established during December 2002, all existing plots will be reviewed as to their ability to remain in the sample pool. Therefore during December 2003 more trap tree plots will be established throughout the FPC estate.

Ips grandicollis (Fivespined bark beetle) and other bark beetles

National Summary: As a consequence of the extremely dry climatic conditions in eastern Australia (Appendix 2) damage from fires was observed in pine plantations in Queensland, NSW and Victoria. *Ips* was associated with these fire damaged trees in Queensland and Victoria. *Ips* continues to be a problem in the Wirrabara Forest in South Australia, and various changes to the management of this area (particularly in regard to timing of activities) should reduce the effect of *Ips* in this forest.

Queensland: As a consequence of the extremely dry climatic conditions fire-damage (many fires ignited by arsonists) to the basal area of stems and foliage was common especially within the Atherton, Rockhampton and Maryborough areas. The exotic 5-spined bark beetle *Ips grandicollis* quickly established within severely scorched and stressed trees from Rockhampton south. The sapstain fungus *Ophiostoma ips*, introduced by the beetle, impacted on log quality (due to bluestain) and contributed to tree mortality. The pinhole borer *Xyleborus perforans* was common within old wildfire sites and subterranean termites frequently established within dead pine stems. The termite genera *Heterotermes* and *Nasutitermes* were very active within old wildfire sites. The subterranean termite *Microcerotermes turneri* caused minor damage to the living tissue of *Pinus* in the Maryborough area. No exotic termite species were detected.

The newly identified bark beetle *Cyrtogenius brevior* was found at more plantation sites near Ingham but is not considered economically important. The sapstain fungus associated with this beetle requires identification.

New South Wales: There were no significant occurrences of *Ips* in NSW.

Victoria: Close inspection was made of fire-affected trees in north-east Victoria and Gippsland for *Ips* attack following the wildfires of early 2003. Apart from isolated minor outbreaks involving individual and small plots of trees in the north-east of the state, *Ips grandicollis* and other bark beetle species (*Hylurgus ligniperda* and *Hylastes ater*) have not presented a significant problem in *Pinus radiata* plantations.

Tasmania: Specific trapping for *Ips* was done at Hobart Airport and the Port of Launceston at Bell Bay as part of a quarantine trapping program. *Ips* was not trapped and has still to recorded from the State. Large areas of *P. radiata* in the Pittwater Plantation, adjacent to Hobart Airport, was severely damaged by fire in 2003. Very high levels of *Hylurgus ligniperda* and *Hadrobregmus australiensis* were detected at Hobart Airport during a summer trapping program before and after the fire. Replanting of fire-affected areas should be delayed until population levels decline. An inspection in August 2003 of fire-damaged pines that have recently died in the Pittwater Plantation found some attack by the buprestid, *Melobasis hypocrita*.

South Australia: In the Green Triangle Region, there has been no significant *Ips* activity though there was a report of a feeding attack in 12-15yo pines adjacent to an area that was clearfelled in summer. In the Ranges Region there have been no reports of *Ips*, however in the most northerly forest, Wirrabara, *Ips* continues to be a problem. Various changes to the management of this area (particularly in regard to timing of activities) should reduce the effect of *Ips* in this forest. Golden Haired Bark Beetle (*Hylurgus ligniperda*): A large flight of these beetles occurred at Kuitpo in the Ranges Region in September. There have been no further sightings.

Western Australia: No reports on high numbers have been received for this past year.

Essigella californica (Monterey pine aphid)

National Summary: *Essigella* continues to be a problem in mid-rotation to harvest-age *P. radiata* in NSW and Victoria, although not as severe as previous years for NSW. Damage was minimal in South Australia in 2002-2003, and although present, *Essigella* is still not causing significant damage in Queensland, Tasmania nor WA. For the first time significant damage associated with *Essigella* (and also drought) was observed in *P. elliottii* and *P. taeda* in northern NSW.

Queensland: The exotic Monterey pine aphid *Essigella californica* was distributed throughout the entire exotic estate, as has now been detected (for the first time) within the Mareeba and Kuranda areas (north Queensland). High numbers of *E. californica* (including winged adults) were detected on chlorotic foliage in the Ingham area and they were widespread but in very low numbers within the Rockhampton area. Medium to high numbers of this aphid were present in the Beerburrum area. Within the Passchendaele area large numbers of *Essigella* were affecting the health of young second rotation *P. taeda* and *P. radiata* (small areas) but overall aphid numbers varied greatly. Thick black sooty mould covered the stems and branches of these trees where aphid numbers approximated thousands per each 600 mm limb. Anecdotal evidence from widespread surveys suggests that these aphids are strongly associated with chlorotic sparse canopied rather than green

flush trees and that the nutritional status of trees influences aphid numbers. *Essigella* was more common than *Eulachnus thunbergii.*

New South Wales: *Essigella* was again widespread in Hume Region and again with most damage (chlorosis and needle cast) in the mid- to older age-classes (20-years plus). However, damage was lower than in 2001-2002. Damage from *Essigella* was significantly lower in Monaro, Macquarie and Northern Regions and considerably lower than in previous years. One anomaly was significant upper-crown needle cast associated with *Essigella* and drought in the *P. taeda* and *P. elliottii* plantations around Casino observed in December 2002. This was the first time such damage had been observed n "southern pines" in this area.

Victoria: Monterey Pine Aphid populations have been high again this year, with significant defoliation occurring in localised areas in north-east and central Victoria predominantly within 15 year-old thinned stands of *P. radiata*. At the time of this report being compiled, surveillance of aphid population levels and associated damage in the south of the state is being completed. In some areas of the north-east subjected to significant aphid defoliation, large populations of ladybirds (Order Coleoptera, Family Coccinellidae) of an as yet to be identified species have been observed. However, as these predator beetle species populations only increase after significant defoliation has already occurred, it is anticipated that they will not play a substantial role in controlling pine aphid populations.

Tasmania: A low incidence throughout southern Tasmania. No noticeable damage in infested plantations was observed during the past summer. The aphid remains undetected in the north of the State. Monitoring specifically for *Essigella* damage is not conducted in Tasmania.

South Australia: *Essigella* has had minimal impact in South Australia this year. There has been a slight yellowing in some areas and a loss of 4yo needles in thinned stands in some areas. The effect seems to be more severe on low fertility sites. The trees also take longer to recover on these sites. Very high numbers of ladybirds were present throughout April/May.

Western Australia: Damage due to the aphid still appears to be minimal. Western Australia will co-operate in regards to Ms Trudi Wharton's research on this insect.

Eulachnus thunbergii (pine aphid)
National Summary: Minor pest; identified from Queensland to Victoria.

Queensland: Status unchanged – present in all plantation areas but causing no discernable damage.

Victoria: Despite monitoring for the insect, Victoria has not recorded any *Eulachnus thunbergii* to date. (However, identified from Victoria by Trudi Wharton recently)

Tasmania: Not recorded from Tasmania.

Pineus laevis (pine aphid)
Tasmania: The pine aphid, *Pineus laevis*, is common in wildling regenerated plantations on poor sites in the northeast. Locally incidence of infested trees can reach 10% and may be predisposing a small proportion to *Hylastes ater* attack resulting in a mortality of 1-2%.

1.1.2. Diseases

Dothistroma septosporum (Dothistroma needle blight & cast)
National Summary: Lower rainfall across eastern Australia (Appendix 2) resulted in a lower severity of *Dothistroma* needle blight in 2002-2003, with control necessary in 1300ha in NSW only.

New South Wales: Lower rainfall across NSW resulted in lower severities of *Dothistroma* needle blight in NSW in 2002-2003. The severity and extent of *Dothistroma* needle blight was lower than previous years n the *P. radiata* plantations around Walcha (Northern Region) with only 1300 ha requiring control (cf. 2000 ha in 2001-2002). Localised areas n Monaro Region also had significant levels of *Dothistroma* needle blight (350 ha).

Victoria: Due to the continued dry conditions in Victoria, *Dothistroma* continued to show low levels of disease, and no spray programs were conducted in the State for 2002/2003.

Tasmania: *Dothistroma* was common in wetter areas of the state but was generally of low severity. However, there was a hotspot in the northeast where two compartments showed a disease incidence of up to 80% with a severity ranging from 50-90% of the crown. No control was undertaken in either of these areas.

Cyclaneusma minus
National Summary: Widespread throughout many plantations in NSW, Victoria and Tasmania, although mainly at severities below 25%.

New South Wales: Widespread throughout the state but generally restricted to less than 25% of the crown.

Victoria: Defoliation associated with *Cyclaneusma* was recorded in most areas of plantations in the State, with some areas exhibiting moderate defoliation levels.

Tasmania: Widespread throughout the state but generally restricted to less than 25% of the crown. Tendency to be worse in areas of higher rainfall.

Sphaeropsis sapinea (=Diplodia)
National Summary: Due to drought stress (see Appendix 2), *Sphaeropsis* was more damaging in several states in 2002-2003, including Queensland, NSW and Victoria.

Queensland: The widely distributed sapstain fungus *Sphaeropsis sapinea* was more damaging throughout the entire plantation estate as drought stress reduced host-pathogen responses. This fungus was found to be invading dying *Pinus* throughout the Maryborough

area. In the Passchendaele area (south-east Queensland boarder region) *S. sapinea* was infecting *y*oung 2R *P. radiata* from the crown down with their upper stems desiccated and blue-stained and the lower basal area of the stems swollen. *Sphaeropsis sapinea* continues to be implicated in dieback within the older age classes of *P. radiata*.

New South Wales: Drought-related *Sphaeropsis* damage, dead tops and dead trees, was significant in several Regions in NSW in 2002-2003. In Macquarie Region over 2200 ha had incidence of 1-15%. Levels of damage were generally lower in Hume Region, however, several localised areas (up to 500 ha) had higher damage (up to 15% incidence). Hail damage had resulted in *Sphaeropsis* damage in several localised areas in Northern (300 ha) and Monaro (250 ha) Regions.

Victoria: *Sphaeropsis* in association with drought, is continuing to cause dead topping and death of trees in some plantations throughout the State.

Tasmania: No fresh cases of *Sphaeropsis* crown wilt were detected during recent surveillance although a low incidence of dead tops was observed in drier areas of the northeast. *Sphaeropsis* shoot blight was not detected during the past year.

South Australia: No significant damage has occurred this year.

There have been several reports of canker-like lesions on young pines in some areas. This is being investigated further.

Bursaphelenchus (pine nematode)

Victoria: In February 2000, an unidentified *Bursaphelenchus* nematode was isolated from a dying *Pinus halepensis* tree in a botanical garden near the port of Melbourne. Due to the fact that some species of *Bursaphelenchus* (eg. *B. xylophilus*) are significant pathogens of conifers overseas, and its association with a dying tree, a survey and eradication program was approved as a precautionary approach to their introduction by the then Standing Committee of Forestry (now Forests and Forest Products Committee) under the coordination and support of a National Consultative Committee established for this purpose.

Surveys for the *Bursaphelenchus* nematodes continued in 2002/2003. The following summarises findings to date:

The reports of dying trees around Melbourne have diminished sharply over the past year with only 2 trees found to be infested (at the same location) in the summer of 2002/2003. However for the first time in the eradication program, a breeding population of males and females were found in the trees, which has enabled a positive identification of the nematode as *B. hunanensis,* by Mike Hodda (CSIRO) thus confirming his initial identification. This species has previously only been recorded from a dying pine tree in China. The two trees were on the ends of a row of 12 trees that had died over the previous 2 years, and were missed in the initial surveys. Nematodes were also isolated from the 10 middle trees but they were all secondary bacterial and fungal feeders, probably introduced

with *Ips* beetles found infesting the dying trees. It appears that *B. hunanensis* may not be able to compete with other saprophytic nematodes. As with all other trees removed to date, this site appears to be associated with the initial incursion event as locals recollect the trees started to die in 2000 with a single tree in the middle of the shelterbelt. It's possible that, if they were the cause of tree death, following the initial infestation the nematodes have spread from tree to tree via root to root contact.

Since the commencement of the surveys in 2000, a total of 39 mature pine trees (generally *Pinus radiata* > 40 yrs of age) out of 288 that were dying across Victoria, contained the nematodes. These nematodes were not isolated from any pine trees tested outside of a 60km zone around Melbourne or from samples taken from dying trees in other States. Other factors (such as drought, *Sphaeropsis,* Sirex and salinity) were also associated with some of the tree deaths, particularly in country Victoria. All trees containing the nematode were removed and destroyed.

While the initial pathogenicity trials were not successful, the FWPRDC sponsored project at Adelaide University appears to have successfully cultured the nematode and thus further trials are planned under quarantine conditions. This will enable an assessment of the potential threat of this nematode to forestry and along with their research to develop probes to identify these types of organisms, will aid identification for any future incursion.

A trapping program for potential vectors of the nematode produced no evidence of the establishment of *Monochamus* beetles, the usual vector of the nematodes in overseas studies. However *Arhopalus rusticus* was recorded during the surveys (an exotic longicorn beetle of pine that attacks stressed trees) and has established itself in Melbourne. These beetles are not considered efficient vectors of the nematode, as they do not have a maturation feeding stage on healthy trees as part of their life cycle. The rearing program from billets of nematode infested trees recovered over 200 *Arhopalus rusticus* beetles with only 4 *B. hunanensis* isolated from an extraction from a squash of 40 beetles from one tree.

It is anticipated that with the absence of an efficient vector, it's apparent poor survival in the presence of other saprophytic nematodes and a continued monitoring program and eradication with the assistance of local and State government land management agencies and the general public, that it will be eradicated from the Melbourne area thus reducing any threat to urban and rural pine trees and plantations.

Armillaria novaezelandiae

<u>New South Wales:</u> Scattered mortality associated with *Armillaria* was again observed in the *P. radiata* plantation at Acacia Plateau in Northern Region. Mortality of up to 10% annually for the first three years, then around 1% in following years, has been observed since 1996 in this plantation. *Armillaria*-associated mortality was observed in the 1st rotation crop of *Araucaria* spp.

1.1.3. Environmental (drought, frost, fire, nutrient, weeds, etc.)

National Summary: Drought conditions (Appendix 2) impacted on many plantations in eastern Australia in 2002-2003, resulting in *Sphaeropsis* infection, dead topping, stem resinosis, needle chlorosis and browning and premature needle cast.

Queensland: During the 2002-2003 period the severe drought conditions experienced throughout Queensland impacted on the health of all the plantations. Drought induced effects on the mature trees comprised stem resinosis, widespread foliage chlorosis, browning of needles, green needle fall and sparse thin canopies. Resinosis was common on trees with dead canopies or very sparse foliage. *Fusarium circinatum* (pine pitch canker) was not associated with this resinosis. There were several very large patches of young tree mortality within the Rockhampton area where mortality was more common within the lower lying areas. Drought stress on newly planted trees was also common ie. resinosis lesions, swollen lower stem, cracking bark, proliferation of new shoots below the lesion at ground level. The effects of drought were more severe in the plantations within the Atherton, Ingham, Rockhampton and Maryborough areas. Following good rainfalls from January to March a number of plantations in southeast Queensland showed signs of recovery.

Foliage chlorosis was common in *Pinus* spp. plantations but is seasonally and temporally variable. Soil moisture (drought/water-logging), nutrition and plantation age are implicated and occurrence/duration/impact is unpredictable. The situation on some of the Podzolic soils where the *Pinus elliottii* var. *elliottii* stands are unhealthy is an extreme manifestation of the problem. The cause is not a simple/multiple element nutrient deficiency and other factors may be implicated. Scale insects *Parlatoria* sp. and pine mites *Acarina* sp. were commonly associated with chlorotic stands.

New South Wales: As mentioned in the previous section drought- and hail-related *Sphaeropsis* mortality was observed in many plantations in 2002-2003. Fire in late 2002 killed up to 300 ha of *P. elliottii* in Northern Region. These trees were salvaged logged. Boron deficiency is an ongoing problem in many 1st rotation areas planted on ex-pasture. Remedial fertilisation alleviates the problem. Moderate levels (25% incidence) of speed wobbles were observed in localised areas in young trees on ex-pasture sites in Hume Region. Weeds, mainly *Acacia,* were a problem in several areas of younger age-classes, and control was necessary in several areas. Lightning was again prevalent in Sunny Corner SF in Macquarie Region.

Tasmania: Patch death due to lightning strike occurred in several plantations scattered throughout the northeast. Typically 20-30 trees had been killed. Two small regions (<3 ha) of windthrow/stem breakage were recorded in the east and northeast of the state.

South Australia: There continue to be a few deaths due to salt. There have also been deaths around the edges of swampy areas in parts of the Green Triangle Region. It is thought these deaths are due to this year being very wet compared with previous years and low-lying areas (that have not had water in them for many years) are this year full of water. Some

nutrient deficiencies have been reported in the Green Triangle Region – particularly K and B deficiencies in young trees, also some Zn and Cu deficiencies.

1.1.4. Vertebrate pests

Possums
National Summary: Possums continue to be a major problem in southern NSW, and in several areas in Tasmania.

New South Wales: Although the area of possum damage has not changed significantly in recent years in Monaro Region, the levels of damage (incidence) has decreased again from those seen in 2001-2002. Still, over 2550 ha were observed with significant damage.

Tasmania: Top death resulting from stem girdling by brushtail possums was found at low incidence in mid-rotation plantations in the Oonah area of northwestern Tasmania in 2002-2003. However, little new top death was seen in the affected area during the past year.

Wallabies
National Summary: Wallabies continue to be a problem in young age-classes adjacent native bush in NSW and in Tasmania.

New South Wales: Significant damage was again observed in young age-classes adjacent native bush in Monaro Region. Damage from wallabies was also observed in Macquarie Region.

Tasmania: Damage from browsing mammals (wallabies and brushtail possum) cause significant damage in pine plantations throughout Tasmania. Bark stripping of 2-5 year old plantations by wallabies remains a widespread problem throughout the State. Mortality resulting from girdling was, however, uncommon. Only three compartments in northern Tasmania had noticeable mortality from bark stripping.

1.2. *Pseudotsuga menziesii* (*Douglas fir*)

1.2.1. Diseases

Phaecryptogus gaeumannii (Swiss needle cast)
New South Wales: *Phaecryptogus gaeumannii* was again associated with chlorosis and needle cast in the majority of the Douglas fir plantations in Bago State Forest (the largest plantations in NSW), averaging 25% severity (Figure 1).

1.2.2. Insects

Adelges cooleyi (Cooley spruce gall aphid)
New South Wales: *Adelges cooleyi* (Gillette), an exotic pest from Northern America, was first observed on Douglas fir in Macquarie Region during surveys in 1997 and has since been observed in the majority of Douglas fir plantings in NSW, although not from the Northern Tablelands. It is associated with white cottony tufts, and often in association with *Phaecryptogus gaeumannii* can cause yellowing and premature needle cast (Figure 1).

Adelges cooleyi was observed in significant numbers on Douglas fir in Bago State Forest in mid-2003, on the majority of trees where foliage could be observed (ie. younger trees or roadside trees). Damage was significant on young wildlings, with over 25% severity including copious sooty mould, and on older needles of older trees. Damage appeared to be more severe than in previous years.

Figure 1. White cottony tufts associated with *Adelges cooleyi*, and *Phaecryptogus gaeumannii,* on Douglas fir from Bago State Forest.

1.3. Hoop pine (*Araucaria cunninghamii*)

1.3.1. Diseases

<u>Queensland:</u> The root rot pathogens *Rigidoporus vinctus* and *Phellinus noxius* continue to cause tree mortality throughout the *A. cunninghamii* estate. *Phellinus noxius* is the major cause of tree mortality in the first and second rotations in north Queensland. In southeast Queensland *P. noxius* is more frequently associated with first and older second rotation stands. *Rigidoporus vinctus* predominates in the younger (up to 6 years) second rotation stands where the greatest losses are occurring. *Phellinus noxius* was detected for the first time within the Ingham area where it had caused mortality within a small patch *A. cunninghamii*. A plantation estate dominated by *Pinus* spp surrounded this patch of *A.cunninghamii*. *Rosellinia* sp. played a minor role in tree mortality (percentage wise) and tended to cause mortality at sites where there were large quantities of surface organic matter. Drought appeared to slow the activity of these pathogens. Biological and chemical control research programs aim to address root diseases within the *A. cunninghamii* plantation estate.

<u>New South Wales:</u> No significant pests or diseases were observed in the *Araucaria* plantations in NSW.

1.4 Wollemi Pine (*Wollemia nobilis*)

1.4.1. Diseases

Queensland: *Phytophthora cinnamomi* related deaths has been reduced through the use of Ridomil[R]. *Fusicoccum* sp. has resulted in deaths of a number of cuttings, both when recently struck and established plants. Recent severe outbreaks have been linked with stress events such as sunburn. Chemical controls are being tested at present. *Nectria* sp. has been associated with deaths of recently struck cuttings within the temperature controlled glasshouse facility. *Mycosphaerella wollemia*, a recently described foliage pathogen of Wollemi pine, has been detected regularly but is generally classed as a low impact pathogen.

1.5. *Eucalyptus* species

1.5.1. Pests

Mnesampela privata (Autumn Gum Moth)

National Summary: Low to moderate levels of damage from AGM was observed in *E. globulus* plantations in Victoria, Tasmania, South Australia and Western Australia.

Victoria: Low levels of Autumn Gum Moth defoliation have occurred predominantly in *Eucalyptus globulus* plantations throughout Victoria during autumn/winter 2002. Early signs indicate this trend will continue into autumn 2003 with only trace to low levels being observed in plantations around the state to date.

Tasmania: A research plantation with a low incidence of occupied shoots (1 in 50) was sprayed with Mimic in August 2003. This plantation was also attacked by a summer population in 2002-3 resulting in minor damage. AGM was recorded at noticeable levels in seven compartments, most of which were in the northeast of the state. These compartments totalled 438 ha in area of which around 250 ha included variable levels of damage which reached "moderate" (25% defoliation) in places. Damage throughout the remaining area was generally of low severity and/or incidence.

South Australia: Autumn Gum Moth remains the major pest of eucalypts in the Green triangle region. It is present in almost all plantations. In two private plantations, 50-60% of trees had up to 20% damage. However in general damage was slight. Many growers now accept that Autumn Gum Moth will cause some damage and do not necessarily report outbreaks.

Western Australia: Autumn gum moth has not been a significant pest during 2003. With very minor damage occurring on young coppice plantations in the Albany region.

Psyllids (Cardiaspina, Ctenarytaina, Creiis)

National Summary: A major outbreak of *Creiis lituratus* has caused moderate to severe damage in over 500 of *E. dunnii* in northern NSW and southern Queensland. Control was necessary in much of this. This is the first record of *Creiis lituratus* in Queensland. Low

to high damage from *Cardiaspina* spp. was observed in *E. camaldulensis* and *E. grandis* in northern Victoria, but generally confined to localised areas. In general *Ctenarytaina eucalypti* was not a significant pest in Victoria, Tasmania nor Western Australia in 2002-2003.

Queensland: *Creiis lituratus* has been identified for the first time in young *E. dunnii* plantations in southern Queensland. Severe damage was observed in several private plantations, with control spraying necessary.

New South Wales: Severe damage from *Creiis lituratus* occurred in up to 500 ha of 3-6 year-old *E. dunnii* in northern NSW in early- to mid-2003. 320 ha were severely affected (>75% Crown Damage Index), including total foliage death on trees, with 110 ha at "moderate" damage (25-75% CDI). Much of the severely damaged trees are not expected to recover satisfactorily. A monitoring program was established, which included egg counts and identification of psyllid instar stages, to accurately determine the optimum area and time to spray (aerial and ground surveys). Control was conducted by air and ground using dimethoate (Emergency Permit PER6785). Results were variable, mainly due to size of trees (over 12 m in some cases). Monitoring is continuing.

Victoria: Psyllids of the genus *Cardiaspina* have been observed causing trace to high levels of defoliation to predominantly *Eucalyptus camaldulensis* and *E. grandis* plantings in northern Victoria during spring 2002 although as with last year, this damage was generally confined to localised areas rather than being widespread across a region. Defoliation occurred predominantly in the lower crown of trees with levels up to 50% in some stands being recorded compared to levels ranging up to 20% in the upper crowns.

Reports were received of the Bluegum psyllid *Ctenarytaina eucalypti* causing damage to the new shoots of *E. globulus* in 1-2 year-old plantations in north central Victoria. While sever infestations were reported, these were generally confined to individual properties rather than widespread across an entire region. Infested trees generally made a full recovery with minimal damage to leading shoots and subsequent stem deformation.

Tasmania: Blue gum psyllid is widespread but damage is negligible.

Western Australia: The blue gum psyllid is common across the plantation estate but has not been a significant pest during 2003.

Leaf beetles

National Summary: *Paropsis atomaria* caused significant damage in *Corymbia* spp and *E. cloeziana* in SEQ. Generally low to moderate damage from chrysomelids in Victoria, NSW, South Australia and Western Australia. In Tasmania, spraying to control high populations of chrysomelids was conducted in 803 ha.

Queensland: Late season leaf beetle defoliation caused by *Paropsis atomaria* was severe in several spotted gum plantations. These are the first records of outbreaks of this beetle species on spotted gum plantations in SEQ. Beetle populations were low in most locations

during the early summer, but with abundant flush foliage produced following rainfall in February severe damage by *Paropsis atomaria* was also observed in some coastal plantings of *E. cloeziana*.

New South Wales: There was generally only low to moderate levels of damage from chrysomelids in 2002-2003. However, several plantations experienced higher levels of damage from *P. atomaria.* Several years ago an entomogenous fungus was observed infecting *C. cloelia* in an *E. grandis* plantation in northern NSW during regular forest health surveys (Figure 2). More collections have recently been made from *C. cloelia* and *P. atomaria,* on *E. grandis, E. dunnii* and *E. cloeziana,* now from 3 separate plantations. The fungal species involved is being investigated.

Figure 2. Entomogenous fungus growing out of *Chrysophtharta cloelia* on *E. grandis* in northern NSW

Victoria: Leaf beetles of the genus *Chrysophtharta* and *Paropsis* have caused trace to moderate levels of defoliation (up to 20%) in young canopy closed stands (five years plus) of *Eucalyptus globulus*, *E. viminalis* and to a lesser extent *E. nitens* and *E. saligna* in Gippsland during the 2002-2003 summer with damage generally observed in the upper 50% of the tree canopy. Some minor upper crown damage was also observed to similarly aged *E. globulus* and *E. camaldulensis* plantations around the Shepparton irrigation region over the same period.

Tasmania: Monitoring for leaf beetle populations was done in 9,451 ha of eucalypt plantation on State Forest in 2002-3. Spraying to control high populations was done in 803 ha.

South Australia: There have been few reports of damage this year by Chrysomelid beetles though they are present in nearly all plantations. In one plantation, *Aporocera melanocephala* damaged 1yo and 2yo *E. globulus*.

Western Australia: Very minor damage from *Cadmus* and Chrysomelids was noted in the Denbarker area.

Swarming scarabs

Queensland: Swarming scarab beetles caused damage in some plantations, though emergence patterns were unusual because of odd rainfall patterns. The larger *Liparetrus* spp. were more prevalent than *Automolus* spp., the most common of these beetles in previous years. Damage by night active *Sericesthis* spp. was also observed at some sites.

Western Australia: *Heteronyx* have caused light defoliation to the growing tips of older aged plantations, particularly in the North Bannister area (~300 Ha) & east of Albany (~100 Ha). The distribution and density has significantly increased in the last 12 months. African Black Beetle (*Heteronychus arator*): The introduction of "socks" to the seedlings prior to planting in known african black beetle areas has reduced the threat of this insect to nil. Spring Beetle (*Liparetrus* spp): Increased knowledge of the life cycle has significantly reduced the threat of this insect. WAPRes ground sprayed four properties with no significant damage occurring.

Erinose mite (Rhombacus sp.)

Queensland: Damage was widespread and severe across a large proportion of young spotted gum plantations. This mite has increased in importance each year since it was first recorded in plantations in 2000. Data from monitoring plots indicated that growth was more severely reduced at sites where tree vigour (as measured by growth increment) was low.

New South Wales: Although recorded in numerous *Corymbia* spp. plantations since 1996, *Rhombacus* sp. has not caused significant damage. The species involved is probably a new species to science (Danuta Knihinicki, pers. comm.).

Plate galler (Ophelimus sp.)

Queensland: Populations of this eulophid wasp on western white gum were very low in all plantations visited.

New South Wales: Has been observed on western white gum in trials. A species in the same genus (probably a new species, J. La Salle, pers. comm.) is common on *E. dunnii,* causing large, spongy galls. Damage from this species was significant in a trial in northern NSW, with up to 25-50% CDI. Elsewhere it was not significant.

Weevils

Tasmania: Defoliation by the weevil *Gonipterus scutellatus* was obvious in four compartments in the south and southeast of the state where both adult and juvenile foliage

were affected. The area involved was around 103 ha and of this perhaps some 65 ha might have approached the moderate damage level.

Western Australia: Weevil control was carried out on approximately 2,500 Ha over 22 treefarms with the ages varying from 2 to 4 years old. Significant damage would have eventuated if this preventative spraying hadn't occurred.

Gum leaf skeletonizer

Tasmania: *Uraba lugens* was apparent in at least four compartments throughout the state but was causing moderate damage in only around 5 ha.

Cicadas

Queensland: These insects caused patchy but severe damage in a number of plantations over a wide spatial range. Oviposition by adult cicadas on stems and branches causes stem dieback/breakage, leading to loss of the leading stem and development of poor form. Monitoring plots were established in one plantation to quantify this loss.

Sawflies (Perga spp.)

National Summary: Gregarious sawflies were a problem in Victoria and South Australia, mainly of individual trees. In South Australia the Cattle Poisoning Sawfly (*Lophyrotoma interrupta*) have been common this year.

Victoria: Sawflies were again observed causing trace to low levels of defoliation in north central Victoria during winter/spring 2002, slightly later than usually observed in previous years. Damage was generally confined to individual trees (predominantly *E. globulus* and *E. camaldulensis*) although small groups of trees were sometimes affected also. Defoliation was predominant in the upper 50% of tree crowns although in severe cases, lower crowns were also affected. Most trees defoliated generally recovered, with only very low levels of resultant mortality occurring. Such mortality was usually associated with other causes including site/environmental factors. Monitoring is continuing to assess population levels and associated damage over the 2003 winter period.

New South Wales: Not a problem in 2002-2003.

Tasmania: Not a problem in plantations.

South Australia: There have been many reports of sawflies this year. They have been attacking *E. globulus*, *E. occidentalis* and *E. camaldulemsis X E. grandis* hybrids. *Perga* is the main species but this year the Cattle Poisoning Sawfly (*Lophyrotoma interrupta*) have also been common.

Leaf Blister Sawfly

National summary: Mainly a problem in *E. camaldulensis* hybrids in several plantations in Queensland and NSW. Several trials have been established to investigate impact.

Queensland: Leaf blister sawflies (*Phylacteophaga* spp.) were active in a number of plantations, mainly on eucalypt hybrids (*E. camaldulensis* x *E. grandis*, *E. camaldulensis* x *E. globulus*) and *E. dunnii*. Monitoring plots were established in one plantation of *E. camaldulensis x E. grandis* to assess the impact of this pest on growth.

New South Wales: Leaf blister sawfly caused significant defoliation in trial plantings in the Hunter Region: *E. camaldulensis* x *E. grandis* (CDI >75%), *E. camaldulensis* x *E. globulus* (clone 44<25% CDI; clone 34 50-75% CDI). An insecticide trial has been established in this plantation to investigate effectiveness of imidacloprid, tree recovery from severe defoliation, and impact of defoliation.

Western Australia:
Have caused light and partial defoliation to the lower leaves of older aged plantations mainly in the Albany area, but has not been significant during 2003.

Wingless Grasshopper (Phaulacridium vittatum)
Victoria: The Wingless grasshopper *Phaulacridium vittatum* caused localised damage to newly established eucalypt plantations in south west Victoria over summer 2002-2003 although not on a scale to warrant widespread control measures to be implemented.

Christmas Beetles (Anoplognathus spp.)
New South Wales: Damage not significant this year.

Victoria: Christmas beetles (*Anoplognathus* spp.) have caused low to moderate levels of damage in the upper crowns of 1-2 year old plantations on ex-pasture sites in Gippsland over early summer 2002-2003. However, the damage observed was localised with most trees making either a partial or full recovery by autumn/early winter 2003.

Tasmania: Not a problem in plantations on State Forest.

Stem borers
National Summary: Stem borers continue to be a problem in older age-classes, mainly scattered at low incidence, in most states.

Queensland: Borers mainly a problem in private plantings of *E. grandis.*

New South Wales: Continue to be a major problem in older plantings of *E. grandis.* Several plantations of *E. dunnii* with moderate levels of damage this year also.

Victoria: Borers of the species *Phorocantha acanthocera* were observed in eucalypt plantations in East Gippsland attacking 12 year old *Eucalyptus saligna* and *E. viminalis* although the attack was confined to individual trees and not widespread across whole stands. Borer damage has been increasingly observed over the past two years in eucalypt plantations, coinciding with factors including increased tree stress caused by a combination of ongoing dry conditions and unthinned older age stands. Although the borer damage has not been associated with tree mortality, it has led to an increased incidence of defects being

observed in trees. Monitoring is continuing to observe whether borer damage has spread to other parts of the state in eucalypt plantations experiencing similar sets of conditions.

Tasmania: Stem borers were encountered in five compartments varying in age from 4 to 13 years. Damage/mortality was usually restricted to a few trees but in at least two cases it was scattered over a wider area at very low incidence. In the majority of cases cerambycid larvae, often *Coptocerus rubrides*, caused the damage. In one instance damage was due to buprestid larvae.

South Australia: In the drier areas of the Green Triangle Region (the Upper South East of South Australia) there have been several plantations damaged by longicorn beetle larvae. Damage has been to 4-5yo trees – in some cases causing them to fall over.

Other Pests

Victoria: The Gumtree scale *Eriococcus coriaceus* has been observed causing damage to 2-3 year old eucalypts (predominantly *E. globulus* and *E. camaldulensis*) in the Shepparton/Kyabram area of northern Victoria. While some mortality was observed, this was generally associated with other environmental factors such as the prevailing dryer than average conditions, with most affected trees making a full recovery.

New South Wales: Damage from geometrides was more common in 2002-2003 than in previous years. A species of looper caused extensive and severe damage (50% CDI) in up to 100 ha of *E. cloeziana* and *E. pilularis* on the mid-north coast. Damage from cup moth larvae (*Dortatifera casta* & *D. vulnerans*) was also common, but not as damaging, on a range of species including *E. pilularis, E. cloeziana, E. grandis* and *Corymbia* spp.

1.5.2. Diseases

Aulographina eucalypti

National Summary: Not a significant problem this year.

Mycosphaerella leaf diseases

National Summary: Low levels in most areas in Queensland, NSW, Victoria, Tasmania and Western Australia. However, severe defoliation in young plantations in East Gippsland, Victoria. Several new species being described from Queensland, NSW and Western Australia.

Queensland: *Mycosphaerella* spp. has been detected on a large number of species in both plantations and trial sites. It appears that a few new species of this fungus may have been detected in a recent joint survey of North Queensland plantations conducted with Treena Burgess from Murdoch University.

New South Wales: Low levels of damage from *M. cryptica* and *M. marksii* in several *E. pilularis* plantations. Several new species being described, one of which has increased in severity on *E. dunnii* in northern NSW since last year.

Victoria: Very little disease has been recorded in eucalypt plantations in 2002/2003. The exception to this was *Mycosphaerella* defoliation in 2 year-old *Eucalyptus globulus* plantations in South Gippsland, which has resulted in reduced growth and increased weed control issues due to the loss of canopy resulting in increased light reaching the ground.

Tasmania: Much drier spring and summer conditions experienced throughout much of the State this year resulted in much less damage from *Mycosphaerella nubilosa* in young *E. globulus* plantations compared with last year. Trees that were severely defoliated in last year's epidemic in the Smithton area (all in plantations established in 2000) are recovering growth but substantial growth losses have occurred.

South Australia: *Mycosphaerella* has caused damage in two plantations in the Green Triangle Region this year. In one plantation 5% of trees were affected while in the other approximately 40% of trees were affected.

Phaeophleospora epicoccoides

Queensland: Limited impact by this disease has been recorded within plantations. However infection of eucalypt species planted off site in trials has been recorded at high levels resulting in significant defoliation.

New South Wales: Very common again in 2002-2003 on *E. grandis* and *E. grandis* hybrids, associated with lower crown defoliation of up to 25%, but with several plantations of over 50% defoliation. A new species of *Phaeophleospora* is being described from *Corymbia* spp., which is common but not damaging.

Coniella leaf blight (Coniella fragariae)

Queensland: Coniella leaf blight has been detected in the majority of eucalypt plantations within North Queensland. The incidence and severity of *Coniella* spp. was greater than in previous years with a number of species other than *C. fragariae* yet to be identified. A species of *Coniella* has recently been detected in the south east of the state. This is the first record of it occurring in the region. However the species is yet to be determined.

New South Wales: Coniella leaf blight again common in *E. dunnii* plantations but at trace to low levels.

Corymbia shoot blight (Quambalaria pitereka)

Queensland: *Quambalaria pitereka* continues to be a major limiting factor in the development of spotted gum plantations within Queensland. However extended dry periods appear to have reduced the rate of spread of the disease within plantations. Maps using GPS data have been initiated recording the pattern of spread and its relation to weather conditions. The disease has also been noted on hybrid material in north Queensland although the impact does not appear to be as significant. Isolate variability has been shown through ITS sequencing indicating the potential for a species complex. Further investigations into the population structure of *Q. pitereka* will be made in the near future.

New South Wales: *Quambalaria pitereka* was not as severe this year as previous years. A trial investigating impact and effectiveness of chemical control was destroyed by frost, and will be re-established.

Cylindrocladium leaf blight (Cylindrocladium quinqueseptatum)

Queensland: *Cylindrocladium quinqueseptatum* has not been as prolific in the north Queensland region as previous years, predominantly due to the drier than normal conditions in this region. However outbreaks of the fungus have still been found to be impacting on nursery material at Walkamin Forestry Nursery.

Root diseases – Armillaria & Phytopthora

Tasmania: Scattered deaths due to *Armillaria* spp continue to be detected throughout the State. In most cases the incidence of affected trees was very low. However, in one 10 year-old *E. nitens* plantation in the Scottsdale area *Armillaria* caused the death of about 20 trees in a roadside patch.

An undiagnosed root and collar rot was causing the mortality of about 1% trees in a 1-year-old *E. nitens* plantation in northeastern Tasmania. *Phytophthora cinnamomi* was suspected but could not be confirmed by culturing. Attempts to isolate a pathogen are continuing.

Canker Fungi

Queensland: Fungi associated with branch and stem cankers are beginning to become more pronounced within plantation areas in Queensland. A recent survey in North Queensland indicated a number of fungi associated with branch and stem cankers including: *Botryosphaeria parva, Botryosphaeria ribis, Botryosphaeria rhodina, Nectria* sp., *Cytospora eucalyptola, Lewia infectoria. Botryosphaeria* sp. has also been detected in association with Q. *pitereka* dieback in spotted gum plantations.

Tasmania: Top death due to *Botryosphaeria dothidea* was detected at low incidence in one 2-year-old *E. nitens* plantation near Bracknell (in the central north).

1.5.3. Environmental (drought, frost, fire, nutrient, etc.)

New South Wales: Frost in winter 2002 caused extensive and severe damage to plantations up to 5 years old. Over 900 ha were affected, with approx. 320 ha killed and 520 ha with greater than 50% CDI. *Corymbia* spp. were the most affected (735 ha), but also *E. dunnii* (80 ha) and *E. pilularis* (85 ha). Drought caused mortality in localised areas in *E. pilualris.*

Queensland: The severe drought, in association with nutritional problems, caused patchy mortality in some plantations.

Tasmania: Tasmania experienced a summer drought in 2002-3, with the southeast experiencing the lowest summer rainfall on record. Derwent District was most affected with patches of dead trees detected in 14 plantations scattered throughout the District. Affected patches were of limited extent (up to 0.5 ha) and occurred on shallow soils overlying bedrock.

South Australia: Some nutrient problems have been identified (Mn) on previously irrigated pasture sites. On Kangaroo island there have been problems with very low Mn levels and very high N levels in *E. cladocalyx*.

1.5.4. Vertebrates

National Summary: Wallabies and possums are a continuing problem in Tasmania, with 120 ha failed due to excessive browsing. Possum damage of eucalypts was observed for the first time in Tasmania, in *E. nitens*. The Port Lincoln parrot is a significant problem in Western Australia, with control (shooting) necessary. Cockatoos remain a problem in trees with cossid and cerambycids in Queensland, NSW and Victoria.

Queensland: Severe vertebrate browsing damage was not reported in any plantation.

New South Wales: Cockatoos continue to cause damage to cossid moth infested trees.

Victoria: Minor damage to *E. saligna* and *E. globulus* plantations in Gippsland has again been observed by cockatoos pulling off bark and wood on trees in search of cossid moth and longicorn larvae (Figure 3). Damaged trees are subsequently blown over by wind gusts.

Figure 3. Cockatoo damage to *Eucalyptus saligna* in search of cossid moth larvae, Gippsland.

Tasmania: Browsing of young seedlings by mammals (mainly wallabies and brushtail possum) continues to be a major problem. A total of 120 ha of plantations established in 2001 had failed to establish because of excessive browsing. Top death following stem girdling by possums was reported for the first time in a 4-year-old *E. nitens* plantation in the upper Derwent Valley (this problem has previously been confined to pine). About 10% of trees in a 10 ha patch were affected.

Western Australia: Port Lincoln (28) Parrot - Parrot control (shooting) is currently occurring on 18 Treefarms with approximately 3,000 birds being shot over the last 12 months. Trapping was carried out on three properties during the last 12 months but was not successful (at all). Parrot shooting is by far the easier and more cost-effective method for controlling parrots.

1.6. Sandalwood

Western Australia:
A Sandalwood plantation south of Wickapin, east of Narrogin, was found infested with *Delias aganippe*. Host plants were established in 1998 and Sandalwood in 1999 - 2002.

2. MANAGED NATURAL FORESTS

New South Wales: Native forest dieback is a continuing problem in coastal NSW.

Phasmatid defoliation, by *Didymuria violescens*, has occurred in the native forest stands (*E. dives*, *E. dalrympleana*, *E. viminalis*, *E. delegatensis* and *E. regnans*) in the Tumut/Tumbarumba area in recent years. The severity of the outbreaks varies from year to year, with localised severe defoliation occurring in 1997, 1999 and 2001. In these years, the FHSU mapped the extent of defoliation. The next expected severe outbreak is due in the summer of 2002-2003.

State Forests of NSW staff (Debbie Kent and Peter Haenig, Native Forest Division) attended a two-day training session in September 2002 on phasmatid egg survey and collection methodology, conducted by Michael McCormick, NRE Victoria and held around Myrtleford and Bright, Victoria. After attending the workshop Debbie and Peter collected 20 leaf litter samples from Bago and Maragle State Forests. These samples were air dried for several weeks and then machine-sieved at NRE Myrtleford using equipment specifically designed to separate coarse and fine litter particles. The samples were then hand-sorted for eggs and shells.

The numbers of viable eggs from the hand-sorted fine litter were high in both State forests. Previous studies of phasmatid egg density in both NSW and Victoria found that densities greater than 4 viable eggs per litter sample indicated that defoliation could be expected in these forests. Bago State Forest had 9 out of 10 samples with greater than 4 viable eggs per sample and Maragle State Forest 7 out of 10. These finding suggest that some localised areas in both NSW forests can expect to have severe phasmatid defoliation in 2003. However, weather conditions, particularly variations in air temperature, can affect hatching, ie. relatively high temperatures can reduce hatching success. No severe damage were observed or reported, suggesting high numbers of eggs did not hatch due to high temperature experienced in early 2003. Large numbers of parasitoids were observed from collected eggs, suggesting these also reduced egg viability.

Victoria: Few diseases were reported from native forest during 2002/3. Frost damage was reported from *E. delegatensis* seedlings planted in June 2003 in north-east Victoria.

Tasmania: A high incidence of mortality caused by *Phoracantha mastersi* in drought-stressed *E. obliqua* from mature forests in the Bicheno area. A cyclic outbreak of peppermint looper (*Paraloea aphotista*) is causing severe defoliation *E. amygdalina* and *E. viminalis* dry forests at several sites up the east coast. A developing outbreak of *Uraba lugens* (gum leaf skeletoniser) is causing severe defoliation of large areas of mature *E. obliqua*, *E. viminalis* and *E. amygdalina* in the Fingal Valley. No disease problems were reported or investigated from managed native forests this year. Record summer drought in southeastern Tasmania resulted in extensive mortality of eucalypts and understorey species in the Buckland area.

Western Australia:

Eucalyptus marginata

Jarrah leaf miner is still in outbreak in some areas of the northern Jarrah forest. Cutout boundary surveys were not conducted over this past season. It is anticipated that the next survey will be conducted in October 2004. Maintenance of a project investigating the control of Jarrah leaf miner through selective retention of resistant trees continues. Populations of gum leaf skeletonizer (*U. lugens*) remain low in the southern Jarrah forest. A paper on *U. lugens* spatial distribution during the outbreak period has been submitted for publication.

Defoliation Trial at Holmes Block near Dwellingup

The annual defoliation of the jarrah coppice at Holmes Block near Dwellingup was carried out last December. The project has been terminated after 15 complete annual defoliations.

Biodiversity study (Forestcheck)

The biodiversity study FORESTCHECK, aims to measure the biodiversity in jarrah as influenced by forest management practices. The project is all encompassing and measures vertebrate and avian fauna; invertebrate fauna; vascular plants; fungi, cryptograms and lichens; soil properties and structure; forest structure; etc. The project is planned with the long term in mind (eg 30 years). The first site set was assessed by CALM Forest Entomologists in spring 2001 and autumn 2002, and 588 morphospecies > 1cm were collected. The second location was sampled in Nov 2002 and April 2003 increased the number of morphospecies to 795.

Impact of Wildfire on Biodiversity

Following a wildfire in the Walpole-Nornalup National Park on the south coast of Western Australia a survey of the fire impact was established at 15 sites. These sites are stratified from the Nuyts 2001 wildfire area to the wet sclerophyll Tingle and Karri forests of the Douglas Hill area, unburnt since 1937. Also, at each site, pitfall traps have been set up to compare a number of microhabitats, ranging from floor litter, inside hollow butts and on moss covered fallen logs. Pit trapping has taken place in Dec. 2001, Feb.& Dec.2002 and Feb. 2003. Local volunteers from the Walpole Nornalup Association have sorted over 700 morphospecies from the Dec. 2001 and Feb. 2002 samples. While a Curtin University honours student has identified 160 species of beetles from these samples. Voucher

specimens from these reference collections, will be incorporated into a regional collection for permanent use by the local community and visiting researchers.

3. NURSERIES

3.1. Conifer species

New South Wales: No significant problems.

Victoria: Monitoring of nurseries for *Phytophthora cinnamomi* remains a high priority so as to reduce the further spread of disease. In June 2003, the garden symphilid (*Scutigerella immaculata*) was detected in an asparagus crop in South Gippsland. This is the first record of this pest occurring in Victoria, although there is an unconfirmed record of this pest from New South Wales in 1982. It is reported to affect coniferous seedlings in nurseries in the USA. No reports from *P. radiata* nurseries have been recorded and surveys for this pest will be undertaken during spring 2003.

South Australia: Minor damage by *Essigella californica* occurred in one nursery in the Green Triangle Region. The area was sprayed with a garlic solution which seemed to work well!

3.2. Eucalyptus species

New South Wales: No significant problems.

Victoria: No reports of damage due to pathogens were recorded in 2002/2003.

*Tasmania:*Two surveys of Forestry Tasmania's nursery were conducted during the past year. The only problem recorded was widespread leaf damage (distortion of lower expanded leaves) on *E. nitens* seedlings caused by an unnamed species of mite. Several applications of miticide were done to control the problem.

4. NATIVE PLANT COMMUNITIES

Queensland: Tree decline within the Mary Cairncross Scenic Reserve, a remnant rainforest patch in the Sunshine Coast Hinterland, was recently investigated. *Phellinus noxius* was found to be widespread within the reserve killing a number of different tree species of various sizes and ages. The spread of the pathogen was determined as being from spore movement and direct root to root contact with some disease patches consisting of 20 or more trees showing various stages of tree decline. The other major fungal species associated with tree decline was *Ganoderma* sp. cf. *lucidum*.

Phellinus noxius was also found to be having a significant impact within a number of shire and city council regions. This included the Byron Bay reserve (The Pass), Gold Coast City Council, Caloundra City Council and Brisbane City Council.

Phellinus noxius has also been found to be impacting on the Avocado industry in the Atherton Tablelands in North Queensland. Incidence and severity are soon to be investigated with a potential for testing the effectiveness of chemical control.

Victoria:
Didymuria violescens (Spurlegged Phasmatid): The phasmatid egg surveys in north-east Victoria during spring 2002 indicated *Didymuria violescens* defoliation patterns during the 2002/03 summer were expected to mirror those observed during the 2000/01 summer period (Figure 4). The sporadic distribution of 'critical' samples (> 4 viable developed eggs) throughout the area indicated that the pattern of defoliation was expected to correspond to that observed during summer 2000/2001, with small areas of localised severe defoliation spread amongst areas of healthy unaffected forest. These results complemented eggs surveys conducted by State Forests of New South Wales at two sites in south-east New South Wales using identical methodology over the same period. However, the intervening effects of both the wildfires of early 2003 in north-east Victoria and drought have significantly reduced the survivorship of eggs, nymphs and adult phasmatids. This impact was greatest where extensive areas of mixed species and *E. delegatensis* forest were burnt by wildfire. It is anticipated that the wildfires will have caused significant mortality of the summer 2002/03 nymphal and adult populations, which will in turn reduce the potential for breeding and egg laying. While already hatched and developing phasmatid populations during late 2002 may have survived in areas where the fire was either less intense, absent or restricted to the removal of the litter layer only, subsequent populations are unlikely to survive in large numbers as phasmatid eggs require deep, well structured litter for the concealment and protection of eggs from desiccation and surface predators. Consequently, it is expected that there will be a high level of 'natural' control of the phasmatid population as a result of the wildfires throughout much of north-east Victoria, with large populations unlikely to return in these areas until the litter layer progressively becomes more favourable to egg development. While the overlaying effects of drought are anticipated to be subtler and may result in some reduction of phasmatid population levels, it is possible that areas unaffected by wildfire will still incur localised severe levels of defoliation.

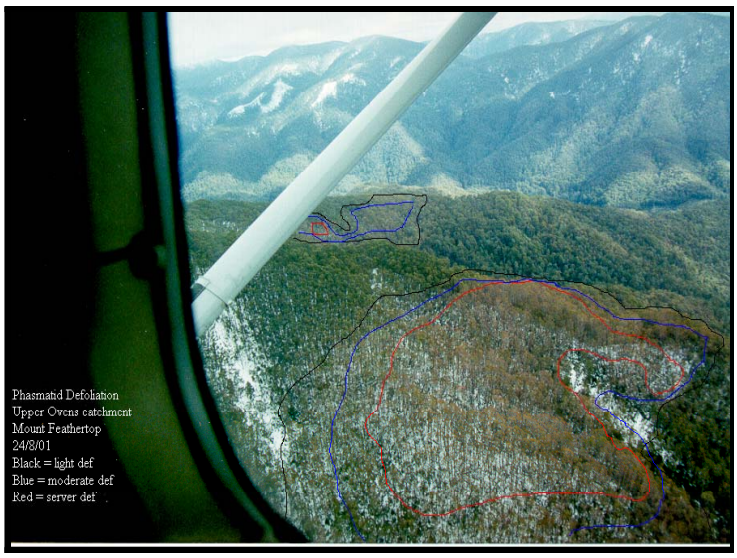


Figure 4. Phasmatid defoliation in *Eucalyptus delegatensis*, north east Victoria 2001-2002.

During May 2002, a report was received of *Eucalyptus delegatensis* being subjected to significant defoliation on the Nunniong Plateau in north-east Victoria (Figure 5). Specimens of the defoliating insect were collected by district staff and subsequently identified as *Chrysophtharta agricola* (Chapuis), (Order Coleoptera, Family Chrysomelidae). Subsequent surveys were conducted in early October 2002 and late March 2003 with results indicating that *C. agricola* populations most probably increased over the 2000/2001 summer and reached peak levels in the 2001/2002 summer by which time the defoliation damage had become more visually apparent. Both visual crown assessment and digital canopy cover analysis identified a decline in defoliation and a corresponding recovery in canopy cover over the 2002/2003 summer following the 2001/2002 peak defoliation period. As no monitoring plots nor their surrounding vicinity were affected by the wildfires that swept through the region in January/February 2003, this decline in defoliation is likely due to a combination of conditions affecting chrysomelid populations including adverse climatic and habitat related factors. Given this decline in chrysomelid activity, it is anticipated that in the absence of conditions that promote chrysomelid population development, tree crowns should recover. Survey results also suggest these observed defoliation trends are consistent with the 'normal' cycle of peaks and troughs associated with native insect population activity in native forest ecosystems.

Figure 5. Canopy image of *Eucalyptus delegatensis* defoliated by *Chrysophtharta agricola*, north east Victoria, 2002.

Cardiaspina retator (Red gum basket lerp): Infestations of *E. camaldulensis* by the Red gum basket lerp *Cardiaspina retator* have been observed in northern Victoria alongside roads and riverbanks, with damage most evident during early to mid summer 2002-2003. While defoliation had been severe in certain localities, by the following autumn, trees had generally made a full recovery.

Few diseases were reported from native forest communities during 2002/2003. Dry conditions in Victoria have resulted in less disease attributed to *Phytophthora cinnamomi*,

although advancing fronts continue to expand in areas such as the Brisbane Ranges. A monitoring program for Myrtle Wilt in Myrtle Beech stands has shown little change in disease status over the previous 12 months.

Western Australia:
Eucalyptus wandoo:
A Wandoo Response Group has been set up to prepare strategies and actions to conserve wandoo and other woodlands in the Wheatbelt. A preliminary investigation into the causes of Wandoo decline found no clear cause. CALM and the University of Western Australia had been awarded $125,000 through the Australian Research Council's Linkage Grants Program to study the health of wandoo woodlands. CALM is also providing a further $45,000 to the three-year program as well as in-kind contributions totalling more than $190,000. Other studies by UWA also are investigating the role of disease factors in the decline of wandoo.

Eucalyptus gomphocephala:
In November 2002, the Tuart Response Group released a tuart conservation and protection status report. The Department of Conservation and Land Management, Murdoch University, Edith Cowan University and Alcoa World Alumina Australia have been granted $258,000 over the next three years through the Australian Research Council's Competitive Linkage Grants Program for further scientific research.

Phytophthora root rot disease
Nineteen sites covering a total of 172 ha were aerially sprayed with phosphite in 2003, comprising 150 ha in Stirling Range National Park and on coastal reserves near Albany (South Coast region) and 22 ha on nature reserves and in State forest south of Busselton (South West Region). Ten critically endangered, three endangered and one vulnerable species susceptible to *Phytophthora* root rot disease were treated with phosphite in the South Coast Region and one critically endangered and two endangered, susceptible, taxa near Busselton. Some sites only received a single spray because of inclement weather during the second spraying period and these will be treated again at a later date. All sites in the Stirling range burnt in the 2000 wildfires were sprayed at only half the normal rate because the target species were still very small. The effects of the October 2000 wildfires continue to be evident in populations of several endangered plant species in the Stirling Range National Park. Regeneration is very poor in such species as the critically endangered *Dryandra Montana*.

Monitoring of a canker disease in a small population of the endangered *Eucalyptus phylacis* south of Busselton continues. Preliminary identification of putative causal organisms isolated from cankers includes *Botryosphaeria* spp, *Cytospora* and *Endothiella* like fungi (P. Scott, MU, R. Robinson, DCLM).

5. URBAN AND RURAL

New South Wales: An unidentified species of Thermastocoridae (tru bug) continues to cause significant damage to street trees (mainly narrow leafed peppermints) in Sydney, with greater than 50% foliar daamage and dieback.

Victoria: A *Phytophthora* species was recorded from dying *Alnus glutinosa* (Alder) in Melbourne in autumn 2003. DNA sequence data would suggest that this is a new species to science. Pathogenicity trials are being carried out to assess the threat this new species may pose to amenity trees, horticulture and forestry. Preliminary screening suggest that it is much less pathogenic than the already established *Phytophthora cinnamomi*.

New records for Victoria of Fusarium Wilt were made in December 2002 from dying Canary Island Date Palms in Melbourne and Geelong. Only two trees have been confirmed to have the pathogen *Fusarium oxysporum fsp canarensis*. Trees containing the pathogen have been removed and destroyed and a survey program initiated to determine the extent of the pathogen.

Mundulla Yellows symptoms were recorded from street, garden and parkland eucalypt trees from Lara and several other locations within the City of Greater Geelong. Investigations into the cause of the 'disease' is being undertaken by a multi-disciplinary team drawn from the Department of Primary Industries and Department of Sustainability and Environment through funding by Environment Australia and South Australia Department of Environment and Heritage.

Cypress canker continued to be identified from dieback of Cypress (Cupressus) shelterbelts from several locations in Victoria.

The City of Melbourne continued to support surveys for Dutch Elm Disease in the main gardens and boulevards under their management. Symptoms resembling DED were attributed to ringbarking of branches by possums and elm bark beetles. The fungus could not be isolated from wood of any trees exhibiting flagging due to beetles.

Further reports have continued within parks and gardens across Melbourne of the exotic Velvet Top Fungus (*Phaeolus schweinitzii*) associated with dieback and brown rot in dying mature pine trees.

Tasmania: Numerous reports of severely damage urban eucalypts in central and southern Tasmania were received.

Elm leaf beetle (*Pyrrhalta luteola*) was detected in February 2003 for the first time in Tasmania on park trees in Launceston. Surveys were conducted by Launceston Council and Department of Primary Industries, Water and Environment to map the area affected. The beetle was found on 200 trees but was causing only minor damage and no control was undertaken this year.

Numerous reports of mortality associated with heavy infestations of *Eriococcus coriaceous*

in drought-affected trees in home gardens and farm woodlots in the Hobart and Huon area.

At Carlton River (Derwent estuary) 40% of a 10-year-old *E. regnans* woodlot were killed by *Phoracantha mastersi*.

Mundulla Yellows continues to develop on urban trees in the Hobart area. *E. sideroxylon* remains the most severely affected species.

Western Australia: Cape Lilac (White Cedar): The White Cedar Moth (*Leptocneria reducta*) outbreak reappeared in many areas of suburban Perth. Reports were made to CALM from concerned members of the general public. Monitoring of the occurrence of Mundulla Yellows (MY) has continued. Symptomatic eucalypts (both planted trees and remnant native trees) have been observed in several additional locations north of Perth (to Geraldton), in the Esperance area on the south coast, and inland in the Wheatbelt region. Tests of foliar samples for "MY-RNA" (by D.Hanold, The University of Adelaide) gave positive results. As in South Australia, MY is only seen in vegetation in disturbed sites or modified landscapes such as road verges and medians, parks and gardens, and in parkland or paddock remnant stands. Symptoms have not been observed within undisturbed native forest or woodland stands in WA.

6. QUARANTINE

New South Wales:

Victoria: See section on pine wilt nematode

Tasmania: Monitoring of five seaports and Hobart Airport between October and March did not detect Asian gypsy moth. Static trapping at Hobart Airport and the Port of Launceston at Bell Bay is being done for 12 months commencing in October 2002. To date all known exotic wood boring beetles and Sirex wood wasp have been captured in the traps. Two species of wood boring beetles could not be identified as either native or known exotic species and have been sent to the American Museum of Natural History for further examination.

Queensland:
Red Imported Fire Ant (*Solenopsis invicta*): Two years of the five-year eradication program for this exotic pest have been completed. The insect is still found in just two main foci in Brisbane although the boundaries of these foci have expanded as surveillance has proceeded, particularly the Western boundary which now borders rural areas near Ipswich. The global treatment area including outliers is 53375 hectares (up from 27807 hectares at June 2001). Most sites in the Treatment Zone have received 7-8 applications of insect growth regulator and toxicant. The treatments have been very successful, particularly in the Eastern zone where no viable nests were found in recent surveys. Under the original plan there will be another four rounds of treatment in 2003-04 followed by two years of surveillance. Of main concern for the program is that the boundaries of the infestation have yet to be conclusively delineated.

West Indian Drywood Termite (*Cryptotermes brevis*): Since June 2002, eight houses and one building in Brisbane, and one building in Maryborough, were fumigated to eradicate infestations of this pest. A small infestation occurring in the Maryborough Court House was spot treated with insecticide prior to the flight season in November.

7. FOREST HEALTH SURVEILLANCE AND DIAGNOSIS

Victoria: *Lymantria dispar (Asian Gypsy Moth):* Monitoring of the ports of Melbourne, Geelong and Westernport continued for the Asian Gypsy Moth over summer 2002/03 as part of a nationwide monitoring program. As a result of the trapping of a gypsy moth in New Zealand, additional traps and lures were also ordered and placed on standby should the moth also be subsequently located in Australia. No gypsy moth were detected during the survey. A new trap with replaceable sticky card inserts was used in place of the disposable Delta traps used in previous years. Field reports indicated the traps were easy to set up and use although no preference was displayed for one trap type over the other. In January 2003, a resident in suburban Melbourne reported a moth resembling an Asian Gypsy Moth on trees outside their business premises in Glen Waverley. Follow up surveys and placement of traps in the surrounding area yielded no evidence of gypsy moth present.

Phorocantha semipunctata (Eucalypt Longicorn Beetle): As part of the pine nematode-monitoring program, billets of *Pinus radiata* from selected trees were placed in cages to trap emerging insects in an attempt to locate a potential vector of the nematode. As part of this program, along with the recently detected new introduction *Arophalus rusticus* being identified, specimens of the beetle species *Phorocantha semipunctata* were found emerging from a small number of *P. radiata* billets. This is the first record in Victoria of this native insect species occurring in *P. radiata*.

South Australia: Flights to detect *Sirex* (and other deaths in pines) are routinely carried out each year. No other formal surveillance work is done. Any reports of presence of insects or damage are sent to the Forest Health Scientist for investigation. There is good cooperation between all 3 major forest growers in the Green triangle Region (ForestrySA, Auspine and Green Triangle Forest Products). A Regional Forest Health Group (RFHG) has been set up – initially for these companies to discuss *Sirex* activity and coordinate responses but it has now broadened to include all forest health issues.

Western Australia: Dieback mapping: In the period July 2002 to June 2003, CALM Forest Management Branch mapped the presence of *Phytophthora cinnamomi* disease symptoms and defined protectable areas on almost 31,800 ha of native forest. Approximately 8,300 ha of previously mapped forest was rechecked. A variety of disease mapping and inspections were carried out for other government agencies and private companies or individuals.

Between July 2002 and June 2003, a total of 1,205 samples were processed for *Phytophthora* identification by CALM's Vegetation Health Service (VHS). *P.cinnamomi* was detected in 470 samples, *P.citricola* (85), *P.cryptogea* (4), and *Phytophthora* sp. (2).

A new, as yet unnamed, *Phytophthora* species has been isolated from soil samples from two distinct locations in the south-west of the state. A small number of other tree health and nursery problems were investigated. (M.Stukely, DCLM).

Department of Conservation and Land Management Forest Insect Collection
The databasing of the CALM Terrestrial Insect Collection has progressed during 2002-2003. Since July 2001 over 16 000 specimens have been databased. This constitutes approximately 98% of the collection. (T. Burbidge)

8. RESEARCH AND DEVELOPMENT

New South Wales:

Tasmania:
Chrysophtharta spp.:
A trial was conducted to compare the impact on populations of leaf beetles and of non-target insects in *E. nitens* plantations that were aerially sprayed with either Dominex® (∝-cypermethrin) or Success® (spinosad). Both insecticides gave adequate control of leaf beetle larvae (91 and 83% mortality for Dominex and Success respectively). Plantations that were sprayed with Success retained populations of non-target insects at levels comparable with unsprayed plantations. However, in plantations sprayed with Dominex the populations of non-target insects dropped to less than half of the levels recorded in the plantations sprayed with Success and unsprayed plantations. Despite the differences in impact to non-target insects, plantations sprayed with Success were recolonised by leaf beetles from surrounding areas just as quickly as plantations sprayed with Dominex.

Mycosphaerella leaf blight (MLB):
A fungicide exclusion trial was established in a 2001 *E. globulus* plantation near Smithton and maintained throughout the year. The drier conditions in 2002-3 resulted in low infection levels with the result that differences between protected and unprotected trees were small (although significant). This trial will be protected again in 2003-4 by applying fungicides with a tractor mounted boom spray. Permanent growth plots were established in adjacent *E. globulus* plantations with contrasting histories of MLB. One plantation (planted in 1999) escaped significant damage while the other (planted in 2000) suffered severe defoliation over a prolonged period during the 2001-2 MLB epidemic. Measurements of height and diameter obtained to date indicate that the severe MLB suffered by the 2000 plantation has retarded growth by at least one year.

A trial has been established to evaluate the use of fertilisers (N & P) as a way of preventing chronic injury following severe defoliation during MLB epidemics. This idea is based on visual and measured differences in response to MLB of trees planted in windrows (nutrients not limiting) compared with trees planted in intervening bays (nutrient limiting). Measurements of height and diameter growth of trees along a gradient of MLB severity

have indicated that the growth of trees planted in windrows was unaffected by MLB. By comparison trees planted in the bays suffered substantial losses in both height and diameter with increasing disease severity. There were corresponding visual differences in the response of windrow and bay trees to MLB. Both suffered top-down defoliation during the initial period of infection at the start of the MLB epidemic (winter 2001). However, as the epidemic extended into spring and early summer the older leaves of the inner crown were prematurely shed in the trees planted in bays resulting in almost complete (>90%) defoliation. Trees planted in the windrows did not experience this premature senescence of older leaves during the latter period of the epidemic.

Port surveillance:
The efficacy of various trap designs and lure combinations to capture bark beetles are being tested at two Tasmanian ports. This is part of a project to design and cost an efficient port surveillance system. The static trapping at the two ports is being run for a full year (September 2002 – September 2003). To complement the static trapping, blitz surveys were done at both ports during summer 2003. As part of this project Dick Bashford travelled to USA and Canada on a Gottstein Fellowship to inspect deployment of static traps within port environs and to refine trap designs and lure combinations with one of the main trap manufacturers.

South Australia:

Western Australia:
Eucalyptus plantations
Work under the following grants is in progress at Murdoch University.
SPIRT Large. 2000-2003 at $200, 000 (Industry Partner-Integrated Treecropping). *Mycosphaerella* leaf blights and other pathogens in *Eucalyptus globulus* plantations and interactions with tree nutrient status. (A/Prof. Bernie Dell, MU, Dr. Giles Hardy, MU and Postdoctoral Fellow Dr. Heike Neumister-Kemp).

Small ARC: Botryosphaeria endophytes in Eucalyptus globulus plantations (T. Burgess, G. Hardy and B. Dell, MU)

Collaborative Project - Murdoch University and the Tree Pathology Cooperative Program (Sth Africa). 'New and emerging pathogens threatening the biodiversity of Australia's eucalypts'. This project is concentrating on some of the major eucalypt pathogens worldwide, (Phaeophleospora spp. Mycosphaerella spp., Botryosphaeria spp. Cryphonectria spp.) with the aim of determining their origin, movement and the risk they pose to Australia's eucalypts. (T. Burgess, MU, M. Wingfield, TPCP).

PhD Theses in progress at Murdoch University:
Mycosphaerella leaf pathogens in Eucalyptus globulus. (Aaron Maxwell; Supervisors, B. Dell and G. Hardy, MU). Funded by ARC SPIRT

Canker diseases in Eucalyptus globulus. (Tania Jackson; Supervisors, G. Hardy and B. Dell, MU).

Paulownia Plantations
Honours Theses
The biology and pathology of Alternaria leaf blights in Paulownia plantations in Western Australia. (Jane Rae, Supervisors T. Burgess and G. Hardy, MU)

The interaction of plant nutrition with severity and incidence of Alternaria leaf blights in Paulownia Plantations. (Harley Barron, Supervisors B. Dell and G. Hardy, MU)

Managed natural forests
Canker fungi associated with deaths of Corymbia calophylla (marri) (Trudy Paap; Supervisors: G. Hardy, MU, Bryan Shearer, CALM and Jen McComb, MU). Part funded by Forest and Wood Products Scholarship.

Dieback-resistant jarrah (Eucalyptus marginata): Planting of a production seed orchard of dieback resistant jarrah clones continued at the Forests Products Commission's Plant Propagation Centre near Manjimup. Field trials of jarrah clones selected for resistance to Phytophthora cinnamomi have continued, and trials of site preparation procedures for re-establishment of jarrah in dieback "graveyard" sites have commenced. (M.Stukely, DCLM).

Work under the following grants is in progress at Murdoch University.
SPIRT Large. 2000-2003 at $300,000 (Industry partners CALM, Alcoa, Worsley Alumina, CSIRO). Will Phytophthora cinnamomi become resistant to the fungicide phosphite? Its implications. (This study examines plant and fungal interactions at a genetic level). (Investigators: Giles Hardy-MU, Inez Tommerup-CSIRO, Phil O'Brien,-MU, Bryan Shearer-CALM, Ian Colquhoun-Alcoa World Alumina, Postdoctoral Fellow Mark Dobrowolski).

Linkage ARC Large. Industry Partners Alcoa World Alumina, Worsley Alumina and Department of Conservation and Land Management. The ability of the fungicide phosphite to stop the autonomous spread of Phytophthora cinnamomi in the Eucalyptus marginata forest. Post-doctoral fellow: Bill Dunstan (Investigators: G. Hardy, B. Dell, M. Calver, J. McComb, MU I. Colquhoun, Alcoa World Alumina and B. Shearer, CALM)

Postdoctoral Fellowship. Australia's vertebrate biodiversity and ecosystem health: assessing the role of vertebrates in healthy and diseased ecosystems in southern Australia (Dr. Mark Garkakalis, Postdoc Fellow. Investigators: Giles Hardy, Bernie Dell, MU and Barbara Wilson, Deakin University).

PhD Theses in progress at Murdoch University
Long term survival of Phytophthora cinnamomi in rehabilitated bauxite mines and adjacent Eucalyptus marginata forest. This project is looking at chlamydospore dormancy and saprophytic growth. (Sarah Collins; Supervisors, G.Hardy, MU and B Shearer, CALM). Funded by ARC LINKAGE

Honours Projects.
Saprophytic ability and long-term survival of Phytophthora cinnamomi in rehabilitated bauxite mines and adjacent jarrah forest. (Kathryn Smith; Supervisors G. Hardy, Jen McComb, MU and I. Colquhoun, Alcoa World Alumina). Funded by ARC LINKAGE

The impact of Phytophthora cinnamomi on different mammal guilds in the Darling Range of Western Australia. (Rodney Armistead; Supervisors M. Garkaklis and G. Hardy, MU).

Karri forest (Eucalyptus diversicolor)
The impact of Armillaria root disease on growth and yield of regrowth karri in a thinning experiment infested with Armillaria luteobubalina (R. Robinson, DCLM).

Native plant communities
Work under the following grants is in progress at Murdoch University.
PhD Theses in progress
Sudden death in cutflower Proteaceae. (Chris Dunne; Supervisors, G.Hardy and B.Dell, MU). Funded by ARC LINKAGE

The biology, ecology, pathology and genetics of Puccinia boroniae (Boronia rust) of in Boronia megastigma, B. heterophylla, B. clavata and hybrids. (Susanna Driessen APAI; Supervisors Giles Hardy and Phil O'Brien, MU) Funded by ARC LINKAGE

Interactions between potential fungal and insect pathogens associated with the decline of Tuart (E. gomphacephala) in Western Australia. (Martin Landolt; Supervisors M. Calver and G. Hardy, MU).

Honours Projects.
Identification of the causal organism associated with stem canker disease in the rare and endangered meelup mallee (Eucalyptus phylacis). (Peter Scott; Supervisors G. Hardy, MU and R. Robinson, DCLM) Funded by BankWest Landscope Conservation Visa Card Trust Fund

<u>CSIRO</u>
Heteronyx elongatus
Larval damage to the roots of seedlings by *H. elongatus*, one of the 'spring' beetles, is widespread in the south coastal region of south-western Australia. Damage is characterised by often complete removal of the potting medium and much of the seedling's roots. A one-year project sponsored by the CRC for Sustainable Production Forestry commenced in April 2002 to define the seasonal phenology of *H. elongatus* and to assess a range of methods for protecting seedlings.

H. elongatus emerges in late spring to early summer and disperses from its pasture breeding sites. Small numbers of gravid females are found in pasture during summer, and it appears as though a small, rapidly-developing summer generation occurs. The main larval generation occurs over a prolonged period from autumn to spring. Larvae are in a late stage of development and feeding actively around the time blue gums are planted in

mid-winter; consequently damage is rapid in its onset and immediately severe. Damage often leads to death of the seedling, necessitating costly replanting.

Very small doses of insecticide applied as a liquid drench localised at the seedling are 100% effective in preventing damage. A significant bonus is that inexpensive, generic non-translocated insecticide chlorpyrifos is similar in effectiveness to the far more expensive proprietary partially-systemic insecticide imidacloprid. The very small doses and highly-targetted use of insecticide, used only once in the production cycle, meets IPM ideals and has the significant bonus of being totally and reliably effective rather than a complex, costly or compromise strategy that is often the case.

Further trials to refine doses of insecticide and volume of carrier and confirm the robustness of the method are needed, with the objective of meeting requirements for obtaining registration or permit. This is properly the responsibility of insecticide manufacturing companies or the timber production company users. However, as is so often the case, there is considered to be little financial advantage for chemical companies in undertaking costly registration for a generic product in a small market. Hence the reality is that a simple, inexpensive, highly effective control for *H. elongatus*, will very likely lapse through lack of singular or collective will to complete the legalities.

Diseases
Summarised are selected forest pathology projects, consultancies, or extension publications, of relevance to Australia, all representing collaborative activities with either local or overseas organisations, where CSIRO staff in Hobart, Perth, Melbourne or Canberra have significant input. The names of principal CSIRO contacts have been placed in parentheses.

Quarantine and national preparedness
Guava rust, eucalypt rust (Puccinia psidii)
A collaborative project between CSIRO Australia; Federal University of Viçosa, Brazil; and FABI, University of Pretoria, South Africa has been undertaken with ACIAR support for the past three years. The aims are to screen a wide range of eucalypts and other Myrtaceae for their susceptibility to guava rust, develop disease hazard maps for South America, Australia and other regions at risk; and to develop a molecular diagnostic probe for the rapid identification and detection of the fungus and for screening germplasm including tissue cultures, pollen, seeds and any vegetative material for presence of the rust.

Progress made in all these areas was reported at the 8th International Congress of Plant Pathology (ICPP 2003) in Christchurch February 2003. A highly specific and sensitive molecular-based detection system for the rust directly in vegetative plant tissue and with seed or pollen has been developed. Rust contamination of commercial pollen has been detected (in Brazil) and shown to be biologically significant. The rust has now been found to affect 10 genera and many species in the screening trials.
(Inez Tommerup, Trevor Booth)

Acacia pests and diseases manual
The booklet, *FAO/IPGRI Technical Guidelines for the Safe Movement of Germplasm No. 20. Acacia spp.* by Ken Old, Rob Floyd, and Tim Vercoe of CSIRO and Mike Wingfield and his South African colleagues at FABI, University of Pretoria has been published by FAO International Plant Genetic Resources Institute (IPGRI) Rome and is available as a PDF download at:
http://www.ipgri.cgiar.org/publications/pubfile+.asp?ID_PUB=829
(Rob Floyd, Tim Vercoe, Mark Dudzinski)

Eucalypt diseases manual
"A Manual of Diseases of Eucalypts in South-East Asia" has been authored by Ken Old (CSIRO), Mike Wingfield (University of Pretoria) and Zi Qing Yuan (University of Tasmania). It covers many diseases relevant to Australia and is targeted for use by field and technical staff. The manual is expected to be published and available from CIFOR, Indonesia, by the end of 2003.
(Mark Dudzinski, Ruth Gibbs)

Pine pitch canker
A molecular-based diagnostic technology for *inplanta* detection of Pine pitch canker (*Fusarium circinatum*) was presented at ICPP 2003, in Christchurch, New Zealand.
(Inez Tommerup)

Dothistroma needle blight
A molecular-based diagnostic technology for *inplanta* detection of Dothistroma needle blight (*Dothistroma septosporum* (syn *D. pini*)), potentially applicable to interstate transfer of pine germplasm within Australia was presented at ICPP 2003 at Christchurch, New Zealand.
(Inez Tommerup)

Foliar diseases of eucalypts
Mycosphaerella spp.
In Tasmania, Caroline Mohammed, holds a joint CSIRO-University of Tasmania appointment and is working with Forestry Tasmania and Industry on assessment of impacts of *Mycosphaerella* spp. on growth and productivity of plantation-grown *E. globulus.* A major field trial has been established in northern Tasmania, which will provide opportunities over the next 3-4 years for studying the epidemiology and impacts of disease coupled with growth modelling and remote assessment techniques. Trees within a plantation infected with *Mycosphaerella* were mapped, scored for tree and disease variables. Certain trees were sampled and reflectance measurements taken for 'end-members" i.e. mature and juvenile leaves with various levels of *Mycosphaerella* infection, apical leaves, stems, older branches, burnt bark from windrow logs, weeds, various coloured soils, rock, and gravel. Digital Multi Spectral Videographic Imagery was acquired during a small plane "flyover" in late summer 2003. Those spectra that can be most effectively used to remotely sense *Mycosphaerella* severity are being identified by matching ground-based data to the imagery.

Mycosphaerella spore release and germination is dependent on certain conditions of leaf wetness. In collaboration with the Sustainable Management Program, CRC for Sustainable Production Forestry, the process based model CABALA has been used to predict canopy wetness. Validation of this use of CABALA is being undertaken by measuring leaf wetness in relation to *Mycosphaerella* spore germination and release. Version 1 risk maps for WA, NSW and TAS/VIC have been created based on the climatic factors known to be favourable to *Mycosphaerella* disease.
(Caroline Mohammed, Nicholas Coops)

Stem quality research
Heart rots and stem defect in plantation hardwoods
Fast-growing hardwood plantations are important to the economies of many Australasian countries, including Indonesia and Australia. Fungal diseases affecting productivity of the plantations include heart rots. A project funded by ACIAR aims to provide an improved basis for management of heart rot disease in *Acacia mangium* plantations. Main collaborators on the project are: In Australia - University of Tasmania, and CSIRO Forestry and Forest Products. In Indonesia - Forest and Nature Conservation Research and Development Centre (FNCRDC) Bogor, and Research and Development Centre for Biotechnology and Forest Tree Improvement (CBFTI) Jogjakarta. Project aims include: (1) Quantification of heart rot incidence in *A. mangium*, to establish the relationship with silvicultural practices. (2) Develop reliable and rapid techniques to characterize fungi causing rot. Fruit bodies of lignicolous fungi were sampled from *A. mangium* plantations in Indonesia. The identity of each fungus was assessed by morphology and DNA techniques. (3) Determine the level of heart rot between different genetic lines of *A. mangium*, (4) Undertake studies on wood properties and defence responses of *A. mangium* including analysis of wood phenols (a major antifungal defence), studying wood anatomy and histochemistry. (5) Technology transfer

A project booklet has been produced: Barry, K. 2002. *Heartrots in Plantation Hardwoods in Indonesia and Australia. ACIAR Technical Reports No. 51e, 40 p.*
Further details are available at the project web site at: http://www.agsci.utas.edu.au/heartrot/index.asp

Related Australian-based components in Tasmania are concerned with pruning wounds in *E. nitens* and *E. globulus* and the biochemistry and histology of wound responses are being investigated.
(Caroline Mohammed, Neale Bougher, Inez Tommerup, Chris Beadle)

NEW ZEALAND

Collated and summarised by J. Bain, L. Bulman, M. Dick, and I. Hood (Forest Research) from data and information from the Forest Research Forest Health Database, *Forest Health News* (Forest Research), the Forest Research Forest Health Reference Laboratories Diagnostic Services, and other Forest Health staff (R. Crabtree, K. Dobbie, J. Gardner, B. Gresham, D. Jones, N. Kay, T. Ramsfield, G. Ridley, T. Withers).

1. PLANTATIONS

1.1 Pinus radiata

1.1.1. Pests

No insect problems of any note were recorded in *P. radiata* plantations. The status of *Essigella californica* continues to be monitored. It is still considered to be an insignificant pest in New Zealand.

1.1.2. Diseases

Dothistroma needle blight

Records of *Dothistroma* needle blight confirmed a substantial increase in disease severity in 2002-03, in comparison with the level reported for 2001-02, which in turn was higher than that in the two previous years. The number of records where severity was greater than 15% increased significantly in the 2002-2003 year (Figure 6). Above average rainfall was experienced in the central North Island (where most of the susceptible *P. radiata* is grown) during the summers of 2000-2001 and 2001-2002. Two consecutive wetter than normal summers and difficulties experienced during the 2001-2002 spray programme contributed to the high infection levels in 2002-2003.

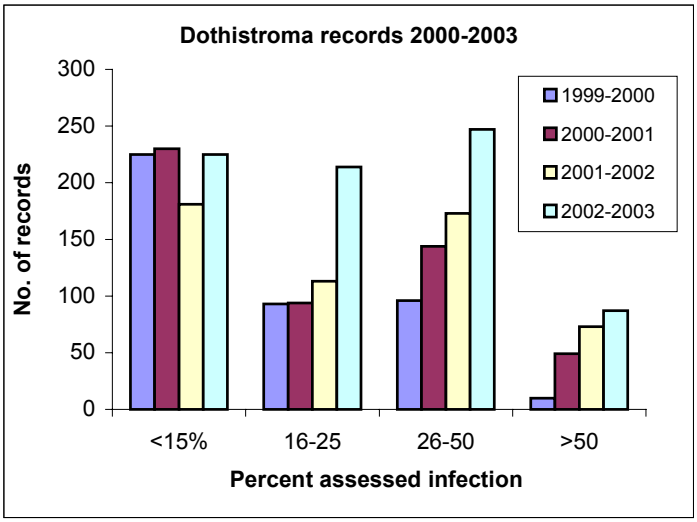


Figure 6. Forest Health Database records of *Dothistroma pini* during the period 1999-2003

The increase in *Dothistroma* infection during 2002-2003 was independently demonstrated by data on the aerial spraying of diseased forests with copper fungicide. An area of 207,549

ha was sprayed during 2002-03, 193,028 ha being in the North Island and the remainder (14,521 ha) in the South Island (figures provided by the Dothistroma Control Committee). This is the largest spray programme ever undertaken, and easily surpasses the 106,451 ha treated in the previous season (cf. 68,000 ha in 2000-2001, 47,000 ha in 1999-2000, and about 90,000 ha in 1998-99). The area sprayed is a separate, but less refined indicator of the annual impact and extent of Dothistroma needle blight throughout the whole country, since it may be influenced by other forces driving company activities (for example: budget constraints, changes in silvicultural practices, increasing area of at-risk age classes due to greater planting in the 1990s).

Cyclaneusma minus

In contrast, the severity of Cyclaneusma needle-cast was again low, as it was in the previous season (Figure 7). Disease severity was less than 15% for approximately 70% of the Cyclaneusma needle-cast records for the 2001-02 year, compared with roughly 50% of the records for the preceding two years. These lower disease levels are attributed to the drought conditions experienced over much of the country during autumn 2001 (see last year's status report). Rainfall in autumn 2002 was less than 75% of normal in Bay of Plenty and Northland, and less than 50% of normal in East Cape (NIWA 2002[1]), regions where traditionally Cyclaneusma is most severe. The main infection period for *Dothistroma* differs from that of *Cyclaneusma*.

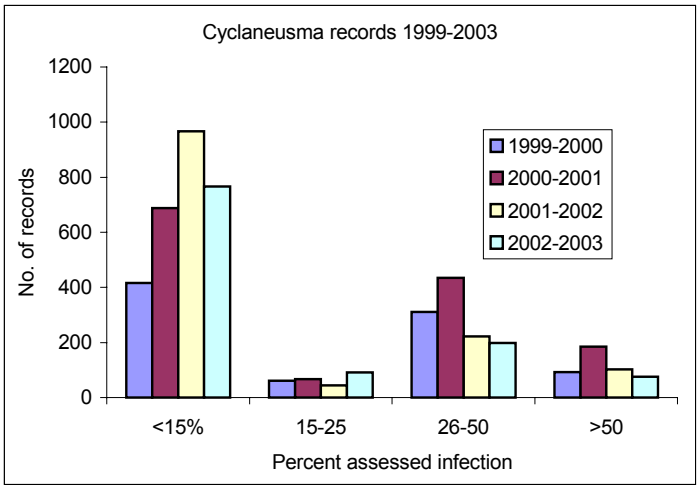


Figure 7. Forest Health Database records of *Cyclaneusma minus* during 1999-2003

Strasseria-*associated defoliation*

In contrast to the spring of 2001, there were instances of the severe spring defoliation associated with *Strasseria* and other needle fungi in spring 2002 (Figure 9), as were recorded in 1995, 1998, and 2000. An aerial survey of Northland showed that approximately 30% of trees older than 15 years had average disease levels of 60%, in affected areas. These were primarily ridges and gully systems at higher altitudes (over 300-400 m asl). June and July rainfall in 2002 at Northland was 150-200% of normal. The

[1] NIWA (2002): Climate Summary for Autumn 2002. http://www.niwa.co.nz/ncc/cs/sclimsum_02_2_autumn

defoliation was also severe in Coromandel, an area where this disorder has rarely been recorded. June and July 2002 rainfall was over 200% and 125% of normal, respectively, in this region. No defoliation was apparent in the East Cape where it was drier than average in June and July.

Figure 8. Severe defoliation caused by an increase in *Dothistroma septosporum* infection after two consecutive wet summers (taken late 2002).

Figure 9. *Strasseria*-associated defoliation in a stand of radiata pine. Incidence is higher in gullies and adjoining slopes

Nectria fuckeliana

Stem malformation was reported in the 2001-02 Pest and Disease Status Report as due to infection by the pruned stub invader, *Bionectria aureofulva*. Examination of fungal isolates and herbarium material have since been carried out by world experts in the Nectriaceae, resulting in an overturning of the original identification. The causal fungus is *Nectria fuckeliana*, a northern hemisphere wound invader of spruce and fir. Pine hosts have occasionally been reported but these records are scarce and several are of artificial inoculation studies. Identification has been confirmed using DNA analysis. A number of forests in the southern part of New Zealand now report low-to-moderate levels of severe stem malformation associated with infection by *N. fuckeliana*. In a very few cases, infection of unpruned trees has apparently occurred in the absence of visible injury.

Sphaeropsis sapinea

Sphaeropsis sapinea was frequently associated with shoot, branch and leader dieback of *Pinus radiata* throughout the country. Physical injury caused by birds and animals, and by environmental agents (wind, hail, snow and frost) often provided an entry point for the fungus and contributed to these disorders. Other fungi less commonly associated with such dieback included *Sclerophoma pityophila, Phomopsis* spp. and *Botryosphaeria* spp. There have been regular reports of low levels of these disorders but no significant outbreaks. In periods of drought the incidence of whorl canker (pruned stub infection) and crown wilt caused by *S. sapinea* generally increases but in the 2002-03 year there were few reports, even from some areas such as Taranaki that sustained quite serious drought conditions.

Armillaria root disease
Armillaria root disease remains widespread at variable incidence in generally non-lethal form in many pine plantations through much of the country. Economic loss from past infection on previously indigenous forest sites remains substantial in current harvests. Significant impact will continue if the disease spreads into new stands by means of basidiospores. This is being investigated in a new research programme, which is also studying methods of control and management.

Phaeolus schweinitzii
The Northern Hemisphere wood decay fungus, *Phaeolus schweinitzii*[2], was recently found on the roots of a mature, healthy-looking *P. radiata* tree in a park in Auckland, indicating that this species now has a wide distribution within this country. The fungus was first recorded in New Zealand in 1995 when bracket-shaped fruitbodies were collected from decayed wood at the base of mature live *Pinus radiata* trees in a city park in Invercargill. *Phaeolus schweinitzii* was found again in 2002, also on *P. radiata*, by a forest owner near Lawrence in southern Otago.

1.2. Douglas fir (Pseudotsuga menziesii)
1.2.1. Diseases
Phaeocryptopus gaeumannii Swiss needle cast disease
Swiss needle cast disease (*Phaeocryptopus gaeumannii*) was again recorded throughout New Zealand and remains the most significant disease of Douglas fir.

1.3. *Eucalyptus* spp.
1.3.1. Pests
Psyllids
Creiis lituratus, which was found in New Zealand in June 2002, is still confined to urban Auckland. It has been recorded from *Eucalyptus botryoides*, *E. grandis* and *E. saligna.*

Leaf beetles
Between September 2002 and April 2003 *Paropsis charybdis* populations and the associated parasitoid guild were monitored in the central North Island. In the first few months *Enogerra nassaui* parasitised up to 50% of *P. charybdis* eggs. However by December *Baeoanusia albifunicle* (a hyperparasitoid) was present in the samples and was effectively reducing the *P. charybdis* parasitism rate to about 10%. These observations have confirmed that by reducing the *Enoggera* populations, *B. albifunicle* checks its efficacy as a biological control agent of *P. charybdis*, especially late in the season when it used to account for up to 90% parasitism of second generation eggs.

Last year it was reported that another self introduced parasitoid of *P. charybdis* had been found in New Zealand, which has been identified as *Neopolycytus insectifurax*. This species was deliberately introduced into New Zealand in the late 1980s but apparently failed to establish at that time. *N. insectifurax* was detected in the sampling sites only

[2]Not to be confused with the indigenous species *P. schweinitzii* (synonym, *Coltricia schweinitzii* sensu G.H. Cunningham), found naturally as a wood decay fungus of *Agathis australis*, which requires formal renaming.

sporadically in December but parasitism rates increased steadily as the season progressed. At one site parasitism rates of 80% were recorded. Some rearing and inundative release of *N. insectifurax* was undertaken in 2002-2003, and it is planned to continue this procedure over the summer of 2003-2004.

Uraba lugens

Uraba lugens, which was first found in New Zealand in 1997 at Mount Maunganui and then in Auckland in 2001, is now widespread in the latter locality and some sites have very large populations. It is thought to have been eradicated from Mt Maunganui as it has not been found there since early 2001. *U. lugens* is now the subject of a containment strategy in Auckland and its spread is being monitored using pheromone traps, the pheromone having been identified by HortResearch. Plans are underway to initiate a biological control programme involving the importation of one or more parasitoids from Australia. For more information see:
http://www.maf.govt.nz/biosecurity/pests-diseases/forests/gum-leaf-skeletoniser/index.htm

1.3.2. Diseases

Aulographina eucalypti

Aulographina eucalypti has caused heavy leaf spotting and, in some instances, associated defoliation of *Eucalyptus delegatensis*, *E. regnans* and *E. fastigata* in a number of North Island and northern South Island locations.

Phaeophleospora and Mycosphaerella leaf diseases

Defoliation of *Eucalyptus nitens* caused by a combination of *Phaeophleospora eucalypti* and, to a less severe extent *Mycosphaerella cryptica*, continues to be a serious problem in many central North Island plantations.

Fairmaniella leprosa

Fairmaniella leprosa has been recorded in New Zealand for over 20 years, often fruiting on the same leaf spots as *Aulographina eucalypti*, and for most of that time has been considered to be a weak pathogen and of no significance. In the past few years the number of records has markedly increased along with the number of known hosts, and it has become less common to find it with *A. eucalypti*. Although no pathogenicity testing has been carried out the consistent association of the fungus with characteristic lesions indicates that *F. leprosa* is a successful pathogen under appropriate conditions.

1.4. Cypresses

Cypress canker (Seiridium* sp.*)

Cypress canker disease caused by species of *Seiridium* continues to affect many plantations and woodlots of cypresses, particularly *Cupressus macrocarpa*. A mass inoculation programme conducted over the 2002-03 summer in order to select for possible disease resistance revealed a number of promising *C. macrocarpa* clones, and these will be subjected to further testing over the coming summer.

2. NATIVE FORESTS

An unusual new fungus was recorded on the indigenous *Pittosporum tenuifolium* in a Wellington gully. Galls on twigs and small branches were caused by an undescribed species of *Elsinoe.* This is the first record of an *Elsinoe* sp. on *Pittosporum* and it is possible that it represents a previously unrecognised native fungus. Only one *Elsinoe* species native to New Zealand has previously been recognised. *Elsinoe dracophylli* was described on *Dracophyllum* in 1994.

Increasing interest in the health of amenity forests, forested water catchments and plantation forest certification has led to the Tree Health Evaluation Package (THE Package™), specifically for monitoring the health of indigenous forests. The methodology focuses on crown condition, regeneration, animal damage and weed invasion, using circular tree centred permanent sampling plots. THE Package is delivered by Forest Research's Vigil group in partnership with Hosking Forestry, and is designed to deliver cost-effective monitoring of forest health change over time for extensive indigenous forest.

3. BIOSECURITY

Pre-border (preparedness)

Pine pitch canker

A Forest Owners' Association (FOA)/Ministry of Agriculture and Forestry (MAF) workshop on pine pitch canker was held in Rotorua in February 2003 with Australia represented by CSIRO forest geneticist Colin Matheson. The objective of the workshop was to identify any significant gaps in the present knowledge and risk management framework that could be limiting our ability to understand and deal with the pine pitch canker threat.

The prospect of introducing cone and seed insects as a potential biocontrol agent for pine weeds (such as *P. contort*a) was discussed at a recent workshop on wilding pine management held in Christchurch, in association with the New Zealand Plant Protection Society annual conference. The contribution that such insects might make to the dissemination of disease propagules was discussed at length, particularly in relation to spores of the pine pitch canker agent, *Fusarium circinatum*, should it become established in Australasia. The perceived threat was sufficient to relegate the proposal to the backburner and other solutions for pine control are to be promoted.

Western gall rust

Endocronartium harknessii is readily identified from the form and germination pattern of its powdery spores, but these are not produced on galls until at least two years after infection, and then only in season. Therefore to facilitate early detection, a molecular protocol is being developed using a species-specific marker, in association with the Institute of Forest Genetics, USDA Forest Service. The early stages of this project involved the extraction of DNA from rust aeciospores collected in British Columbia and a PCR based assay is being developed. To date, the test is able to differentiate *E. harknessii* from *Cronartium coleosporioides* and *C. comandrae*. Ongoing research is now underway to differentiate *E. harknessii* from *C. quercuum* f.sp. *fusiforme*.

Border interceptions

A live adult male citrus longhorn beetle (*Anoplophora chinensis* form *malasiaca*) was found outside a warehouse in Tauranga in July, 2003. In subsequent follow up inspections by MAF, a range of exotic organisms was collected from five wooden reels of wire rope from China. These included a cast larval skin of the citrus longhorn beetle, an adult and larvae of the thin-winged longhorn beetle (*Megopis sinica*), a number of darkling beetles (*Plesiophthalmus* sp.), and various live fungi. Longhorn beetle frass and workings were present in all five reels, the damage on two of them being recent. Similar damage with no exit holes was found in three more wooden reels from the same consignment in Auckland and Nelson, and two other reels were being traced. All reels found were fumigated or incinerated. Inquiries revealed that the wooden reels had not been treated at the border because there was no indication of a need for biosecurity clearance, since they had not been declared in the importing manifest. This was being followed up by MAF.

Post-border (eradication)

Dutch elm disease

The eradication campaign for Dutch elm disease continues in Auckland, and is being coordinated and funded by MAF supported by the local city councils. The programme for 2002-2003 consisted of three disease detection surveys, which began in late November, 2002. In addition, pheromone trapping for the vector, *Scolytus multistriatus*, was reinstated this season after being discontinued in the 1999-2000 season. Ten infected elms were found and destroyed at three locations as a result of the disease detection surveys. A very high number of beetles carrying *Ophiostoma novo-ulmi* were trapped at a fourth locality, Waikumete Cemetery in west Auckland. This triggered a targeted survey of the surrounding area, and the primary source was found to be a dead elm tree from which beetles had emerged. The discovery of this tree, which had been repeatedly missed during the disease detection surveys, highlights the value of the trapping programme. By the end of the season 3,521 beetles had been caught, of which 2.2% were contaminated by *O. novo-ulmi*. This is the highest percentage recorded in the history of the programme in New Zealand (the previous highest was 1.3% in the first season of trap deployment 1990-91). The great majority (95%) of infective beetles were trapped at Waikumete. The eradication campaign will continue in the 2003-2004 season. For further information see:
http://www.maf.govt.nz/biosecurity/pests-diseases/forests/dutch-elm-disease/index.htm

Fall webworm

In March 2003 a member of the public in Mount Wellington, Auckland called MAF about a hairy caterpillar they suspected might be painted apple moth. An immediate search in the area found a "web" in a *Liquidambar styraciflua* containing a further 15 caterpillars on a neighbouring property. The caterpillars were identified as those of the fall web worm, *Hyphantria cunea*. *Hyphantria cunea* is a North American species that is also present in Europe and Asia as an introduced species. It is extremely polyphagous; common hosts include *Prunus, Morus, Populus, Salix, Betula, Diospyros* and *Liquidambar.* Extensive ground searches have revealed no further signs of the insect and pheromone traps have caught no male moths. Monitoring will be continued over the 2003-2004 season. For further details see:

http://www.maf.govt.nz/biosecurity/pests-diseases/forests/fall-webworm/index.htm

Painted apple moth

The painted apple moth (*Teia anartoides*) which was first found in Auckland in May 1999 is still the subject of an eradication campaign. Aerial spraying with Btk was initiated in January 2002 and is still continuing. For further details see:
http://www.maf.govt.nz/biosecurity/pests-diseases/forests/painted-apple-moth/index.htm

Asian gypsy moth

The last decade has seen the sporadic detection of viable eggs and larvae of *Lymantria dispar* during routine inspections of imported cargo and vehicles. A national gypsy moth pheromone trapping programme was put in place in 1993 by the then Ministry of Forestry around all major ports and selected inland high risk sites. This programme is now maintained by the Ministry of Agriculture and Forestry (MAF) who coordinate the inspection of over 1000 traps at least once every 10 days from November until April. No gypsy moths were trapped in the first 10 years of the programme but in March 2003 a single male was trapped in Hamilton. This has been identified as *Lymantria dispar praeterea*, a subspecies that occurs in Siberia and Japan (Figure 10). Preliminary DNA evaluation indicates that the specimen is likely to have originated from Iwate Prefecture in Japan. Within days of the moth being trapped additional pheromone traps were deployed in Hamilton following a prescription detailed in a contingency plan formulated in 1996. No more moths were trapped and intensive ground searching failed to find any evidence of other life stages of the insect. MAF formed a Technical Advisory Group and a decision has been made to undertake aerial spraying of Btk in Hamilton starting in October 2003. For further up to date information see:
http://www.maf.govt.nz/biosecurity/pests-diseases/forests/gypsy-moth/index.htm

Figure 10. A single male moth of *Lymantria dispar* ssp. *Praeterea* trapped in Hamilton on 26 March 2003 (distance between wingtips, 47 mm)

Post-border (new records)

The following fungi were recorded as new to New Zealand. None was considered significant and no response action was taken. There were no new forest insects recorded this year.

Rhizosphaera pini was found on unthrifty and dying needles of *Picea pungens* associated with spruce aphid damage. This fungus may have been in NZ for many years (referred to by Gilmour, 1966[3]) but no specimen was retained and the early record cannot be validated.

Calonectria sp. A species of *Cylindrocladium* isolated from discoloured *Pinus radiata* needles could not be allocated to any known species and it is likely that this is an undescribed taxon. It was isolated along with known saprophytic fungi and its role in needle death is probably negligible. Perithecia of *Calonectria* sp. formed readily in culture.

Leptomelanconium australiense on *Eucalyptus ficifolia* foliage. *Leptomelanconium australiense* was first described in Australia from *Eucalyptus ficifolia* in 1974, where it was reported to cause leaf lesions. This is the first record from outside Australia. Although there is no published indication that *L. australiense* causes any significant damage, there were moderate to high levels of leaf spotting on the New Zealand material.

Elsinoe sp. on *Pittosporum tenuifolium* is discussed under 'Native forests'.

4. ADMINISTRATION AND POLICY

New Zealand Biosecurity Strategy

New Zealand's first biosecurity strategy was launched by the Biosecurity Council in August, 2003. The strategy was developed after months of consultation with a wide range of interested parties, and is fully endorsed by Government. During consultation, stakeholders identified a number of improvements needed in the present biosecurity system, which have been flagged in the strategy. It is intended that biosecurity in New Zealand will be managed using a longer term, stable, more strategic approach. There will be a clarification of roles and accountabilities, better coordination, and improved prioritisation and decision-making. The Ministry of Agriculture and Forestry (MAF) will take on increased responsibility for biosecurity, assisted by the Department of Conservation, Ministry of Health, and Ministry of Fisheries. Performance will be monitored, and capability gaps will be plugged. Other aspects to be dealt with include priority setting, funding, science capability, risk pathways, public relations, border activity, surveillance, incursion response, and pest management. Progress will be assessed by a proposed ministerial advisory committee and chief executives' forum, with the Minister for Biosecurity, taking a lead role. The Minister for Biosecurity will report on progress to Cabinet on 31 December 2004. Full implementation may take up to five years, but high priority work will begin now. A New Zealand Biosecurity Summit was held at Te Papa, Wellington, during 3-4 October, 2003, to examine the strategy and determine key expectations.
To view the strategy, see:
www.maf.govt.nz/biosecurity-strategy

Log fumigation

[3] Gilmour, J.W. (1966): The pathology of forest trees in New Zealand. The fungal, bacterial, and algal pathogens. Technical Paper No. 48. Forest Research Institute. New Zealand Forest Service.

Logs sent abroad from New Zealand are generally debarked, fumigated, or subjected to both types of treatment, in order to reduce the biosecurity risk for recipient countries. The most common fumigant is methyl bromide, which is inexpensive and effective against a wide range of organisms. Unfortunately, methyl bromide is also an ozone depleting gas that has been banned for non-quarantine use in many countries. Some reduction in methyl bromide treatment has been achieved by employing phosphine for hold-stowed logs, which can be fumigated while in transit. However, top-stowed logs must still be fumigated before loading, and the use of methyl bromide has grown with increasing log trade with China. No inexpensive and effective candidates for alternative fumigants have emerged. It is believed that the solution for New Zealand lies in a more integrated approach involving the identification and reduction of risks, and the restriction of methyl bromide application to specific biological requirements instead of as a blanket fumigation specification. Research into new fumigants and fumigation techniques is being undertaken.

5. EXTENSION

ICPP 2003

In February, 2003, New Zealand hosted the International Congress of Plant Pathology (ICPP 2003) in the Christchurch convention centre, only the second occasion this prestigious event has been held in the Southern Hemisphere. The Forest Health group, Forest Research, organised two successful post-Congress forest pathology tours, centred on Christchurch and Rotorua, respectively. The first, a joint one-day event combined plantation forest health issues with the growing of black truffles. The second tour occupied two days, the first focussed on pine plantation disorders, primarily in Kaingaroa Forest, and the second on diseases of other crops such as eucalypts, cypresses, and kiwifruit, in the coastal Bay of Plenty district. With such an array of international expertise there was much in-depth discussion.

Recent publications and website features

- "Host specificity testing in Australasia: improved assays for biological control". Edited by T.M. Withers, L. Barton Browne, and J. Stanley. A 98-page compendium of papers presented at a workshop sponsored by the Cooperative Research Centre for Tropical Pest Management dealing with methods for assessing host specificity of weed and insect biocontrol agents. For information and purchasing details on this and other Forest Research forest pathology and entomology publications, see: http://www.forestresearch.co.nz/OnlineShopping/Catalogue.asp?ProdCat1=Publications

- A review by the Ministry of Agriculture and Forestry (MAF) of the procedures for clearing containers, which included a survey of over 11,000 sea containers to determine the degree of risk and the effectiveness of current procedures. To see the discussion document: http://www.maf.govt.nz/biosecurity/border/papers/sea-container-review/summary.htm

- The monthly Forest Research publication *Forest Health News* can be viewed on line. See: www.foresthealth.co.nz. To subscribe to this newsletter electronically, contact geoff.ridley@forestresearch.co.nz.

APPENDIX 1: NATIONAL DATA FOR REPORTING DAMAGE BY FOREST PEST AND DISEASE

REPORTING THRESHOLDS

Species	**Moderate damage**	**Severe damage**
Autumn gum moth	25% defoliation	50% defoliation
Christmas beetle	"	"
Paropsine beetles	"	"
Gumleaf skeletoniser	"	"
Jarrah leafminer	"	"
Sawfly	"	"
Leafblister sawfly	"	"
Phasmatids (Stick insects)	"	"
Weevils	"	"
Psyllids (lerp-forming species)	"	"
Spring beetle (swarming scarabs)	1% trees affected or 25% defoliation	10% trees affected or 50% defoliation
Phoracanthine beetles	1% trees affected	5% trees affected
Wood moths	1% trees affected	5% trees affected
Wingless grasshopper	% defoliation	% defoliation
Bark beetles (*Ips, Hylastes*)	1% trees affected	5% trees affected
Sirex wood wasp	0.1% trees affected	2% trees affected
Monterey pine aphid	25% defoliation	50% defoliation
Mycosphaerella spp.	"	"
Aulographina eucalypti	"	"
Cylindrocladium spp.	"	"
Quambalaria pitereka	"	"
Armillaria spp.	1% mortality	5% mortality
Phytophthora spp.	1% mortality	5% mortality
Dothistroma septosporum	25% defoliation	50% defoliation
Spring needle cast / *Cyclaneusma*	"	"
Sphaeropsis sapinea	1% trees affected	5% trees affected

Data for New South Wales – Eucalyptus spp.

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Geometrids / Loopers		✓					✓						*E. cloe, E. pil, E. grand, Corymbia spp.*
Christmas beetle													
Paropsines			✓					✓			15,000		*Eucalyptus spp.*
Gum leaf skeletoniser													
Sawfly													
Leaf blister sawfly							✓				15,000		*E. camal x E. grandis, E. camal x E. glob*
Phasmatids										✓			*Native forest*
Weevils (defoliating)													
Psyllids (*Creiis lituratus*)			✓					✓			15,000		*E. dunnii*
Phoracanthines					✓					✓	25,000		*Eucalyptus spp.*
Wood moths					✓					✓	25,000		*Eucalyptus spp.*
Mycosphaerella spp.		✓									15,000		*E. pil*
Aulographina eucalypti													
Quambalaria pitereka													

Data for New South Wales – Pinus spp.

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Wingless grasshopper													
Bark beetles (*Ips, Hylastes*)													
Sirex wood wasp					✓					✓	205,000		*P. radiata*
Monterey pine aphid					✓					✓	205,000		*P. radiata, P. taeda, P. elliottii*
Armillaria spp.		✓					✓				205,000		*P. radiata*
Phytophthora spp.													
Dothistroma septosporum				✓					✓		205,000		*P. radiata*
Spring needle cast / Cyclaneusma													
Sphaeropsis sapinea					✓					✓	205,000		*P. radiata*

Data for Queensland – *Eucalyptus, Pinus & Araucaria* spp.

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Paropsines		✓						✓			3100		*Corymbia citriodora ssp. Variegata, E. cloeziana*
Sawfly													
Leaf blister sawfly							✓				100		*E. cam x grandis, E. cam x globulus, E. dunnii*
Spring beetles (scarabs)		✓									3200		*C.cv, dunnii, hybrids*
Phasmatids													
Weevils (defoliating)													
Psyllids													
Phoracanthines					✓						5000		*Eucalyptus spp*
Wood moths										✓	5000		*Eucalyptus spp*
Erinose mite (*Rhombacus* sp)			✓				✓				3000		*C.cv*
Cicada (Parnkalla Muelleri)		✓									3100		*C.cv, cloeziana*
Flea beetle (*Chaetocnema* sp)		✓									500		*E. argophloia*
Sphaeropsis sapinaea										✓	90000		*Pinus spp*
Phellinus noxius				✓					✓		45000		*Araucaria cunninghamii*

Data for Tasmania – ***Eucalyptus*** spp.

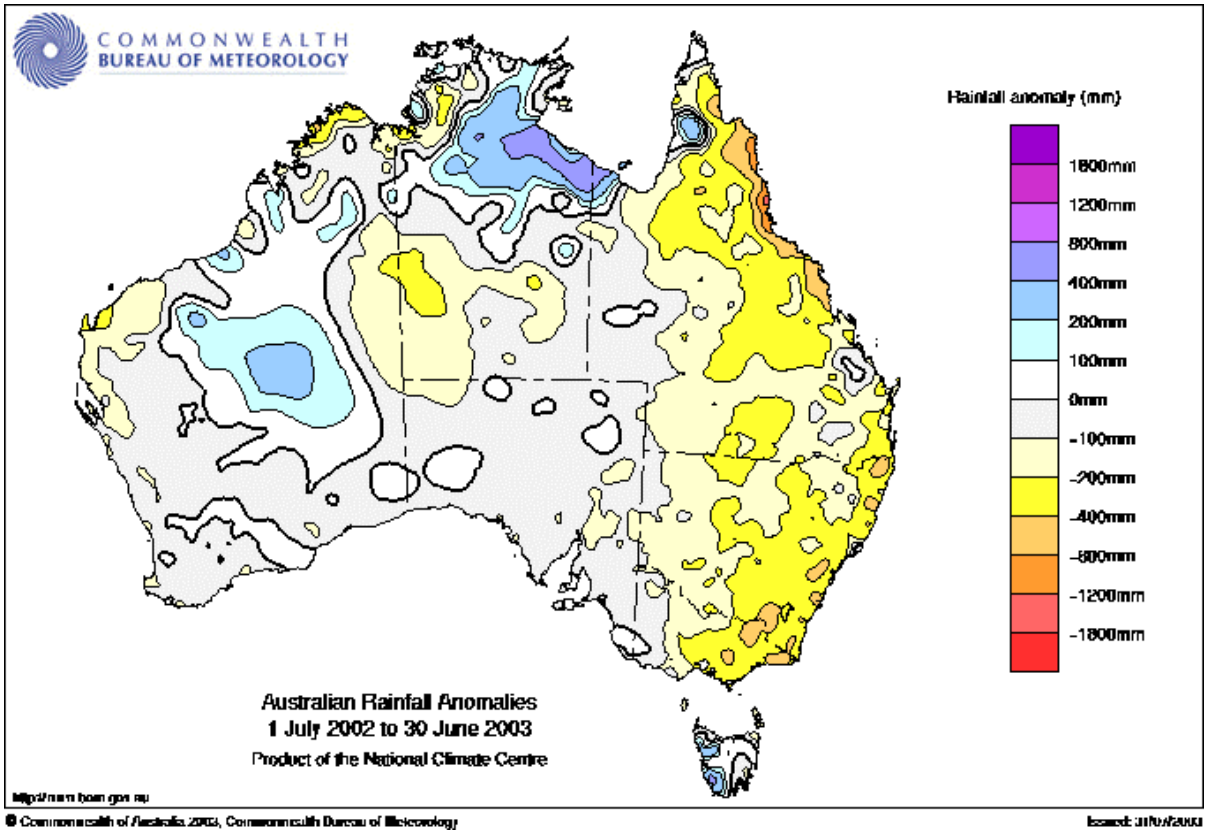
Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Autumn gum moth			✓								8,500		*nitens, glob*
Christmas beetle													
Paropsines				✓				✓			9,451	803	*nitens, glob*
Gum leaf skeletoniser	✓										8,500		*nitens, glob*
Sawfly													
Leaf blister sawfly													
Spring beetles (scarabs)													
Phasmatids													
Weevils (defoliating)			✓								29,000		
Psyllids													
Phoracanthines													
Wood moths													
Wingless grasshopper													
Mycosphaerella spp.									✓		8,500		*nitens, glob*
Aulographina eucalypti													
Quambalaria pitereka													
Armillaria spp.						✓					29,000		*nitens, glob*
Phytophthora spp.		✓									29,000		*nitens, glob*

Data for Western Australia – *Eucalyptus & Pinus* spp.

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Autumn gum moth	Nil					Nil					1000	0	*E. globulus*
Leaf blister sawfly	Nil					Nil					0	0	*E. globulus*
Spring beetles (scarabs)	Nil					Nil					600	30	*E. globulus*
Weevils (defoliating)	Nil					Nil					8,000	2,500	*E. globulus*
Psyllids	Nil					Nil					1000	0	*E. globulus*
Creiis periculosa										Estimate 50,000	Nil (not specifically inspected)	Nil	*E. rudis*
Jarrah leaf miner					Estimate 50,000						Nil (not specifically inspected)	Nil	*E. marginata*
Gum leaf skeletonizer	Nil										Nil (not specifically inspected)		*E. marginata*
Bark beetles (*Ips*)	Nil										Nil (not specifically inspected)		*Pinus radiata*
Monterey Pine aphid	Nil										Nil (not specifically		*Pinus radiata*

											inspected)		

APPENDIX 2


COMMONWEALTH
BUREAU OF METEOROLOGY
Rainfall anomaly (mm)
1600mm
1200mm
800mm
400mm
200mm
100mm
0mm
-100mm
-200mm
-400mm
-800mm
-1200mm
-1600mm
Australian Rainfall Anomalies
1 July 2002 to 30 June 2003
Product of the National Climate Centre