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 2001-2002

August 2002

INTRODUCTION

1. This report presents the annual statement of forest pest and disease conditions throughout Australia and New Zealand for the year 2001-2002. It comprises the fourth combined pest and disease report under RWG 7 (Forest Health). Individual state and country reports are attached in Annex A.

PURPOSE

2. To communicate the annual statement of forest pest and disease conditions and disease 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.

CONSIDERATION

AUSTRALIA

PLANTATIONS

PESTS (Exotic pines – Pinus species, especially *P. radiata*)

Sirex wood wasp (Sirex noctilio)

3. In South Australia, aerial inspections in June 2002 revealed very few pine deaths in any forest areas.In the Green Triangle Region numbers of *Sirex* are extremely low. Trap tree plots from the 2000 program which were felled in August 2001 contained no Sirex. As a result no billets were collected from trap trees in the 2001-2002 emergence period. Billets collected from other dying trees contained very small numbers of Sirex larvae. No adult insects subsequently emerged from these billets. No trap tree plots were established in 2001 due to logging activity in suitable areas and time constraints. In the Ranges Region, Sirex populations have been low to very low. Nematode levels have been nil to low. Sixteen percent of trap tree plots were attacked by Sirex and 13.8% of these Sirex contained nematodes. All Sirex emerging from inoculated trees were infected with nematodes. None of the Sirex emerging from non-inoculated trees were infected with nematodes. Consequently we have been unable to supply sufficient nematodes to confirm infectivity. No Sirex have been found in the Northern Forests. Monitoring is continuing in all areas,

as is the nematode inoculation program. *Ibalia* adults have emerged from billets collected in all forest areas.

4. In Western Australia, November 2000, 55 plots were established throughout the South-west between Wanneroo and Manjimup. Most plots had 5 trees per plot and were se tup according to specifications given by the National Sirex Control Strategy using Dicamba as the tree-stressing agent. An additional 45 plots were initially proposed to be installed in 2002 however this was later considered to be unrealistic given the time demands on the officer involved. A continual programme of establishing (given the loss of plots through harvesting) and maintaining a maximum of 50 Plots is now the target. Monitoring of these plots in 2002 again showed no sign of the Sirex wasp.

5. In Victoria, the incidence of Sirex over summer 2001-2002 remained low. As in previous years, nematode samples collected from the field have been forwarded to Canberra to identify the strains of nematode currently present in Victorian plantations, in order to determine their infectivity and whether additional inoculations with the preferred strain are required.

6. The incidence of naturally struck trees remains low in State Forests of NSW pine plantations, with mainly suppressed trees attacked. Localised areas (~800 ha) in Buccleuch State Forest, Hume Region, had levels of *Sirex* mortality over 1% (up to 3%), similar to last year. *Sirex* was not significant in any other region in NSW. *Sirex* was detected in trap trees in Mount Mitchell State Forest, east of Glen Innes, for the first time. There was also evidence of *Sirex* in trap trees at the Copeton Dam *P. radiata* plantation, south west of Inverell. Private plantations and shelter-belt plantings north to Tenterfield were also inspected for *Sirex* (in June 2002). Emergence holes (from last years flight season) were observed in a single tree in a private plantation at Tenterfield. This is the northern most detection of *Sirex*.

7. There has been an increase in the number of *Sirex* outbreaks around Tasmania. Two private farm planting's contained enough killed trees to warrant the introduction of nematodes. At one of these sites, Ranelagh near Huonville, nematodes were inoculated into 31 trees. Heavy attack occurred in 7 year old planting's which had had a second pruning to 6.5 metres done in early February. In the second site, at Montagu near Smithton, dissected adults were found to have nematodes. The nearest site at which nematodes had been introduced in 1990 is Oldina some 70 km away. Low levels of *Sirex* killed trees (<1%) were located in seven Rayonier coupes in northern Tasmania. Several wood lots, on Flinders Island, containing *Sirex* killed trees were logged last winter. The permanent plots at Tower Hill and Branchs Creek do not currently have *Sirex* present.

8. Queensland remains free of Sirex but the insect is present at Tenterfield, approximately 60 km from the Queensland border. Trap tree plots and ground surveillance have been increased in the border area, and training provided for DPI Forestry District staff on detection and management of the pest. Joint investigations with State Forests NSW into the susceptibility of subtropical and tropical pines are continuing. Male Sirex have been reared from *P. caribaea,* and females have been observed ovipositing on F1 and F2 hybrid billets in the insectary.

Fivespined bark beetle (Ips grandicollis) and other bark beetle species

9. In South Australia, *Ips* has not been a serious problem this year in the South East or Ranges region, though odd infestations have occurred. There has been no damage to standing trees. *Ips* continues to be a problem in the Northern forests. Various management strategies are being examined to lessen the impact of *Ips* in this area.

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

11. Apart from isolated minor outbreaks involving small plots of trees in the north-east of the state, *Ips grandicollis* and other bark beetle species (*Hylurgus* and *Hylastes*) have not presented a major problem *in P. radiata* plantations in Victoria during 2001-2002.

12. There were no significant outbreaks of *Ips* in the New South Wales pine plantations surveyed in 2002.

13. The Five Spined Bark Beetle (*Ips grandicollis*) has not yet been detected in Tasmania. *Hylastes ater* adults killed trees over several hectares of planted and regeneration one-year-old *Pinus radiata* seedlings at Scamander. At several other coupes where wildlings have been thinned to rows deaths caused by *Hylastes* is evident. Patch mortality of young trees in six northern coupes was often associated with animal browsing.

14. The pest remains south of the quarantine border established in 1994 at Marlborough in Central Queensland (just north of Rockhampton). Populations have remained low, the only activity of any significance being in fire damaged *Pinus* spp. at Beerburrum.

Monterey pine aphid (Essigella californica)

15. In South Australia, significant damage has not been evident this year. Small numbers of trees have been affected but to the extent of previous years. Monitoring has been discontinued.

16. In Western Australia, the Commission Plantations Branch (CPB) continued their commitment to Essigella monitoring. The CPB Environmental Officer established these plots in December 2000 in line with the monitoring program that required the location of plots to take account for site quality and species differences. The plots have been monitored continually on a monthly basis, since they were established, until July this year when monitoring ceased. Populations have been low this year, with no evidence of canopy damage. Little impact of the aphid has been noted throughout the monitoring program, consequently, terminating the program in July 2002 was considered appropriate.

17. *Essigella* 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*. Monitoring is continuing on both aphid population and defoliation levels at a number of sites around the state.

18. (NSW) The area affected by *Essigella californica* had increased in 2001 compared to the previous year. This was observed as chlorosis of foliage and upper-crown needle cast, especially in older age classes. In Hume Region, approximately 40,000 ha were affected. Most of the damaged stands were older age classes (20-years-plus), where over 25% of trees had moderate to high damage levels. Vast areas in Buccleuch State Forest, Bago State Forest, Carabost State Forest, Green Hills State Forest and Munderoo State Forest were affected, with plantation having a "yellow" cast during the aerial survey. In Northern Region, over 600 ha in Hanging Rock State Forest were affected, again in older age classes. Lower levels of damage were observed in Armidale State Forest, Mt. Topper State Forest and Spirabo State Forest. Approximately 4500 ha were affected in Macquarie Region, in Mullions Range State Forest, Pennsylvania State Forest, Roseberg State Forest, Vittoria State Forest, Canobolas State Forest and Glenwood State Forest. In Monaro Region, yellowing associated with *Essigella californica* was widespread in older age classes in the Moss Vale plantations.

Chlorosis of lower foliage on these trees, especially younger age classes, was also attributed to *Cyclaneusma minus*.

Monitoring for *Essigella californica* was carried out in 2001-2002 at two sites in Carabost State Forest, Hume Region. Both sites showed increased numbers both in affected trees and aphid numbers compared to 2000. This increase was the reverse of the trend seen in 2000. Another trend seen for the first time this year was the increased length of aphid activity, in past years

aphid numbers had reduced significantly by June. However, this year the numbers are still high in June.

State Forests of NSW continues to contribute to funding for the PhD studies of Trudi Wharton, on the "Biology and ecology of *Essigella californica* (Hemiptera: Aphididae: Lachininae) on *Pinus radiata*".

20. This aphid is widely distributed at low population levels in southern Tasmania. There are no reports of sightings in the large plantation areas in the north of the State however two central south compartments were found containing aphids at low levels.

20. This aphid has spread to most pine plantations in Queensland, the most northerly record being at Cardwell (between Townsville and Cairns). No damage has been observed.

Eulachnus thunbergii (Pine Aphid)

21. Surveys in Victoria has not recorded any *E. thunbergii* to date.

22. *Eulachnus thunbergii* was detected for the first time in Carabost State Forest, NSW, in June 2002. The previous distribution of the aphid in NSW had it only as far south as Oberon; however, during the monitoring for *Essigella californica* a single individual was detected. Trudi Wharton has also recently found and identified *E. thunbergii* from the south coast of NSW and in southern Victoria. Other state agencies (Victoria and South Australia) were notified of this change in distribution.

23. Not recorded from Tasmania.

24. As with *E. californica*, *E. thunbergii* is present in all radiata pine plantation areas in southern Queensland but no serious damage has been evident.

Other Pests of Pine

25. In Western Australia, three plantations in the Midwest Eastern Cell were affected by cutworm in the early months after establishment. In total, 35 hectares were reduced to less than 25% survival however many of the pines re shot reducing the infill requirements. The cutworm problem was addressed by a single application of synthetic pyrethrins. (FPC)

Wingless Grasshoppers: All plantations in the Midwest Eastern Cell were prone to an ever-invading front of hoppers! These were quickly sorted with a misting of the ol' synthetic pyrethrins followed by small platter of freshly pickled hopper bait! "Get em while there hot, there lovely". Hopper bait (a Midwest concoction of Chick Starter, not to be confused with the cocktail variety, and a lethal dose of malathion) forms a sort of safeguard around the pines like a firebreak and often lasts up to a week. (FPC)

Rutherglen bug: Several sites had varying degrees of Rutherglen infestation in the Midwest. This insect is most commonly associated with plantaions adjoining crops and areas of remnant bush. Control was necessary on sites throughout our planting zone, from New Norcia to Moora and out to Cataby. Standard applications of Alpha - Cypermethrin with 1% oil were used effectively, though since reinfestation could occur within two or three days a number of reapplications were necessary. Nevertheless no significant areas of plantation required infill operations from Rutherglen attack this year. (J. Lette and FPC)

Port Lincoln (28) Parrot: The effects of this pest are beginning to prove detrimental to the predicted returns of the pinaster plantations in the Midwest Region. Trapping on a small scale began in March 2002 however no parrots were trapped as after harvest in the agricultural areas, there is too much grain on the ground to entice them to their death. Trapping in July has resumed. Further control options are being discussed such as alternative food sources, baits and shooting programs which will be trialed in due course. (FPC)

25. In New South Wales, there were no serious outbreaks of wingless grasshoppers in the pines this year. Painted apple moth (*Teia anartoides*): damage from this insect was significant in NSW in 2001.

Possum damage was again the main problem in Monaro Region in 2001. Possums had caused significant damage to pines in Bondi S.F., Coolangubra S.F. and Nalbaugh S.F. The area of plantation affected by possums in Monaro Region has not changed significantly from 2000. The incidence of damaged trees, however, has decreased from previous years, with fewer trees having fresh damage.

Browsing from wallabies was a problem in young stands in several compartments in 2001. In most cases levels were <1% incidence (eg Nowendoc State Forest and Mt Mitchell State Forest in Northern Region).

26. In Tasmania, the Painted apple moth, *Teia anartoides,* was detected in three compartments in the central south. The incidence of larvae was high but causing minor damage.

The pine aphid *Pineus laevis* was encountered on 0.7% of assessed trees of the 4 year old estate. The highest incidence was in the NE of the State with 1.8% of assessed trees were lightly damaged.

27. Thrips (*Pseudanaphothrips araucariae*) This native Australian species breeds in the male cones of *Pinus* and *Araucaria* species, and at Cardwell in north Queensland has occurred in such large numbers that it has caused public health problems. A school surrounded by *Pinus caribaea* plantations was invaded by these insects which caused distress to children by getting into their hair, eyes and mouth. The insects also got into food, making outside eating impossible.

Possums have continued to extensively damage *Pinus taeda* within Gambubal State Forest. Their preference for the bark on the upper stems and limbs of this species resulted in ringbarking followed by upper crown dieback. The majority of *P. taeda* at Gambubal displayed past and present possum activity. As the plantings of *P. taeda* are limited within this estate control is not considered necessary.

DISEASES (Exotic pines – Pinus species, especially *P. radiata*)

Bursaphelenchus (pine nematode)

28. (WA) Bursapahlenchus (Pine Wilt) nematode was first reported from Victoria in July 2000. A national alert was raised with sampling proposed from each state for rapidly killed or dying trees. Fifty samples were proposed for Western Australia however suspicious deaths were not common enough to provide 50 samples over the sampling period. For a period of time, CPB committed itself to providing 1 sample per month for nematode extraction with sample details recorded in the CPB Bursaphalenchus sample register. This target was removed from the environmental management system (EMS) since the only practical way to sample is by an opportunistic mode where samples are taken only when trees displaying suspicious symptoms are discovered. In terms of processing, samples are now sent directly to Victoria as the Ag WA representative felt that she was a redundant link in the process. For the 2001/02 reporting period, 4 samples were collected, recorded and sent. However the problem of results reporting still remains with no feedback of what was isolated from samples.

29. Surveys for exotic *Bursaphelenchus* nematodes in Victoria continued to be a major focus of the Forest Health program within the Forest Science Centre. The following summarises findings to date:

- Since February 2000, '*Bursaphelenchus*' nematodes have been isolated from 35 pine trees out of 171 trees tested within a 60km radius of Melbourne that have died rapidly (generally over a 6-12 week period). With the continued eradication program, there has been a drop in the percentage of tested trees infested with the nematode from 22.4% (33 trees out of 147 tested from February 2000 to June 2001) to 8.3% (2 out of 26 tested in summer/autumn of 2001/2002) (Figure 1). All trees found to be infested with the nematode were removed and destroyed. *Bursaphelenchus* nematodes were not isolated from any of the 92 pine trees tested within Victoria, outside of the 60km zone around Melbourne.
- There were possibly two nematode genera isolated of concern as potential new incursions. A *Bursaphelenchus* sp (similar to *hunanensis*) and a possible *Ektaphelenchus* sp. closely related to the genus *Bursaphelenchus. Bursaphelenchus xylophilus* was not isolated from any of the samples collected as determined by morphological examination by Dr Mike Hodda of CSIRO. This was confirmed by DNA extraction by Ann Lawrie at RMIT University.
- These '*Bursaphelenchus*' type nematodes have only been isolated from dying trees within a 60km radius of Melbourne. No samples tested from interstate contained these nematodes. A different *Bursaphelenchus* sp. was isolated from Queensland and is believed to be similar to a species isolated from *Ips grandicolis* beetles in NSW in 1989.
- While some trees have had high numbers of nematodes within them (up to 700/g wood) most have had only a few (<1/1g wood). However this may just be a reflection of the different stages in the life cycle. The dispersive stage may be difficult to pick up within the tree.

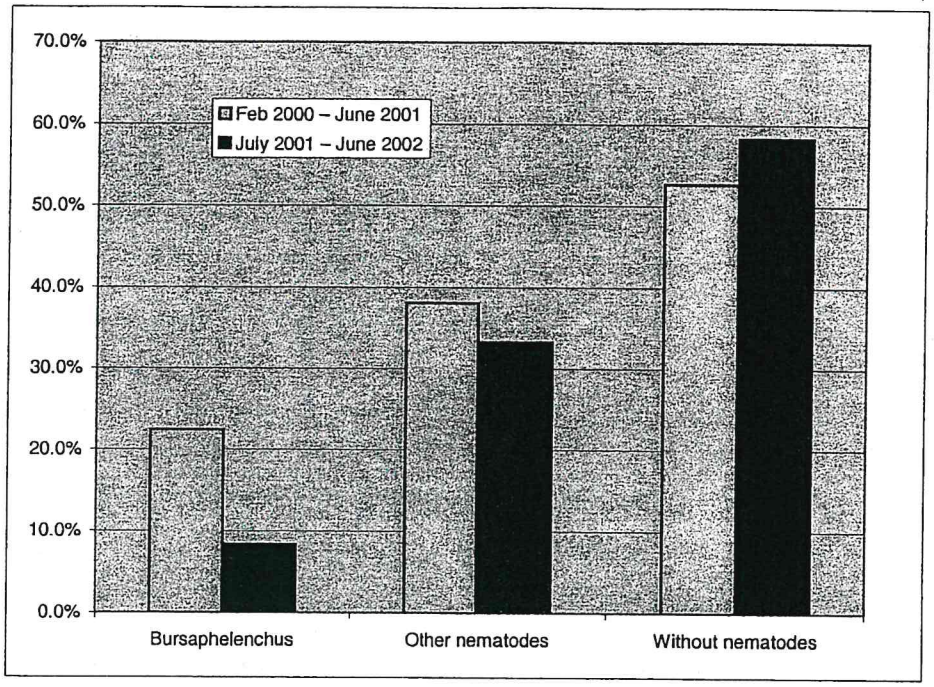


Figure 1. Percentage of dying pine trees within a 60km radius of Melbourne from which nematodes were isolated.

- Pathogenicity tests were conducted without success and therefore Koch's postulates have not been proven. Attempts to culture the nematode have not been successful. Wood samples and nematodes extracted from affected trees and placed back into healthy trees have not as yet produced any symptoms.

- *Arhopalus rusticus* (a pine longicorn beetle) have been recovered from caged billets from many of the dying trees taken following tree removal. These beetles are believed to only attack trees that are dying or under stress due to other factors. However the damage caused by these beetles in standing trees is of concern due to the extensive galleries created in the trunk which may lead to stem failure. '*Bursaphelenchus*' type nematodes were isolated from some *A. rusticus* beetles. In total 210 *Arhopalus* beetles emerging from caged wood billets from nematode infested trees were tested for the presence of nematodes but only 4 nematodes were extracted from beetles from 1 tree (from an extraction from a squash of 40 beetles). It is likely that only one beetle was carrying the nematodes. Exit hole of *Arhopalus* beetles and larvae in the trunks have also been observed in dying trees associated with other causes (eg. salt, ringbarking, poison, etc.). It appears that the beetle is well established in Melbourne and is spreading rapidly into areas in the outer environs of. Melbourne.

- *Ips grandicolis* have also been recovered from branches from many of the removed trees.

- No *Monochamus* species have been detected in either light or pheromone traps deployed over the summer.
- Pine trees affected are generally been large and 40 years of age +. Most over 60 years.
- In the 60km zone around Melbourne, rapid deaths of pine trees have also occurred in 136 trees from which no '*Bursaphelenchus*' were isolated. However sampling problems involving the stage of life cycle may have resulted in false negatives.
- Other nematode genera were isolated from around 38 and 33% of the trees tested in February 2000 - June 2001 & July 2001-May 2002 surveys, in the Melbourne zone from which no '*Bursaphelenchus*' spp. were isolated (Figure 1). These nematodes have been preserved for further identification at a later date (as part of the FWPRDC PhD project). They are believed to be secondary species feeding on blue-stain fungi.
- Although other conifers have also died (particularly Monterey Cypress), no nematodes have been isolated from them.
- Other factors involved in the tree deaths have included drought, poison, ring-barking, soil disturbance/root damage, high salinity, *Armillaria*, *Sphaeropsis* (for the pines) and Cypress canker (for the Cupressus). High salinity has been associated with most of the dying conifers occurring along the coastal regions of Victoria including many trees tested within the Southern and Western suburbs of Melbourne. The recently recorded exotic Velvet Top Fungus (*Phaeolus schweinitzii*) was also associated with dieback and brown rot in some of the trees observed (Figure 2).

Figure 2. Brown rot in 50 year-old *Pinus radiata* in Melbourne associated with *Phaeolus schweinitzii*.

- The hypothesis (proposed by Dr Mike Hodda of CSIRO) that the population of nematodes present in Melbourne is possibly not a breeding population because the vector that introduced it may have failed to establish, appears to be holding as only two trees during this summer were shown to contain the nematode. On this basis the number of infested trees should continue to decline next year (approximate maximum lifespan of the nematodes is 2 years).
- While the identity and pathogenicity of the '*Bursaphelenchus*' spp. isolated is still unclear, it would appear that only 20% of the total number of dying pine trees tested within a 60km radius of Melbourne with the characteristic observed rapid death, contain the nematode, and at levels that could be considered not to be the primary cause of death. However, the isolation frequency and population levels may reflect the stage of the life cycle of the nematode.
- It is probable that other factors such as previous drought/salinity may be the predisposing factor that is leading to tree deaths by other causes such as nematodes, *Sphaeropsis*, etc.
- The National Coordinating Committee has recommended that the eradication program continue until June 2003 albeit in a reduced form. The program is to include:
    - Continued monitoring for nematodes within any further dying pine trees within the Melbourne area to determine if eradication has been successful and/or that the population of the nematode has not established.
    - Complete the rearing of any insects from wood billets taken from the two infested trees that were destroyed in 2001-2002, and check for nematodes.
    - Continued deployment of light and pheromone traps over Spring/Summer 2002/2003 to check for the presence of *Monochamus* beetles and other potential vectors.
- FWPRDC has agreed to the funding of a PhD to undertake research into nematodes in pine and related conifers in south eastern Australia. It is proposed to conduct a systematically designed, stratified survey of the nematode fauna in *Pinus* in south eastern Australia to identify and characterise the nematode fauna. The biology and pathogenicity of *Bursaphelenchus* spp. will be determined and methods for reliable and efficient detection developed. The research is to be carried out by a student based out of Adelaide University under the supervision of Dr Ian Riley with external supervision by nematologists Dr Kerrie Davies (Adelaide University) and Dr Mike Hodda (CSIRO, Canberra) and Forest Pathologist, Mr Ian Smith (DNRE, Victoria). State Forest Pathologists and Forest Health Surveillance Officers will be approached to assist in collection of material for study. Regular progress reports will be circulated.

Sphaeropsis sapinea (Diplodia)

30. Damage in South Australia by *Sphaeropsis* has been slight in the South East. Areas which previously were severely affected have not shown any signs of the disease this year.

31. Diplodia in association with drought, is also causing dead topping and death of trees in some plantations throughout the State. High salinity is also causing deaths of *Pinus* and *Cupressus* shelterbelts, particularly in costal areas of Western Victoria and South Gippsland.

32. In New South Wales, drought-related *Sphaeropsis* damage was a significant problem in Macquarie Region in 2001, with over 4000 ha affected. Damage was observed as dead tops and dead trees, and in some cases as high as 20% in localised areas. Pennsylvania State Forest and Vittoria State Forest were the worst affected, with lower levels of damage in Canobolas State Forest, Mount Davis State Forest and Gurnang State Forest. Approximately 3000 ha were affected in Hume Region, mainly in Buccleuch State Forest, with lower levels in Carabost State Forest. *Sphaeropsis* was not significant in Monaro or Northern Regions.

33. In Tasmania, crown wilt due to *Shaeropsis sapinea* continues to be found at low incidence in plantations throughout the southeast.

34. In Queensland, *Sphaeropsis sapinea* induced dieback was again prevalent in mature 1R and young 2R plantations in site stressed areas within Passchendaele State Forest (Warwick area). Within drought the more mature stands *Sphaeropsis* has apparently invaded tissues following an extended period of resulting in widespread severe upper stem/branch dieback. This disease in combination with *Phytophthora cinnamomi* and primarily drought has continued to cause widespread mortality and patch death within the Passchendaele estate. Shallow rocky sites, which are a common feature of the Passchendaele estate, are the sites where patch death is frequently situated.

Sphaeropsis still frequently causes stem/leader malformation/loss especially within young 2R trees. Symptoms such as whorl cankers are still a common occurrence within particular compartments at Gambubal State Forest. Incidence/severity of this disease is regularly linked with abiotic events such as frost, hail and drought. This year following a severe hail event *Sphaeropsis* contributed to severe widespread dieback and tree mortality over the entire plantation estate at Gambubal State Forest. Poor sites (soil types/depth & nutrition) have also been found to predispose trees (especially young trees) to this disease. Although widespread in

Queensland on other host species (*Pinus*) this disease is currently only of consequence in the southern border plantations.

Dothistroma septospora

35. Due to the continued dry conditions in Victoria, *Dothistroma septospora* continued to show low levels of disease, and no spray programs were conducted in the State for 2001/2002.

36. Levels of *Dothistroma* needle blight were higher in NSW than last year. This followed above average rainfall in many areas in NSW where *P. radiata* is planted. In the *P. radiata* plantations on the Northern Tablelands (Northern Region), over 2000 ha were severely affected. The area affected is similar to previous years, but the severity of damage was higher in 2001 than in 2000, with large areas having over 30% and higher severity. Plantations significantly affected were in Nowendoc State Forest, Nundle State Forest, Riamukka State Forest and Mt Mitchell State Forest. *Dothistroma* needle blight was more significant in Hume Region, but mainly in localised areas in Buccleuch State Forest, Bago State Forest, Carabost State Forest and Green Hills State Forest. The area affected was slightly higher than previous years. Levels of *Dothistroma* were lower in Monaro Region than previous years, with just over 400 ha affected, mainly in Nalbaugh State Forest and Coolangubra State Forest. *Dothistroma* needle blight was not significant in Macquarie Region.

37. In Tasmania, *Dothistroma* was more prevalent this year (9.6% of trees) than in 2000-1 (3.6% of trees) in 3-year-old plantations across northern Tasmania. However severity of disease was low with only 1.5% of trees showing >25% defoliation. The greater incidence of *Dothstroma* follows 2-3 months with above-average rainfall during the 2001-2 growing season.

38. In Queensland for a number of years now favourable climatic conditions have enhanced the severity of *Dothistroma* within the Gambubal State Forest (Warwick area). Resultant extensive and widespread foliage loss has been occurring on an annual basis during the July/August period. Infection is more prevalent within the unpruned younger age classes, where there are weed problems and especially on the higher open exposed slopes. Control of this disease is currently not believed to be economically viable within this small plantation estate.

Other Diseases of Pine

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

40. *Cyclaneusma* needlecast was widespread in *P. radiata* plantations in all production regions in NSW. A Ph.D. student at Deakin University, a project sponsored by State Forests of NSW, is looking at variation in populations of *C. minus* in Australia and New Zealand, and seeking molecular markers for resistance in the *P. radiata* breeding population. Low levels of mortality (~1%) associated with *Armillaria* were observed in young *P. radiata* plantations on ex-*Araucaria* land north of Urbenville. Continued mortality is expected.

41. In Tasmania, detection of moderate level of spring needle cast in the Plenty Valley area of southern Tasmania this year has expanded the known range of susceptible plantations. New plantations in the Ringarooma area (northeastern Tasmania) are also likely to increase the nett area of plantation affected by the disease. An analysis of management strategies to reduce the impact of spring needle cast was done for Rayonier.

Phoma sp. was isolated from cankers associated with top death of two trees in an 8-years-old plantation in the southern Midlands. The pathogenicity of the isolate remains undetermined.

Fusarium lateritium was associated with flagging in a small patch of 5-6 year-old trees in a southern Midlands plantation. The flagging was confined to the lower crown of affected trees.

Dead branches in scattered trees were found in a young plantation in the Upper Derwent Valley. Fruiting bodies in the bark of the branches were identified as *Cytosporella*. This is the first time this genus has been recorded in Australia.

The undiagnosed stem gall problem, first detected in 1999, continues to be found in new areas at very low incidence. Two affected trees with galls formed on previous the seasons shoots, were found in Saddleback Plantation (northeastern Tasmania). No root disease problems were detected in P. radiata during the past year's health surveys.

Isolated trees with severe needle bleaching have been found in a number of plantations throughout the State. Although culturing of bleached needles has yielded *Alternaria* sp., a confident diagnosis has not been made.

42. (Qld) Armillaria Root Disease (*Armillaria novae-zelandiae*)This root rot fungus is still active and continues to cause scattered mortality throughout a number of compartments within the Gambubal State Forest. Where present, infection levels tend to be high, resulting in productivity losses. Scattered mortality suggests spore dissemination although distinctive disease foci are evident indicating root-to-root spread. *Armillaria* sp. was also detected within a

half-hectare ridge-top site killed by lightning strike. In this case *Armillaria* is believed to be a secondary invader. Other than the mountainous Gambubal estate *Armillaria* has not been detected within any other *P. radiata* plantations.

Phytophthora Root Rot (*Phytophthora cinnamomi*) Phytophthora is still causing scattered establishment losses to newly planted *P. radiata* within the Passchendaele State Forest. Mortality directly attributable to this disease dramatically declines after 1 year and then is rare for the duration of the rotation. Movement of contaminated nursery stock is believed to have led to the establishment and now widespread distribution of this disease in the plantation estate. Little-leaf symptoms are obvious throughout this estate and there is little doubt that the widespread occurrence of this disease at Passchendaele has contributed to the chronic poor health of *P. radiata* (especially older age classes), so long a characteristic of the plantation there.

43. (QLD) Subtropical and tropical *Pinus* species

Diseases and environmental factors

Significant diseases recorded were *Sphaeropsis sapinea, Phytophthora cinnamomi, Ophiostoma ips* and *Armillaria pallidula.*

Diplodia Shoot Blight (*Sphaeropsis sapinea*)

Sphaeropsis sapinea was frequently identified as the agent associated with the death of leading shoots within young coastal *Pinus* spp. plantings. Site investigations indicate that in the majority of occasions infection resulted from pre-exposure to short periods of extreme air temperatures, drought, unfavourable soil depth/type, nutritional disorders etc. Insolation induced S*phaeropsis* dieback within young *Pinus* spp. was confirmed within Beerburrum State Forest (Beerburrum District) and Byfield State Forest (Rockhampton District). In both cases *Sphaeropsis* was the secondary agent. Affected species were 1-year-old F1 hybrids (*P. elliottii* var. *elliottii* X *P. carebaea* var. *hondurensis*) at Beerburrum and 2 year-old *P. carebaea* var. *hondurensis* at Byfield. At Beerburrum, symptoms varied throughout the compartment i.e. from browning off of a few terminal needles to complete leader loss. Severity (in terms of the numbers of plants with damaged leaders) was restricted to patches but within these patches up to 75% of the trees was affected. Overall, the damage at Beerburrum was classified as minor. At Byfield the young trees were pre-disposed to fungal invasion as a result of severe nutrient disorders exuberated by drought. In south east Queensland *Pinus carebaea* var. *hondurensis* planted on podsolic soils

frequently suffer from copper deficiency. *Sphaeropsis* is a common secondary invader at these sites.

Phytophthora Root Rot (*Phytophthora* spp.)

Phytophthora cinnamomi was first recognised as a problem in coastal *Pinus* plantations in 1957 at Beerburrum. Movement of contaminated nursery stock is again believed to have led to the establishment and now widespread distribution of this disease in the coastal plantation estate. Although present, *Phytophthora* has tended to have little visible impact on tree health in the coastal plantations. Recent isolation of *Phytophthora* from the roots of mature *Pinus,* thought to have fallen due to windthrow (Beerburrum, Byfield & Kuranda State Forests), suggests that *Phytophthora* is active throughout the rotation. Where active *Phytophthora* may be a limiting factor re optimum growth.

Ophiostoma ips

The pathogenic fungus *Ophiostoma ips* (carried by the exotic Five Spined Bark Beetle *Ips grandicollis*) was identified as a potential problem at Beerburrum following a intense wildfire, which burnt out 517 hectares of *Pinus* spp. in the latter part of 2001. In the months following the fire, populations of *Ips* beetles, which are established in the southeast corner, could have quickly escalated. *Ophiostoma* when "inoculated" into a tree by these beetles' results in eventual tree mortality, and the associated blue-stain in the timber reduces returns. A quick operational response by DPI Forestry (removal of burnt/stressed trees) resulted in minimal infection levels. *Ophiostoma ips/Ips grandicollis* were detected in dead *Pinus* stems throughout the plantation estate up to Rockhampton. In all cases *Ophiostoma ips/Ips grandicollis* were not the primary agents causing tree decline.

Armillaria Root Disease (*Armillaria pallidula*)

A*rmillaria* has been recorded as causing significant mortality within *Pinus* spp. at Toolara State Forest (Maryborough District). To date no other occurrences have been detected within the coastal exotic plantation estate.

Nutritional

Large but well-defined areas of the exotic coastal plantations in southeast Queensland are chlorotic to various degrees. Within the exotic plantation estate in southeast Queensland soil

types, soil profiles and rainfall are highly variable, and this dramatically influences the nutritional status across the plantation estate. Nutritional disorders may therefore be widely associated with the observed chlorosis. In many instances chlorosis has been demonstrated to be due to nitrogen deficiencies induced by intense grass competition. At Byfield an investigation established that the widespread leader decline, proliferation of basal shoots and large resinous stem cankers within 2 year-old *P. carebaea* var. *hondurensis* was the result of nutritional disorders. Interpretations of the study revealed that Manganese (Mn) levels were high, possibly toxic. Boron levels in the unhealthy plants were in low concentrations, Zinc (Zn) was very low and Copper (Cu) marginal. Reduced nutrient uptake during drought conditions has probably exacerbated nutritional disorders within the plantation estate.

Physical (poor root configuration)

Poor root configuration within young stands of *Pinus* Hybrids (seedlings & cuttings) is now more frequently being identified as the cause of scattered mortality and windthrow. At Beerburrum a lack of lateral root development within a stand of 4 year-old *Pinus* hybrids allowed excessive stem movement in the wind, which resulted in stem damage/ringbarking, followed by mortality.

ENVIRONMENTAL AND SITE RELATED PROBLEMS (Exotic pines – Pinus species, especially *P. radiata*)

44. In South Australia, deaths of pines and cypresses due to salt toxicity have not increased this year. Black cockatoos have been destroying green cones in seed orchards in the Adelaide Hills. Many methods have been tried to discourage these birds but none has so far been successful.

45. In New South Wales, frost had caused low levels of mortality and needle necrosis (<1% incidence) in several state forest in Macquarie Region (eg. Mount David State Forest). Widespread hail damage occurred in Glen Allen State Forest (Monaro Region) in 2001, with approximately 50 ha "written off" due to severe damage levels of between 50-75% of trees damaged. A further 200 ha were affected at reduced levels of damage ranging from 25% (55 ha) down to 10% (150 ha). More recently, a hailstorm damaged young pines in Bondi State Forest. This will be assessed in August 2002.

Weeds, mainly *Acacia*, were a problem in younger age classes in Macquarie Region (Lidsdale State Forest, Sunny Corner State Forest, Gurnang State Forest and Vulcan State Forest), Hume

Region (Buccleuch State Forest, Bago State Forest, Carabost State Forest, Green Hills State Forest and Maragle State Forest), Monaro Region (Bondi State Forest and Belanglo State Forest), and small areas in Northern Region (Nowendoc State Forest and Koreelah State Forest).

Boron deficiency was the main problem observed, mainly in younger age classes grown on ex-pasture sites, eg in Northern Region (Crofts Knoll), Hume Region (Carabost State Forest, Maragle State Forest and Buccleuch SF), Macquarie Region (Vittoria State Forest and Vulcan State Forest) and Monaro (Oak Range) Regions. Areas were not significantly larger than previous years.

46. In Tasmania, no environmental problems were detected in *P. radiata* during the past year's health surveys.

47. In Queensland, dieback of *P. radiata* is widespread throughout Passchendaele State Forest. Evidence suggests long-term and recent decline. Although both *S. septospora* and *P. cinnamomi* contribute to the poor health of this plantation estate, drought stress is still undoubtedly the primary cause of the present problems. Root infection by *P. cinnamomi* can also aggravate moisture stress problems during drought periods as this disease often leads to poor root formation. The fact that the Passchendaele area is marginal for *P. radiata* indicates that problems of this nature can be expected in periods of drought stress.

Environmental (hail). Early 2002, severe dieback and tree mortality was reported to be rapidly developing within the Gambubal State Forest. Investigations by the Forest Health Surveillance group found that 80% of *P. radiata* within this estate had been damaged by a recent severe hail event. Total crown mortality was measured at 20% of the estate with another 30% of trees displaying hail/*Sphaeropsis* induced dieback. Death of upper crown stem/limbs followed mechanical ringbarking by the hail and/or fungal invasion of stem tissue through the open hail induced wounds. Within the plantation, damage was generally restricted to the upper canopy/stem/limbs with more extensive damage occurring to trees exposed along compartment boundaries, roads etc. *Pinus patula* planted within the same estate sustained equivalent hail damage but as it is not as susceptible to *Sphaeropsis* infection, dieback was minimal.

PLANTATIONS (Hoop Pine – Araucaria cunninghamii)

48. In New South Wales, no significant pests or diseases were observed in the *Araucaria* plantations during the year.

49. There were no significant pest problems in hoop pine plantations in Queensland this year. Iin terms of diseases significant root rot diseases recorded were *Rigidoporus vinctus*, *Phellinus noxius & Rosellinia* sp. Root rot continues to be one of the major influencing factors in tree loss in hoop pine plantations in Queensland. *Rigidoporus vinctus* has been detected in all hoop pine growing areas and is becoming a more significant factor in early tree loss in 2R plantings.

Phellinus noxius has significantly affected some 1R and 2R sites particularly in North Queensland plantations at Wongabel and Gadgarra State Forests. Counts of tree losses within 2 compartments at Wongabel State forest indicated losses in 6 and 8 year old plantings of 113 trees/hectare and 147 trees/hectare respectively.

Rosellinia sp. continues to cause scattered mortality in 2R plantings of hoop especially in areas where high levels of trash are retained following harvesting.

A biological and chemical control research program has now been initiated to address root disease within the hoop pine estate.

PLANTATIONS

PESTS (*Eucalyptus* species)

Autumn Gum Moth (Mnesampela privata)

50. Autumn Gum Moth is again the major problem in young plantations in South Australia. Numbers have been low this autumn/winter – possibly due to very mild temperatures in autumn.

51. Autumn gum moth has not been a significant pest during 2002 in Western Australia. Only minor damage has been experienced on young plantations in the Albany region.

52. *Mnesampela privata* (Autumn Gum Moth) defoliation has occurred at low levels predominantly in E. globulus plantations throughout Victoria during autumn/winter 2001.

53. In Tasmania larvae were recorded on 0.5% of assessed *E. nitens* and *E. globulus* trees statewide, the highest incidence recorded in the NW at 1.4%. Damage levels were all below 25% defoliation.

Leaf beetles

54. Chrysomelid Beetles are of increasing concern in South Australia. They are responsible for damage in most plantations. Control measures are occasionally taken.

55. Several species of *Chrysophtharta* caused some damage to plantations two years and older throughout the plantation estate in Western Australia. Species of *Paropsis* were extremely rare in all ages of plantations. The cryptocephaline *Cadmus excrementarius* caused some defoliation but was late in emerging this year (January - February). Older plantations were also damaged by this species but not as severely.

56. Species of leaf beetle including *Chrysophtharta and Paropsis* caused low to moderate defoliation of young stands in the Gippsland and north central regions of Victoria with damage predominant in the upper 50% of the tree crown.

57. In NSW, the main pest species were again *Paropsis atomaria* and *Chrysophtharta cloelia.* Damage was lower than previous years. Moderate to high levels of damage were

observed in several larger plantations of *E. dunnii* and *E. grandis*. In addition, a new species of chrysomelid was observed causing widespread damage in Dorrigo.

58. Routine monitoring of Forestry Tasmania *E.nitens* and *E. globulus* plantations was conducted using the methodology set out in the Leaf Beetle IPM Technical Bulletin. 10% of the plantation estate aged <6 years required control operations using synthetic pyrethroid sprays.The southern leaf beetle *Chrysoptharta agricola* was very common throughout the plantation estate with 2.2% of assessed trees showing damage. *C. bimaculata* was recorded on 1.1% of assessed trees. The highest incidence levels were recorded in the central north of the state with 4.4% of assessed trees damaged.

59. In Queensland, numbers of the two main species *Paropsis atomaria* and *Chrysophtharta cloelia* remained low this year, and there was no significant damage recorded by any leaf beetle species.

Beetles (Christmas, scarab, spring, etc)

60. In Western Australia, several species of *Heteronyx* have been recorded causing severe defoliation to the growing tips of all aged trees, but is concentrated mainly in the Wellstead area (100km east of Albany).

61. Christmas beetles (*Anoplognathus* spp.) have been observed at trace levels only defoliating young one-year old *E. globulus* plantations in the Latrobe Valley region of Victoria during summer 2001-2002 with no significant damage being recorded.

62. There were no significant outbreaks of *Monolepta australis* this year in New South Wales. Moderate levels of Christmas Beetles (*Anoplognathus* spp.) damage were observed in *E. dunnii* plantations around Taree and Gloucester in late 2001, but no further damage was sustained, with many damaged plantations recovering by March.

63. Operational control was not warranted in Tasmanian plantations.

64. Moderate to severe defoliation by *Automolus* sp., *Sericesthis* sp. and *Anoplognathus porosus* occurred in several joint venture plantations in southern Queensland during the year.

Sawflies

65. There have been few reports of sawflies in South Australia this year.

66. Sawflies have caused trace to low levels only of defoliation in north-central Victoria and Gippsland during autumn/winter 2002. Monitoring is continuing to assess further damage over the winter period.

67. In NSW, little damage from sawflies was observed in mid-2001 to 2002. There was no repeat of the severe damage observed in early 2001.

68. Many wood lots and shelterbelts in the central Midlands of Tasmania continue to be severely defoliated during the spring months. Mortality of trees following successive years of defoliation is now occurring.

Borers

69. Borers of the species *P. acanthocera* were observed in eucalypt plantations in East Gippsland attacking *E. saligna* although the attack was confined to individual trees within the stand. Cossid moth attack on individual trees was also observed. Monitoring will continue to observe whether levels of attack increase.

70. Stem borers, cossids and cerambycids, were again the major problem in plantations older than 3 years old in NSW. In most cases damage was below 5% incidence, with *E. grandis* the most susceptible species.

71. In Tasmania, *Phoracantha mastersii* continues to cause tree death without being in outbreak proportions. Small patches of stressed trees in droughted or waterlogged sites aged 8 years or older seem most susceptible. The incidence of stem damage by the transverse weevil, *Pelororhinus transversus*, is common in *E. globulus* and *E. nitens* planting's aged 8 years or older. As more plantations grow into this age bracket so the incidence is increasing. Thickness of bark is an important criterion for tunnelling by this weevil species. The impact on timber quality for sawn timber may be important when these trees are harvested.

72. Assessment of trials at Mundubbera, Queensland, showed very high rates of attack by *Phoracantha* spp. longicorns on several taxa. Worst affected were: *E.* grandis x *E. tereticornis* (59.5% of trees attacked), *E. grandis* x *E. camaldulensis* (49.2%), *E. dunnii* (30.2%), *E.*

drepanophylla (17.9%) and *E. longirostrata* (16.7%) . *E. globulus maidenii*, the best performing taxa at the site, was not attacked by any stem borer. A single wood moth was found attacking *E. argophloia*, which was a new record for this species. Research continues on the management of the giant wood moth (*Endoxyla cinerea*), the most important economic pest of hardwood plantations in Queensland. The focus of current work is on the isolation of sex pheromones of the moth for use in mating disruption, and on natural enemies such as the braconid wasp *Virgulibracon* sp. (parasitises larvae) and wasp egg parasitoids.

Psyllids

73. The blue gum psyllid is common across the Western Australia plantation estate but only rarely reaches large numbers to cause wilting or death of new shoots.

Positive confirmation was obtained of *Cardiaspina fiscella* by Mary Carver (CSIRO Canberra) on 6 Nov 2001. The host was *Eucalyptus robusta*, at an Albany, plantation on Hanrahan Rd which runs into Princess Royal Drive. The major insect collections at Dept Conservation and Land Management, AG WA and the Western Australian Museum were contacted on 6/11/2001 and all collections confirmed no records of *C. fiscella*. A *C. fiscella* incursion into WA was concluded. Authorities were alerted, however further searches established a wide spread distribution throughout the south-west. Consequently, since this insect was not considered a problem no further action was taken.

74. *Cardiaspina retator* has caused moderate defoliation to predominantly *E. camaldulensis* plantings in northern Victoria during summer/autumn 2002 although as with last year, this damage was confined to individual plantations and not widespread across the region.

75. *Creiis liturata* was not observed in high numbers during surveys in late 2001 to mid 2002 in NSW. Only trace levels were observed. Damage from *Cardiaspina* spp. was also not significant.

Other Pests of Eucalypts

76. Port Lincoln (28) Parrot / White Correllas: Not as much a problem in the Midwest this year as closer to Perth. To date the greatest damage seems to be to some of our Eucalyptus (mainly E. occidentalis) they produce a lot of mallee forms which is upsetting the Farm Forestry people.

77. Minor damage to E. saligna and E. globulus plantations in Gippsland has been observed by cockatoos (species unknown) ringbarking trees in search of cossid moth larvae during summer 2001/02.

78. In Queensland, arly summer damage by erinose mite (*Rhombacus* sp.) in a number of spotted gum plantations (*Corymbia citriodora* s.sp. *variegata*) was severe (up to 90% defoliation). Dry conditions appear to favour the spread of erinose mite, as it has only been recorded at damaging levels during dry seasons. Height increment of trees was significantly affected over the period November to April, but trees could tolerate levels of up to 30% loss of leaf area before growth was reduced. Leaf area loss of 70% reduced height growth by about 50%. Winter-spring damage caused by this plate-galling eulophid wasp on western white gum (*Eucalyptus argophloia*) was severe in some plantations. Loss of photosynthetic area averaged 55% in several study plots. Most trees had recovered well by early-mid summer and were able to vigorously flush with new growth. However diameter increment of trees was significantly affected, with preliminary data indicating that trees may have little tolerance even to low levels of plate galler damage.

DISEASES (*Eucalyptus* species)

79. There have been no reports of diseases affecting eucalypt plantations in South Australia this year. However one farmer has had problems with the fungus Caliciopsis in Sugar gums *(E. cladocalyx*). There have been some unexplained deaths in a few plantations in the South East but not significant.

80. No major problems reported in Western Australia. Research continues on *Mycosphaerella* leaf blights and *Endothia gyrosa* and other cankers in *Eucalyptus globulus* plantations (see Research and Development).

81. Very little disease has been recorded in Victorian eucalypt plantations in 2001/2. *Mycosphaerella* spp. has caused severe defoliation of foliage in *Eucalyptus* plantations grown for foliage in south-central Victoria.

82. Target spot (*Aulographina)* was not a significant disease this year. Damage from *Aulographina eucalypti* was mainly restricted to older foliage in the young eucalypt plantations. There were no severe outbreaks, with the majority of damage being less than 5% severity. *Eucalyptus pilularis* and *E. nitens* were the most susceptible hosts.

Phaeophleospora epicoccoides (= *Hendersonia grandispora*, *Phaeoseptoria eucalypti*, *Kirramyces epicoccoides*) caused significant defoliation in several *E. grandis* and *E. grandis* x *E. camaldulensis* plantations in northern NSW this year. Defoliation occurred from the ground up, and often resulted in over 50% and up to 95% defoliation of trees. The majority of trees affected were in lower lying areas. The defoliation often left trees with a red appearance (red colour of branches and branchlets), giving diseased plantations the appearance of a "red tide", and this is what the "locals" termed the disease.

A new species of *Phaeophleospora* is currently being described from *Corymbia* spp. The fungus causes leaf spots and is common but relatively un-damaging in young plantations and native regeneration in northern NSW.

Mycosphaerella leaf spots

Mycosphaerella leaf diseases were not observed in significant levels during the forest health surveys in northern NSW this year (December 2001-April 2002).

Two new species of *Mycosphaerella* are currently being described from *Eucalyptus*. Neither cause significant disease in plantations.

Coniella fragariae

This pathogen was not significant this year.

Corymbia leaf and shoot blight (*Quambalaria pitereka*)

Levels of *Quambalaria pitereka* were lower than previous years. However, significant damage was observed in early 2002 in several *Corymbia* plantations around Grafton. Field trials of fungicides have been destroyed by frost.

Phytophthora

No evidence of damage from *Phytophthora* observed this year.

Mistletoe was observed at significant levels in several 5-year-old *C. variegata* plantations in northern NSW. Several plantations had levels as high as 25% of trees infested. There was evidence that dry conditions had caused mortality of mistletoes in several plantations. Several *E. dunnii* plantations were also infested.

83. In Tasmania, Mycosphaerella leaf blight (MLB) continues to cause significant defoliation of *E. globulus*. The disease was active throughout the winter – early summer 2001 in response to a wet spring-early summer. All *E. globulus* plantation areas in the Circular Head (Smithton) are at risk from MLB. Crown damage index of 2-year-old *E. globulus* plantations largely reflected damage caused by MLB in the Circular Head area. Six of ten plantation areas had CDI's in excess of 30%, with the most severe almost reaching 90%. Severe MLB was also seen in the southeast at Weilangta..

The timing of the initial MLB epidemic was strongly influenced by proximity to an inoculum source. Plantations established adjacent to an inoculum source suffered severe infection during the winter-spring months coming into the second growing season. However, in plantations established more distantly from a source of inoculum the initial epidemic was delayed by several months, or escaped epidemic damage completely (ie. phase change to adult foliage occurred before epidemic infection).

Shoots: No shoot diseases were detected during the past year.

Stems: An outbreak of *Cryphonectria gyrosa* was detected in a 12-years-old *E. nitens* plantation south of Geeveston. A high proportion of trees (all rough barked) in the plantation had stem cankers. Bark infection was too recent to determine what proportion of infected trees had deep bark infection resulting in cambial damage. However, several trees had died as the result of girdling stem cankers. It is thought that severe summer-autumn droughts during the previous two seasons triggered the outbreak.

Cytonaema sp. was isolated from cankers in several *E. globulus* in a young plantation on the Tasman Peninsula. Affected trees appeared severely stressed indicating that it is likely that infection was secondary to site-related problems.

Roots: No root diseases were detected during the past year.

84. Ramularia shoot blight (*Quambalaria pitereka*) has been detected in a large number of spotted gum (*Corymbia citriodora* subsp. *variagata* and subsp. *citriodora*) plantations within Queensland. The disease has also been noted on hybrid material in north Queensland. Isolates of *Q. pitereka* have been collected from throughout the state with variability, based on morphological characteristics, apparent.

Cylindrocladium quinqueseptatum caused defoliation and seedling death in a large percentage of *Eucalyptus argophloia* and *Corymbia citriodora* subsp. *variagata* in Walkamin Nursery, north Queensland. Prior to the identification of *Cylindrocladium* at Walkamin Nursery, large numbers of *C. citriodora* were transported to southeast Queensland and planted out. Widespread establishment losses resulted from utilising this diseased material. Low levels of *Cylindrocladium* were also detected in plantations of *E. urophylla* in Kuranda State Forest (Atherton District).

Mycosphaerella spp. has not had a large impact on plantation development in Queensland this year. Disease occurrence has occurred in isolated areas affecting species such as *E. cloeziana*, *E. grandis* and *E. tereticornis.* In trial sites *E. camaldulensis*, *E. tereticornis* and hybrids of these species have been affected to varying degrees.

Other leaf spot fungi detected at low levels on *Eucalyptus* spp. included:

Purple leaf spot – *Phaeophleospora epicoccoides*

Leaf blotch – *Coniella fragariae*

Target spot – *Aulographina eucalypti*

Stem cankers with associated kino flow have been detected in southern Queensland. An unknown fungal agent has been isolated but is yet to be identified.

Brown root rot (*Phellinus noxius*) was detected for the first time causing tree death on spotted gum (*Corymbia citriodora* subsp. *variagata*) in ex hoop pine sites.

ENVIRONMENTAL AND SITE RELATED PROBLEMS (*Eucalyptus* species)

85. In Tasmania, severe crown decline leading to mortality of many trees was detected in an 8-years-old *E. nitens* plantation in the Upper Derwent Valley. Affected trees showed a range of symptoms (other than crown dieback) including sapwood staining, gummosis around the root collar, root rot and borer attack. A *Fusarium* species was isolated from the root collar of one affected tree but was considered unlikely to responsible. Affected trees were concentrated on eastern and northern slopes. Trees on western slopes appeared largely unaffected. The cause of the problem remains undiagnosed.

MANAGED NATURAL FORESTS (*Eucalyptus* species)

Pests and Diseases

86. In Western Australia, 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 two to three years. A project investigating the control of Jarrah leaf miner through selective retention of resistant trees has been initiated. The initial area was 9ha and this was cut down to a more manageable 1ha area, which was cleared of all susceptible coppiced trees in 2001. It is anticipated that this 1ha area will be kept clear of all susceptible trees in the future.

Populations of gum leaf skeletonizer remain low in the southern Jarrah forest. A paper on the biology of this insect in WA has been published this year. A further paper on its spatial distribution during the outbreak period is near completion.

The annual defoliation of the jarrah coppice at Holmes Block near Dwellingup was carried out last December. No new deaths of the jarrah coppice were recorded and the 100% defoliated trees put on very little or any new growth increment.

A biodiversity study has been initiated in the Western Australian Jarrah forest. This project, called FORESTCHECK, aims to measure the biodiversity of jarrah as influenced by forest management practices. The project is all encompassing and will measure 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, a total of 588 morphospecies > 1cm were collected. The next monitoring season will commence in spring 2002 at a new group of sites.

Jarrah forest (*Eucalyptus marginata*) Biodiversity study: A biodiversity study, called FORESTCHECK, has been initiated in the Western Australian Jarrah forest (see Pest Section). FORESTCHECK is not a strict pest and disease survey but a program to monitor ESFM. The first set of sites was established in the southern jarrah forest near Manjimup. Fungal diversity is included in the monitoring program and was completed in June 2002, with about 190 species of macro fungi being recorded. No new major pathological problems reported. Management and survey of Phytopthora root disease in jarrah (Eucalyptus marginata) forests and management of

Armillaria root disease in karri (Eucalyptus diversicolor) continues to command attention (see Forest Health Surveillance and Diagnosis, and Research and Development).

87. In Victoria, *Didymuria violescens* which caused damage to Alpine ash and mixed species forests in the Kiewa area of north-east Victoria during the 2001 summer was observed at trace levels only during summer 2002. As this pest has a two year lifecycle, monitoring will continue as the pest could have been midway through its development. Sampling egg levels in the litter to determine populations this summer will be conducted over winter 2002 in conjunction with SFNSW. Few diseases were reported from native forest.

88. No noteworthy disease outbreaks were recorded in native forests in NSW this year.

89. (Tas) In Eucalyptus species, no problems were reported or investigated. An unexplained mortality of young Huon pine (*Lagarostrobus franklinii*) was detected in some remote riverine stands in the World Heritage Area. The cause of the mortality has yet to be determined.

NURSERIES

Pest, Disease and Environmental Disorders

90. There have been no problems in nurseries this year in South Australia.

91. No major problems have been reported in either hardwood or conifer seedlings in nurseries in Western Australia. One report of Hainesia lythri blight on *Eucalyptus torquata* seedlings.

92. *Botrytis* was the main pathogen causing disease in eucalypt nurseries in Victoria. Nutrient deficiencies were also prevalent.

93. No noteworthy disease outbreaks occurred in NSW.

94. In Tasmania, several inspections of Perth Nursery were made during the year. No insect pest problems were observed. In conifer species, no disease problems were reported or investigated. Stem infection by *Botrytis cinerea* was associated with unacceptably high failure (>10%) in several areas of a planted *E. globulus* plantation on the West Coast. It could not be

determined whether the infection developed post-planting or arrived with the seedlings from the nursery.

95. In Queensland, no major disease issues were detected within *Pinus* at any of the nurseries inspected. There was however a number of deaths associated with Zinc and Copper deficiencies.

Phytophthora cinnamomi has again been detected in association with tree death in both pots and hedges of Wollemi Pine. Following pruning *Dothiorella* sp. and *Colletotrichum* sp. have been detected on unhealthy shoots.

Cylindrocladium quinqueseptatum was detected in association with shoot and stem blight on E. argophloia and leaf blight on *Corymbia citriodora* subsp. *citriodora* in Walkamin Nursery in north Queensland.

NATIVE PLANT COMMUNITIES

Pests

96. In Western Australia, onitoring of crown decline and recovery of *Eucalyptus wandoo* in Talbot forest block, using time series photography continued to autumn 2002. Jack Mercer, a consultant from Albany, has been asked to do a complete survey by Ken Wallace, CALM's Wheatbelt Regional Manager, of the *Eucalyptus wandoo* over its known range to find out how widespread the crown decline is. He was given three months to do this and his report on his findings will be published soon.

97. A large number of urban trees around Sydney (New South Wales) have been severely damaged by a true bug [Hemiptera] from the suborder Heteroptera, family Thaumastocoridae. Gerry Cassis, Head of the Centre for Biodiversity and Conservation Research at the Australian Museum, has untaken the task of identifying the species involved. Since last year the number of *Eucalytpus* species affected has increased from *E. scoparia, E. nicholli* to include *E. globulus, E. maidenii, E. bicostata, E. punctata* and *Corymbia maculata.* The symptoms of attack are foliage turning brown or bronze and then falling. Complete defoliation has been reported in some cases. Affected trees do produce new growth and trees defoliated last year have grown new canopies the following spring. However, the long-term effects of this insect on the urban tree resource are

yet to be determined. Dr Harley Rose and Annie Noack, University of Sydney are undertaking research on the bug, including life cycle information and control options.

Diseases

98. ForestySA is part of the South Australian Phytophthora Technical Reference Group, recently formed to investigate and advise on the management of Phytophthora in the Adelaide Hills and on Kangaroo Island. Phytophthora is of increasing concern in the native forest areas.

99. (WA) Management of *Phytopthora* root disease in susceptible plant communities. Treatments and outcomes for 2001 include; (1)Nineteen sites covering a total of 165 ha was aerially sprayed with phosphite in 2002, comprisng 126 ha in Stirling Range National Park and 39 ha on road reserves, nature reserves and private property south of Busselton. This was the second largest area sprayed in a year since operational application of phosphite commenced in 1995. (2) Twelve critically endangered and endangered species were treated with phosphite in the Stirling Ranges and three near Busselton. (3)All sites in the Stirling range burnt in the 2000 wildfires were sprayed at only half the normal rate because the target species were only small seedlings. (4) Rate of spread of disease front measurements in the Albany district show a rate of spread in sprayed areas 5 to 12 times less than in unsprayed areas. (5) Sampling for phosphite levels in plants at the Stirling Range N.P. shows rather low levels of uptake and re-spraying of some sites may be required this spring rather than next autumn. (6) Monitoring of survivorship of the endangered species at the Blackwood District sites shows no increase in deaths since last year (R. Smith, CALM)

Monitoring of a canker disease in a small population of the endangered *Eucalyptus phylacis* south of Busselton continues. Preliminary treatment that involved coppicing one individual has proved to be successful, with new vigorous growth showing no signs of the canker.

100. Few diseases were reported from native forest communities in Victoria during 2001/2002.

101. No noteworthy disease outbreaks were recorded in New South Wales.

102. A number of plant pathogens were detected during pest and disease surveys conducted in Cape York, Queensland. These included:

Phellinus spp. – *Eucalyptus tetrodonta, Eucalyptus* spp.

Phellinus noxius – various genera and species within the Lockerbie Scrub.

Ganoderma spp. – various species within the Lockerbie Scrub.

Racospermyces sp. – *Acacia* spp.

Uromycladium sp. – *Acacia* spp.

Phyllachora sp. – Unknown hosts.

Meliola sp. – *E. tetrodonta*, other unknown hosts.

URBAN AND RURAL

Pests

103. The White Cedar Moth (*Leptocneria reducta*) outbreak in suburban Perth again became obvious in Victoria Park. Reports were made to CALM from concerned members of the general public.

Diseases

104. (WA) Tuart (*Eucalyptus gomphocephala*) Decline

A decline in the health and vitality of tuart trees in the Lake Clifton-Yalgorup area, south of Perth, has been observed since the mid-1990s. The reason for the decline is unclear but is thought to include a declining rainfall, soil and hydrological factors and altered fire regimes. It is linked with heavy infestation of wood-boring insects. Government and Community based action is underway to investigate the causes behind the observed decline. An initial step was taken by the Minister for Environment and Heritage to establish a Tuart Response Group. The TRG recently held a Tuart Science Workshop to review current knowledge on the decline and to consider future directions for research.

Wandoo (*Eucalyptus wandoo*) Decline.

Wandoo trees in woodlands and on farms east of Perth are currently experiencing an unexplained decline similar to the tuart decline. The decline was first noticed in the mid-1980s and intensified in the 1990s. A local community group, the York Land Conservation District

Committee, has prepared an Action Plan that was endorsed by the Minister and CALM has initiated a preliminary monitoring program.

Mundulla Yellows

Monitoring has continued. Symptoms have been noted in several eucalypt species, and tests for MY-RNAs (by D.Hanold, The University of Adelaide) were positive in samples of symptomatic *C.calophylla*, *E.salmonophloia*, *E.loxophleba* and cultivated *E.camaldulensis*. 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 stands. An article was published in CALM's magazine *Landscope* [D.Hanold et al, 2002; Landscope 17(4): 41-47]; reprints are available on request.

105. 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.

Symptoms similar to Mundulla Yellows were recorded from street, garden and parkland eucalypt trees from Lara (near Geelong).

106. Dr Frank Podger spent 3 days conducting surveys for symptoms of Mundulla Yellows in eucalypts throughout southern Tasmania during a visit in April. Suspicious symptoms were seen on several species but were most common on *E. sideroxylon* and *E. ficifolia*. Most symptomatic trees were confined to amenity street trees in the greater Hobart area

107. *Phellinus noxius* has been detected in association with tree death in number of residential areas within Brisbane as well as parks and gardens in central and northern Queensland.

NEW ZEALAND

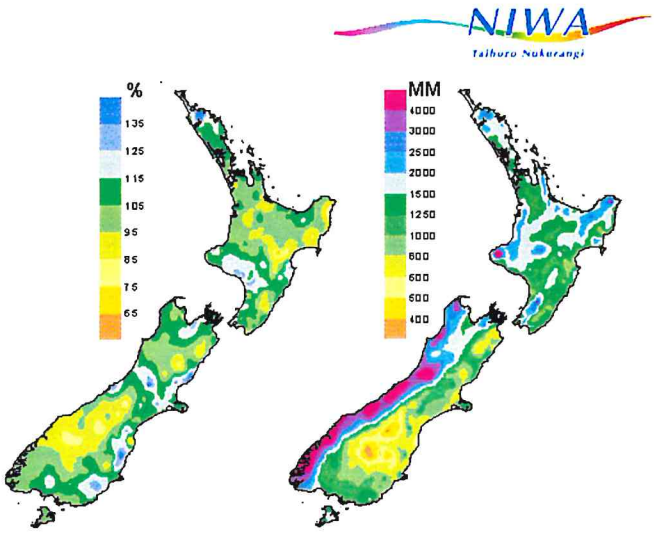
PLANTATIONS

PESTS (Exotic pines – Pinus species, especially *P. radiata*)

Weather conditions

108. According to the New Zealand MetService Annual Report, the weather patterns during 2001-2002 featured slow moving anticyclones interspersed with depressions that tracked over the centre of the country during winter and spring, and to the north of New Zealand during summer. This situation led to the driest growing season for 70-100 years in the centre and south of the country (Marlborough, Nelson, Wellington, Wairarapa, South Canterbury), whereas Northland, Coromandel and the Bay of Plenty experienced wet conditions this year. Mean temperatures were warmer than normal in many parts of the country, but extremes occurred, with cold conditions in November and heat waves in December. There were periods of strong winds from the west between September and January, which caused localised storm damage, and snowfalls occurred in late May. These irregular rainfall patterns influenced the development of some diseases during the 2001-2002 year (see below).

Rainfall anomaly for 1 July 2001 to 30 June 2002



Percentage of average rainfall

Rainfall pattern for this period

Essigella californica

109. *Essigella californica* was first found in New Zealand in 1998 and has now spread throughout the country and has been recorded from *Pinus radiata, P. michoacana, P. montezumae, P. muricata, P. patula, P. pinea* and *Pseudotsuga menziesii.* In October 2000, a programme to monitor populations of the aphid in *Pinus radiata* forests in the Bay of Plenty region and in Hawke's Bay was started. The following is a summary of the work carried out in the Bay of Plenty. The data from Hawke's Bay has not been analysed as yet.

During the winter *E. californica* populations were composed solely of wingless adults in very low numbers. Numbers increased during late February and peaked between late March and early May. Winged individuals appeared in mid May and typically comprised less than 5% of the population at any one time.

Aphid numbers were low in the youngest age class stands (1- to 10-year old) but medium or high in older stands (11- to 20- and 21- to 30-year old). This trend was consistent in both sampling years across a range of altitudes suggesting that aphid development might be influenced in some way by tree age, differences in foliage structure, tree architecture or size. In addition, there was a negative trend relating aphid density and altitude. Numbers during peak periods were very high in low altitude stands (below 300 m a.s.l.) but low in mid-altitude stands (301 – 600 m a.s.l.) and absent above 600 m.

The distribution of aphids within the canopy was also investigated. In general aphid numbers appeared to vary randomly with crown depth, and between trees within stands. However, in a young stand at one of the study sites significantly more aphids were present on trees on a sunny, north-facing aspect than elsewhere. Warmer temperatures on such sites may allow aphid populations to develop earlier in the year and over a longer period.

E. californica was most prevalent in April. At this time it was common to find aphids feeding at the bases of the fascicles and along the full length of the needles throughout the canopy. Generalist predators such as syrphid, neuropteran and coccinellid larvae were associated with these high aphid numbers but there was no evidence of parasitism. Infested trees varied considerably in appearance; some were completely green but others exhibited yellowing foliage. No cause and effect was demonstrated.

Although not comprehensively investigated in these studies, it appears that *E. californica* population growth is linked to trends in mean ambient temperature and day length. *E. californica*

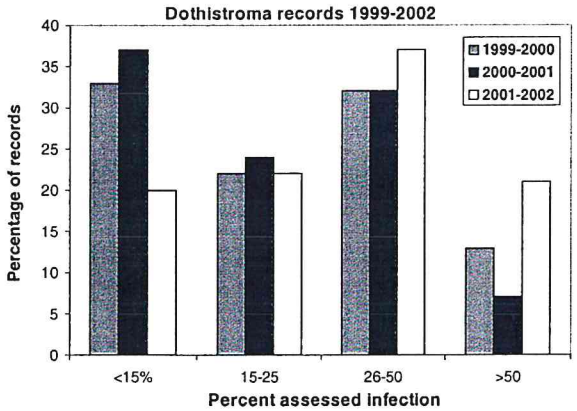
may therefore be cause for concern in lowland *P. radiata* plantations should favourable weather conditions extend into late autumn. However, at present *E. californica* is not considered a significant pest of *P. radiata* plantations in New Zealand.

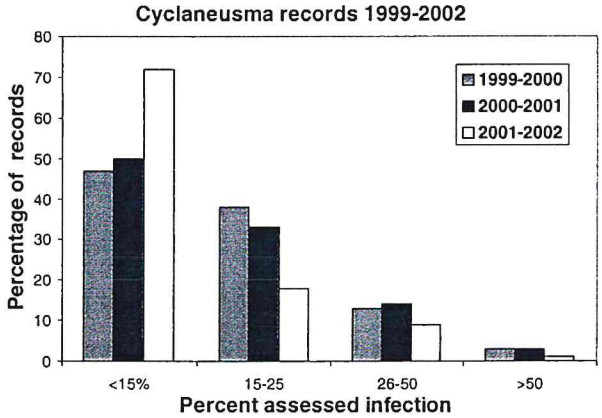
No other insect problems of any note were recorded in *P. radiata* plantations.

DISEASES (Exotic pines – Pinus species, especially *P. radiata*)

Dothistroma/ Cyclaneusma/ Strasseria

110. The total number of Forest Health Database records of *Dothistroma* for 2001-2002, at 1115, was well up on the previous two years (837 in 2000-2001 and 909 in 1999-2000). When compared by frequency of records in different infection severity assessment classes (figure, below left), the proportion of records greater than 50% was found to have increased significantly in the 2001/02 year over the previous two seasons.





The increase in *Dothistroma* infection during 2001-02 is independently demonstrated by data on the aerial spraying of diseased forest with copper fungicide. An area of 106,451 ha was sprayed during 2001-02, 101,053 ha being in the North Island and the remainder (5398 ha) in the South Island. This is the largest area treated in recent years (68,000 ha in 2000-2001, 47,000 ha in 1999-2000, and about 90,000 ha in 1998-99). The high *Dothistroma* disease levels are associated with prolonged wet weather in many parts of the country in the months preceding the spray operations, particularly those during summer (Section 1). Although the area sprayed is a separate indicator of the annual impact and extent of *Dothistroma* throughout the whole country, it is somewhat coarse and may be influenced by other forces driving company activities.

In contrast, the severity of Cyclaneusma needle-cast was lower than in the previous two years (figure, above right). Disease severity was assessed at lower than 15% for over 70% of the Cyclaneusma needle-cast records for the 2001/02 year, compared with roughly 50% of the records for the preceding two years. The lower disease levels are attributed to the prolonged autumn drought conditions experienced over much of the country (Section 1), followed by a drier-than-average winter.

There were no instances of the severe defoliation that has been associated with *Strasseria* and other needle-infecting fungi in 1995, 1998, and 2000. Presumably this was also due to the dry autumn and winter.

Sphaeropsis

111. There were a number of records of Diplodia dieback and Diplodia whorl canker (both caused by *Sphaeropsis sapinea*), but the incidence of both diseases was considerably lower than in the previous year.

Although *S. sapinea* is the most common invader of pruned stubs, other fungi are also capable of infecting *P. radiata* stems in this way. One that has been recorded on a number of occasions in recent years is a species of *Bionectria*. It is very like *B. aureofulva,* which is widely present in New Zealand but is usually found on dead wood of indigenous plants. The red ascomata are very striking when they form on the wood around infected branch stubs. Studies which will examine whether the fungus has a parasitic role, or is colonising tissue killed by other means, will be carried out, and the identity of the fungus will be clarified.

Infection of pruned stubsresulting in whorl canker

Bionectria* sp. fruitbodies on*Pinus radiata

Armillaria

112. Armillaria root disease remains widespread at variable incidence in generally non-lethal form in many pine plantations through much of the country. *Armillaria* was recently investigated as a possible cause of resin soaking in potentially high-value pruned butt logs from certain forests, on clay soils in warmer parts of the North Island. The resinous zone extends up to 4 m above ground level from sunken furrows present at the base of the tree. Impregnated wood is downgraded as not amenable to gluing, staining, or mechanical sanding, and lacking in visual appeal. The problem has been attributed to various causes including damage or stress from production thinning, pruning, wind exposure or cattle activity, but the answer remains elusive. *Armillaria* became implicated when it was found associated with sunken resin soaked depressions at the base of trees in affected forests and on stacked resin-impregnated logs. In a study to resolve the issue, a number of recently created pine stumps on cleared sites were uprooted, washed, dissected, and examined for evidence of resin impregnation and infection by *Armillaria*. It was found that although the incidence of resin soaking was high, infection was low in this first-rotation plantation on a non-indigenous forest site. It was concluded that although *Armillaria* may make a minor contribution to resin soaking degrade, it was ruled out as the main reason for the problem.

There were no records for *Peniophora*, *Junghuhnia* or *Rosellinia* for 2001-2002.

Root death and mortality of 4- to 8-year-old *P. radiata* occurred at a number of locations with no clear indication as to the cause. All affected stands were on ex-pasture sites and experienced very dry conditions for part of the year, but forest owners maintained that the deaths began

before the drought started. None of the well-known root pathogens (eg *Phytophthora cinnamomi, Armillaria* spp., *Junghuhnia vincta, Gleocystidiellum sacratum* (syn. *Peniophora sacrata*)) were cultured during a series of examinations and isolation attempts from the root systems of affected trees. However, soils at some sites yielded cultures of *Phytophthora cryptogea*, a species found to be pathogenic to young pines (*P. ponderosa* and *P. lambertiana*) in the United States and to *P. radiata* in Australia. It has also been implicated as one of the fungi contributing to decline of *P. radiata* in shelterbelts in New Zealand.

Other Diseases of Pine

113. A series of plots has been established in a large central North Island *P. radiata* plantation to provide long-term monitoring of forest health and sustainability. Along with routine health recording, data will be collected from soil and foliage sampling, understorey vegetation surveys, insect population studies, and growth and yield measurements. Health monitoring will include assessments of crown density, foliage dieback, resin bleeding, crown depth, Cyclaneusma needle cast and Dothistroma needle blight. The system was developed at Forest Research and trial work carried out over an 18-month period has shown that assessments of this type can be carried out effectively and with low variability, provided the assessor is experienced. It is believed that the collection of such data over the long term will provide essential information with which to base management decisions in the future. The goal at Forest Research is to initiate a nationwide long-term forest health-monitoring programme in *P. radiata* plantations, akin to programmes in the United Kingdom and Europe, but modified to suit New Zealand conditions.

PLANTATIONS (Douglas Fir – *Pseudotsuga menziesii*)

114. Swiss needle cast disease (*Phaeocryptopus gaeumannii*) was recorded throughout New Zealand (159 reports in the FHDB) and remains the most significant disease of Douglas fir.

Recently it was possible to determine the impact of Swiss needle cast disease on the growth of Douglas fir, by making use of records of when *P. gaeumannii* was first found in specific forests during the three decades it took for the fungus to spread throughout New Zealand. Growth data from 1500 permanent sample plots were standardised in relation to the onset of infection by converting them to numbers of years since or prior to the first observance of the fungus in each forest. The data were then analysed as two discrete sets for the significance in growth difference between records before and after infection, respectively. The results showed that a clear reduction in site basal area growth had occurred in different forests following the appearance of

P. gaeumannii. Early analyses indicated a decline in per hectare volume growth as a result of disease of ca. 20%. However, there are grounds for optimism that breeding and selection may enable most of the lost growth potential to be recouped. The current move to using seed sources originating from the Californian fog belt should go a long way towards offsetting the effects of the disease.

115. There was some mortality in Douglas fir associated with *Armillaria* infection (11 records).

PLANTATIONS

PESTS (*Eucalyptus* species)

116. In June of this year during a routine risk site survey in the vicinity of Auckland Airport an Australian psyllid, *Creiis lituratus* (Froggatt), was found in New Zealand for the first time. It was identified by David Hollis (BMNH, London). So far they have been found over an area up to nearly 4 km from the airport mainly on *Eucalyptus botryoides.*

Creiis lituratus, which produces shell like lerps, has been found in *Eucalyptus grandis* and *E. dunnii* plantations in New South Wales and has caused significant damage mainly in 2-3 year old *E. dunnii* in northern NSW. Other hosts are *E. ovata, E. saligna, E. goniocalyx, E. cordieri, E. botryoides, E. paniculata and E. robusta.* This species is considered to be a potential pest species for New Zealand. It is currently in outbreak numbers on the north coast NSW and populations can build up very rapidly in localised areas (Debbie Kent, pers. comm.)

During the *C. lituratus* delimitating surveys, another Australian psyllid, *Anoeconeossa communis* Taylor, was discovered and identified by Pam Dale (Auckland). This is another new record for New Zealand. The nymphs of this psyllid frequently occupy deserted lerps of other psyllids. However, nymphs will also occupy locations such as between leaves tied together by lepidopterous larvae, in the shelter provided by the curling of leaf edges caused by other psyllid species, and even inside leaf mines if the epidermis has been broken. In Auckland, nymphs of *A. communis* are being parasitised by a wasp. The identity of this wasp has not yet been ascertained (no adults found) but it may be *Psyllaephagus gemitus,* a self-introduced species that attacks *C. fiscella.* Where *A. communis* has been parasitised under *C. lituratus* lerps, the lerp bears the characteristic emergence hole made by the exiting adult parasitoid. At this stage, there is no evidence to suggest that *C. lituratus* is being parasitised. The current distribution status of *A. communis* is presumed to be similar to the *C. lituratus.* In Australia, *A. communis* has been

recorded on: *Eucalyptus brevifolia, E. calcicultrix, E. camaldulensis, E. exserta, E. leucoxylon, E. loxophleba, E. microtheca, E. odorata, E. raveretiana, E. rudis.* The importance of *A. communis* is not known.

117. A Western Australian strain of the egg parasitoid *Enoggera nassaui* was released in 1987/88 to control *Paropsis charybdis*, the eucalyptus tortoise beetle. *E. nassaui* proved successful in controlling *P. charybdis* over much of New Zealand, particularly in plantations of *Eucalyptus nitens*, except in colder areas. To provide better control in these colder areas a Tasmanian strain of *E. nassaui* has been successfully introduced. However, any potential gains from this introduction are likely to be negated by the self-introduction of an obligate hyperparasitoid, *Baeoanusia albifuncicle* (Encyrtidae). *B. albifunicle* invades the eggs of *P. charybdis* but is unable to develop further, and is attacked in turn by *E. nassaui*. When this occurs, *B. albifunicle* consumes the larva of *E. nassaui* and eventually emerges as an adult wasp. Eggs of *P. charybdis* not attacked by *E. nassaui* are able to hatch normally even if *B. albifunicle* is present. Because of its behaviour, there is a risk that *B. albifunicle* may check the population development of *E. nassaui* and prevent it from multiplying as rapidly as it has in past seasons. This is likely to have serious consequences for plantations of *E. nitens*, since until now *E. nassaui* has been the only biological control agent effective against *P. charybdis* in New Zealand.

Another self-introduced parasitoid associated with *P. charybdis* eggs was found earlier this year. It is a species of *Neopolycystus* (Pteromalidae) and like *E. nassaui* is a primary parasitoid of paropsine eggs. As yet it has not been specifically identified. Another species of *Neopolycystus*, *N. insectifurfax* was released in New Zealand at the same time as the original introduction of *E. nassaui* (1987/88) but it failed to become established. There is hope that the new species of *Neopolycystus* may exert some control of *P. charybdis*. Certain species of *Neopolycystus* are believed to be immune to attack by *B. albifunicle.*

Both these two recent self-introductions have so far been found only in the central North Island.

118. The *Nambouria* sp. (Pteromalidae) first found in New Zealand in October 1999 and mentioned in this report last year has now been described – *Nambouria xanthops* Berry and Withers. It has now spread from Auckland to the Coromandel Peninsula and has been recorded from *Eucalyptus glaucesens, maidenii, nicholii, ovata* and *viminalis.* Although very abundant on some of these hosts there is no evidence that it is causing any damage.

119. Uraba lugens (Nolidae) which was first found in New Zealand in 1997 at Mount Maunganui was found on four *Eucalyptus cinerea* trees at one site in Auckland in August 2001. At

both sites it was present in very low numbers and has not been seen in many months now. Further surveys will be conducted this spring and there are still hopes that the struggling populations might be yet eradicated. Forest Research has supplied Hort Research with eggs to start a laboratory population in their quarantine facility to enable them to carry out work on identifying the insect's sex pheromone. If this work is successful a synthetic pheromone should be available to monitor *Uraba* populations and hopefully confirm eradication.

120. *Acrocercops laciniella* (Gracillariidae) was first recorded in Auckland in January, 1999. It is a significant pest in coastal New South Wales, where it causes outbreaks of damage from time to time on blackbutt (*Eucalyptus pilularis*). *A. laciniella* has a wide host range, which also extends to species within the eucalypt sub-genus *Symphyomyrtus*. It continues to spread quite rapidly and is now found in Northland, Auckland, Coromandel, Waikato, Bay of Plenty, Hawke's Bay, Taupo and Taranaki. Populations of *A. laciniella* have increased significantly in the Bay of Plenty and it is now common to find it on young, flushing juvenile and sometimes adult foliage of *Eucalyptus nitens*. There is no funding to support a biological control initiative against this insect and its increase and spread is being viewed with some apprehension. *A. laciniella* was found mining the leaves of *Lophostemon confertus* in the Bay of Plenty in October 2001. This is a new host record for this species.

121. This report last year commented on distinctive "scribbles" that were observed on *Eucalyptus racemosa* in Northland in May 2000. The identity of the insect causing these "scribbles" has still not been ascertained. It might be an established Australian species or an opportunistic New Zealand insect.

DISEASES (*Eucalyptus* species)

122. Herbarium material of *Pseudocercospora* on a range of eucalypt species, and on the closely related *Lophostemon confertus*, has been examined by Dr Uwe Braun (Halle, Germany), a specialist in this group of fungi. The *Lophostemon* fungus was identified as *P. sawadae,* which was described on guava (another close relative of *Eucalyptus*) in Taiwan. On eucalypt foliage, three new species of *Pseudocercospora* were recognised in addition to the widespread *P. eucalyptorum.* One of these is associated with a number of eucalypt hosts from the subgenus Monocalyptus. *Eucalyptus regnans* is particularly prone to infection by this species and young trees can be severely affected. The other two new species both occur on *E. nitens*, Descriptions of these new species of *Pseudocercospora* will be published shortly (*NZJFS*, in press).

123. Severe defoliation of *Eucalyptus globulus* ssp. *globulus* and *E. globulus* ssp. *maidenii* associated with leaf spotting by two species of *Mycosphaerella* was recorded in a sewage effluent disposal area where the treated sewage is sprayed onto the trees. The species found were *Mycosphaerella nubilosa*, which occurs only on juvenile foliage, and *M. suberosa*, which can also infect adult leaves. The second species was first recorded in New Zealand in 1998 and this was a new location record. It is not regarded as one of the more virulent species of *Mycosphaerella* overseas but the potential to cause severe leaf spotting in this type of environment is unknown. Serious *Mycosphaerella* defoliation is associated with wet and humid conditions. The vigour of these young trees was also adversely affected by rampant grass growth, and this may have been an important factor in the high levels of fungi found on the foliage.

124. Defoliation of *E. delegatensis* associated with *Phytophthora* sp. and *Vermisporium* spp. continues to be a problem in Southland.

125. The development of Septoria leaf blight caused by *Phaeophleospora eucalypti* has been ascertained in young plantations of *Eucalyptus nitens*. It was found that although new leaves remain susceptible for only several weeks, spores are produced on infected foliage over much longer periods, so that infection levels accelerate during spring and summer leading to severe leaf shedding on warmer, coastal, disease-prone sites. These findings have focused research towards finding ways of recognising suitable growing sites where conditions will prevent the pathogen from developing epidemically. Field trials have shown that provenances of *E. nitens* from central Victoria are more susceptible to the disease than those from New South Wales. Other species in section *Maidenaria* are also resistant to the disease, but substitute selections must also be resistant to premature defoliation caused by *Mycosphaerella* species.

PESTS (*Acacia* species)

126. The painted apple moth (*Teia anartoides*) which was first found in Auckland in May 1999 and has been the subject of an eradication campaign is still present there. Up until January 2002 the campaign was based on ground spraying (using Decis and Btk) and host removal. In January this year aerial spraying was begun and up until the end of July there have been seven sprays over an area of about 600 ha. Plans are being drawn up to spray as much as 8000 ha and another $12 million has been injected into the project. For further details see http://www.maf.govt.nz/biosecurity/pests-diseases/forests/painted-apple-moth/index.htm

127. In December 2000 a tortricid caterpillar, thought at the time to be that of the eucalypt leaf roller, *Strepsicrates macropetana*, was found on an *Acacia longifolia* tree in Auckland. The

caterpillar could not be reared but because of the very unusual host association it was retained. Subsequent to this more larvae were found on *A. longifolia* and identified by John Dugdale (Landcare Research) as *Holocola* sp. near *triangulana.* Dugdale first found this Australian species at Nelson in 1989 and Robert Hoare (also Landcare Research) had caught it in light traps in Auckland. Further searching has shown that this species is quite widespread in the North Island (Auckland, Coromandel, Bay of Plenty, Gisborne, Wanganui and Wellington). Recorded hosts are *Acacia longifolia, A. floribunda, A. melanoxylon* and *A. sophorae.* The literature suggests that species of *Holocola* feed within the galls caused by rust fungi on acacias but this introduced species behaves differently. Some larvae tie or web the phyllodes together and feed on the enclosed tissues, producing a characteristic gouging pattern, while others bore into the elongating soft shoots. It is interesting to note that *Acacia longifolia* is a significant weed in a number of *Pinus radiata* plantations in Northland and some forestry companies are hopeful that *Holocola* will be a successful, naturally introduced, biological control agent.

128. During a routine risk site survey in October 2000 chrysomelid larvae were discovered on a small group of trees of *Acacia retinodes* in a park a few kilometres from Wellington airport. Adults were reared in containment and subsequently identified by Tom Weir (CSIRO, Canberra) as *Faex suturalis*, a species not previously known in New Zealand. Because of the small number of trees involved the Ministry of Agriculture and Forestry decided to attempt eradication and all the infested trees were sprayed with Decis. The site is monitored at approximately 6 weekly intervals and no signs of beetles have been seen since November 2001. There were no significant incidences of disease of acacias in plantations.

NURSERIES

129. There were few records of pests or diseases in forest nurseries this year. There was some Phytophthora root rot in nurseries that have had similar problems in the past, but the incidence was relatively low in 2001-2002.

URBAN AND RURAL

130. The eradication campaign for Dutch elm disease in Auckland still continues, with disease detection surveys and surveys to determine the incidence of *Ophiostoma novi-ulmi* in the inner growth rings of asymptomatic elms. Over the 2001/2002 season seven infected trees were found at seven separate locations, six in the Howick-Pakuranga area and one in Remuera. In the previous season ten diseased trees were found at eight locations.

A survey was carried out in the Waikato to determine the incidence of staining of elms in a region where Dutch elm disease has not been recorded. The incidence of staining was significantly lower in Waikato (4%) than in Auckland (13%). It appears likely that *O. novi-ulmi* was responsible for some of the staining found in Auckland but the fungus was not recovered because it was no longer viable, or the sampling intensity was not sufficient to guarantee its recovery.

Early in 2002 the Ministry of Agriculture and Forestry commissioned an independent review of the Dutch elm disease eradication programme in New Zealand. Jay Stapes (Virginia Tech University) and Mike Winfield (University of Pretoria) carried this out. The major conclusions of this review were that, with sustained effort, eradication is still possible and that the *Scolytus multistriatus* pheromone trapping should be reinstated. A subcommittee of the Dutch Elm Disease Control Advisory Committee is meeting in August to consider the programme for 2002-2003.

CYPRESSES

131. Cypress canker disease caused by species of *Seiridium* continues to affect many plantations and woodlots of cypresses, particularly *Cupressus macrocarpa.* Collaborative research between Forest Health and Alternative Species groups at Forest Research, and the Institute of Natural Resources Horticultural Plant Protection section at Massey University, is attempting to find cypress material that is less susceptible, besides being desirable in other characteristics, such as rapid growth and fine branching. Cuttings for field trials are being established from stool beds derived from seed collected from a selection of families of *C. macrocarpa.* Forest Health staff will examine additional cuttings from the same stools by testing their response to inoculation with cultures of the cypress canker fungi. Some of the initial work will involve an investigation of the variability in pathogen virulence.

Stigmina thujina caused typical death of foliage of *Chamaecyparis* spp. in a number of locations, this year. The host range of *Phyllosticta spinarum* expanded and this fungus was recorded in a number of new locations (refer new records, Section 6). Tip dieback on affected trees can be considerable.

OTHER HOST SPECIES (PESTS)

132. There were no new or significant pests or diseases recorded on other hosts this year.

NATIVE VEGETATION

133. A two–year monitoring and assessment study of declining mangeao trees, *Litsea calicaris* (Lauraceae), was completed at several localities near Rotorua. It was found that new epicormic growth compensated for ongoing dieback, so that overall crown appearance did not change greatly during the monitoring period. It was established that the decline was not caused by possum browsing or insect feeding, and no recognisable fungal pathogens were isolated, so that the likely cause of the syndrome appears to be physiological, in relation to environmental conditions.

QUARANTINE AND BIOSECURITY

AUSTRALIA

134. (NSW) **Peat Moss Fungus:** An undescribed species of *Galerina* formed abundant basidiomata on potting mix prepared from peat moss imported from New Zealand. The incursion was reported to AFFA.

Phaeolus schweinitzii: The brown rot causing root and butt rot fungus *Phaeolus schweinitzii* was found to be widespread in the Melbourne area on species of *Pinus*. All earlier records of *P. schweinitzii* from eucalypts and from other States are misidentifications. The fungus has not been detected in NSW.

Pine pitch canker - *Fusarium circinatum:* The Pine Pitch Canker Contingency Plan was completed. The Plan was endorsed by Forest Health Committee and is with FFPC for publication. Cultures of *F. circinatum* are now held at Royal Botanic Gardens Sydney. Molecular probes are available at Royal Botanic Gardens Sydney, Queeensland DPI and New Zealand FRI.

Pine wilt nematode- *Bursaphelenchus hunanensis* and *Ektaphelenchus* sp.: Neither nematode, nor the putative cerambycid vector, has been detected in NSW.

Siricid wasps: There have been three interceptions of *Uroceras gigas* in container terminals in Sydney this year. As far as can be determined all these interceptions have been traced and destroyed.

Asian Gypsy Moth

135. Monitoring of three major Victorian ports (Melbourne, Geelong and Westernport) is continuing for the Asian Gypsy Moth over summer 2001-2002 as part of a nationwide monitoring program. No AGM were detected. A new reusable trap will be trialled this coming year in place of the disposable Delta trap used previously.

136. Monitoring of six Tasmanian ports was conducted for Asian Gypsy Moth between October and March. The target insect was not captured. At two port sites the use of sticky trap bands was used on a range of *Acacia* and *Eucalypt* species to obtain a baseline collection of timber insects present within the port surrounds 5-kilometre area.

Monochamus alternatus

137. Following detection in May 2001 of live adults of *M. alternatus* at the Port of Brisbane and at Swanbank near Ipswich in pallets from China, pheromone trapping was conducted for one year around the latter site and dying pine trees sampled for nematodes. No adult beetles or the pinewood nematode they carry were found and the program has now ceased.

Red imported fire ant - Solenopsis invicta

138. The eradication program for this exotic pest is approaching the end of its first year in Queensland. The insect is still found in just two main foci in Brisbane although the boundaries of these foci have extended as surveillance has proceeded. Most of the new finds are related to human-assisted movement, particularly earth fill associated with development of new building estates and landscaping. The treatment program itself is very effective with up to 90% kill per application (there will be 10-12 applications in all over 3 years). An external audit of the program is to be conducted in September 2002.

Bamboo Longicorn (Chlorophorus anularis)

139. An exotic longicorn beetle *Chlorophorus annularis* has been confirmed as established in Queensland. *C. annularis* is primarily a borer of dry bamboo and occurs throughout Asia from India and China to Papua New Guinea. Other hosts include teak *Tectona grandis* and meranti *Shorea robusta.* This insect was not known to occur in Australia, but has been frequently intercepted in bamboo goods at the quarantine border, and sometimes post-quarantine. The circumstances relating to this present finding are that a member of the public brought a piece of insect-damaged bamboo furniture to the Queensland Forestry Research Institute for advice, and adult bamboo longicorn emerged. The furniture was not imported but made by the householder from bamboo grown on his own property. A search of bamboo stands in the western suburbs of Brisbane indicated that the insect was established locally. Subsequently the insect was found in bamboo grown at Kilcoy, 100 km northwest of Brisbane and it appears that it is widely established. There are also records dating back several years of the insect infesting furniture made from locally-grown bamboo at Byron Bay in NSW. At that time, cross-infestation was assumed but the situation may be the same as in Queensland.

NEW ZEALAND

Pine pitch canker:

140. A management plan for response to an incursion of pine pitch canker in Australia and New Zealand was prepared for the Forestry and Forest Products Committee and presented in March 2002. The 119-page document was written by Dr Peter Gadgil, with input and assistance from the RWG 7 pine pitch canker sub-committee.

The effectiveness of several fungicide treatments for reducing levels of *Fusarium circinatum* in infested seedlots has been examined by Dr Tom Gordon's team at UC Davis on behalf of the New Zealand Forest Health Research Collaborative. Two of the fungicides treatments seem to be effective: *Fusarium circinatum* was not recovered from any of the seed treated with either of these materials, nor any of the seedlings which emerged from the treated seed. Seed in untreated controls was 100% infected and *F. circinatum* was isolated from 62% of the seedlings that germinated in this treatment. Validation of these results is desirable and is being carried out by Dr Gordon.

Western gall rust:

141. The North American Western gall rust fungus (*Endocronartium harknessii*) is still considered to be a serious threat to New Zealand *Pinus radiata* plantations, because no alternate host is required for the completion of its autoecious, microcyclic life cycle, and aeciospores may travel several hundred kilometers. Early diagnosis is hampered by the lengthy time period of two years between infection and aeciospore production, and by the fact that *E. harknessii* cannot be cultured from juvenile galls. A project has therefore been initiated to find an alternative detection method. One option may be to use a DNA-based molecular tool to identify *E. harknessii* in non-sporulating galls, by extending a procedure developed by Dr Det Vogler of the Institute of Forest Genetics, USDA Forest Service. The project has been started by holding discussions with Dr Vogler, and extracting DNA from aeciospores released from rust galls collected from *P. contorta* var. *latifolia* and *P. ponderosa* trees in British Columbia. The aim is to produce a rapid and simple molecular technique for the early detection of *E. harknessii* in infected host tissue, in the event of an introduction, to enable prompt action to be taken to prevent its establishment.

Post entry quarantine services:

142. On 25 March a meeting was organised by MAF Biosecurity (Plants) in order to discuss the lack of post entry quarantine (PEQ) services in this country. It is now Government policy that the provision of such facilities is not core government business and has to be provided by industry. However, there is a general consensus from industry that Government is rejecting its responsibility in this matter, and the current situation is that New Zealand no longer has an all-purpose PEQ glasshouse facility. There is also considerable apprehension that the lack of a reasonably priced PEQ facility may result in the smuggling of plant material into the country. MAF Biosecurity Authority has had discussions with the Minister of Agriculture and Biosecurity. They still consider the contestable model valid and that various sectors of the agricultural and horticultural industries have to work together to solve this problem. No substantial progress was made at the meeting, but agreement was reached on the formation of a committee to explore "Alternative options for a Level 3 PEQ facility for New Zealand. Industry to explore with government the extent of public good and hence associated crown funding in this most important aspect of biosecurity". At present the lack of a general PEQ glasshouse in New Zealand has not had any serious repercussions in forestry due to the low volume and infrequent importation of tree material. However there is the potential for long term problems if breeding programmes are forced to wind down due to the difficulty in importing new genetic stocks because of the lack of a PEQ glasshouse.

Administration and policy:

143. An informal group known as the Forest Health Information Working Group (FHIWG) has been formed with interests in forest surveillance and the application of spatial analyses and technologies to forest health. This group meets several times a year. It has championed such projects as the evaluation of hand held Global Positioning System units, which led to an ongoing series of related workshops, a low level helicopter surveillance trial, and greater use of Geographic Information Systems in the analysis of forest health data. The group is exploring new initiatives in the forest health information area in association with input from the wider forestry sector.

FOREST HEALTH SURVEILLANCE AND DIAGNOSIS

AUSTRALIA

144. Monitoring for *Essigella* in South Australia was discontinued this year as damage seems to be minimal. No formal forest health surveillance is carried out apart from annual *Sirex* flights. Any unusual symptoms or deaths reported are investigated as necessary.

145. A Forest Health Surveillance program was commenced within Hancocks Victorian Plantations during 2001/2002. Monitoring is also continuing for specific pest insects within native forests in Victoria.

146. The Queensland Forestry Research Institute continues to carry out formal forest health surveys throughout Queensland on behalf of the Department of Primary Industries Forestry and the Queensland Parks & Wildlife service: Sustainable Forest Practices Unit. Surveys were also carried out for a number of private plantation consortiums. Surveillance is initiated by undertaking systematic low-level light aircraft surveys followed by extensive vehicular and foot surveys. Locations and distributions of disorders are logged and mapped using GIS technology.

Surveys encompassed selected areas within the native forest estate as well as the majority of the native hardwood and softwood (*Araucaria*) and exotic (*Pinus*) plantations. The aim of the surveys is to detect, assess and report on the biotic (mainly insects & fungi) and abiotic agents, which are affecting tree health. An important component of these surveys are the detection and identification of exotic organisms before they become established within the plantation/native forestestate.

147. In NSW, surveys of approximately half of the hardwood /eucalypt Joint Venture and Land Purchase plantations were conducted by the Forest Health Survey Unit during summer and autumn. The remainder were surveyed by field staff. Forest health surveys of all Softwood plantations were completed through winter and spring 2000.

148. In Western Australia, between the period July 2000 to June 2001, CALM Forest Management Branch mapped the presence of *Phytophthora cinnamomi* disease symptoms and defined protectable areas on over 38,000 ha of native forest. Approximately 17,400 ha of previously mapped forest was rechecked. A variety of other mapping and inspections were carried out for other government agencies and private companies or individuals. During the

preparation of the WA Forest Management Plan information was required to assess the impact of future disease on sustained timber yields. Investigations were carried out to define rates of spread of *P. cinnamoni* within different ecosystems. Prescriptions for planning of silvicultural operations were modified based on considerations of *P. cinnamomi* impact on vegetation complexes. Training programs were delivered for both Disease Detection and Hygiene Management.

Between July 2001 and June 2002, a total of 1,155 samples were processed for *Phytophthora* identification by CALM's Vegetation Health Service (VHS). *P.cinnamomi* was detected in 440 samples, *P.citricola* (64), *P.cryptogea* (15), *P.megasperma* (2), and *Phytophthora* sp. (2). A small number of other tree health and nursery problems were investigated.

NEW ZEALAND

149. In the year from 1 July 2001 to 30 June 2002, records of disorders of forest trees in the Forest Health Database totaled 8,894, slightly less than last year. Of these, 4,268 were fungal and 1,395 insect pest disorders, with the remainder being environmental and other miscellaneous disorders. Over this period the Forest Health Diagnostic Services processed 1,209 Pathology and 992 insect pest identifications.

New records:

New to New Zealand:

Fungi

- *Coryneum brachyurum* on *Betula pendula*, Wellington Biogeographic region
- *Pseudocercospora lupini* on *Lupinus arboreus*, Wanganui Biogeographic region
- *Cercospora nogalesii* on *Chamaecytisus palmensis*, Auckland Biogeographic region

Insects

- *Hyalinaspis* sp. on *Eucalyptus botryoides*, Auckland Biogeographic region

New Host (forest trees):

Fungi

- *Coniothyrium ovatum* on *Eucalyptus leucoxylon*, Wellington Biogeographic Region
- *Phyllosticta spinarum* on *Cupressus sempervirens*, Auckland Biogeographic Region
- *Cyclaneusma minus* on *Pinus tabulaeformis* var. *yunnanensis*, South Canterbury Biogeographic Region
- *Fairmaniella leprosa* on *Eucalyptus approximans*, Wellington Biogeographic Region.

- *Pseudocercospora eucalyptorum* on *Eucalyptus baxteri*, MC, 26/09/2001, new host record, risk site survey.
- *Phaeothyriolum microthyrioides* on *Eucalyptus maculata*, Northland Biogeographic Region.

Insects

- *Acizzia uncata* on *Virgilia* sp., Wanganui Biogeographic region
- *Acrocercops laciniella* on *Eucalyptus delegatensis*, Taupo Biogeographic region
- *Acrocercops laciniella* on *Eucalyptus obliqua*, Auckland Biogeographic region
- *Acrocercops laciniella* on *Eucalyptus microcorys*, Auckland Biogeographic region
- *Acrocercops laciniella* on *Lophostemon conferta*, Bay of Plenty Biogeographic region
- *Agapanthida pulchella* on *Chamaecyparis lawsoniana*, Taupo Biogeographic region
- *Ceroplastes sinensis* on *Eucalyptus ficifolia* Bay of Plenty Biogeographic region
- *Ctenarytaina* sp. on *Eucalyptus pulverulenta*, Taranaki Biogeographic region.
- *Eriococcus coriaceus* on *Eucalyptus cladocalyx*, Wanganui Biogeographic region.
- *Gastrosarus nigricollis* on *Agonis flexuosa*, Auckland Biogeographic region
- *Glycaspis granulata* on *Eucalyptus cladocalyx*, Wanganui Biogeographic region
- *Holocola* sp. on *Acacia floribunda*, Wanganui Biogeographic region
- *Holocola* sp. on *Acacia longifolia* subsp. *sophorae*, Wanganui Biogeographic region
- *Megastigmus* sp. on *Ophelimus eucalypti*, Gisborne Biogeographic region
- *Nambouria xanthops* on *Eucalyptus ovata*, Coromandel Biogeographic region
- *Navomorpha lineata* on *Abies nordmanniana*, Wellington Biogeographic region
- *Paropsis charybdis* on *Eucalyptus gobulus* subsp. *pseudoglobulus*, Hawkes Bay Biogeographic region
- *Prionoplus reticularis* on *Cupressus lusitanica*, Bay of Plenty Biogeographic region
- *Prionoplus reticularis* on X *Cupresocyparis leylandii*, Bay of Plenty Biogeographic region
- *Quadraspidiotus perniciosus* on *Acmena smithii*, Waikato Biogeographic region
- *Stenopotes pallidus* on *Pinus monticola*, Bay of Plenty Biogeographic region
- *Strepsicrates macropetana* on *Eucalyptus fraxinoides*, Wanganui Biogeographic regionregion
- *Strepsicrates macropetana* on *Eucalyptus maculata*, Northland Biogeographic region

FOREST PRODUCTS

West Indian drywood termite (Cryptotermes brevis)

150. Ten houses in Brisbane and 8 buildings (mainly shops) and a boat in Maryborough were fumigated in 2001/02 to eradicate infestations of this pest. This concludes fumigation of buildings found infested during the past several years in the Maryborough Central Business District (CBD). A further 8 buildings in Brisbane and 1 in Maryborough were discovered infested during recent surveys and require fumigation. Five of these buildings are in new areas of infestation.

After several years of trying, there are positive signs that we will be able to source and import sulphuryl fluoride into Australia for use against this termite.

Subterranean termites - Termite Standards

151. (Qld) Termatrac™ is a microwave instrument that has been developed in Australia to detect termite movement within timber and wall cavities. We conducted an investigation into the usefulness of the instrument in detecting drywood and subterranean termites in timber. Details of the work are presented in:

Peters, B.C., and Creffield, J.W. (2002) - Termatrac™: microwave technology for non-destructive detection of insect pests in timber. 33rd Annual Meeting, *International Research Group (Stockholm) on Wood Preservation*, Cardiff, Wales UK, 12-17 May. Document No. IRG/WP 02-20253.

Lyctine pests

152. Peters, B.C., Creffield, J.W. and Eldridge, R.H. (2002) - Lyctine (Coleoptera: Bostrichidae) pests of timber in Australia: a literature review and susceptibility testing protocol. *Australian Forestry* **65**(2):107-119.

Peters, B.C., Creffield, J.W. and Eldridge, R.H. (2002) - Susceptibility testing protocol for powderpost beetles in Australia. 33rd Annual Meeting, *International Research Group (Stockholm) on Wood Preservation*, Cardiff, Wales UK, 12-17 May. Document No. IRG/WP 02-20242.

RESEARCH AND DEVELOPMENT

Western Australia

153. **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)

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).

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.

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

Corymbia calophylla

Diseases

Honours Projects in progress at Murdoch University

Canker fungi associated with deaths of *Corymbia calophylla* (marri). Trudy Paap (Supervisors: G. Hardy, MU, Bryan Shearer, CALM and Jen McComb, MU)

Jarrah forest (Eucalyptus marginata)

Diseases

Dieback-resistant jarrah (*Eucalyptus marginata*): The second stage of a production seed orchard of dieback resistant jarrah clones is being established at the Forests Products Commission's Plant Propagation Centre near Manjimup in 2002. Field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have continued (M.Stukely, CALM).

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).

SPIRT Large. 2000-2003 at $200,000 (Alcoa, Worsley Alumina, CSIRO). A comparison of ectomycorrhizal biodiversity in rehabilitated mines and adjacent indigenous forest sites. (An emphasis on molecular tools for the characterisation of the different fungi on roots). (Investigators: G. Hardy, MU, Inez Tommerup, CSIRO, Ian Colquhoun- Alcoa World Alumina, Neil Bougher, CSIRO and Phil O'Brien, MU. Postdoctoral Fellow Morag Glen).

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: Rose Daniel (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

The uptake and distribution of phosphite in *Eucalyptus marginata* and how this effects *Phytophthora cinnamomi.* (R.Pilbeam; Supervisors G.Hardy, MU, and B.Shearer, CALM).

Early disease development of *Phytophthora cinnamomi* in *Eucalyptus marginata* growing in rehabilitated bauxite mines as influenced by waterlogging and drought. (Anne Lucas; Supervisors, G.Hardy and J. McComb, MU). **Funded by ARC LINKAGE.**

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.

Biochemistry of host plant defences induced by phosphite in response to *Phytophthora cinnamomi.* (Emma Groves; Supervisors Giles Hardy and Treena Burgess, MU).

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*)

Diseases

Armillaria root disease:

Recent research has shown that intensive above ground surveys for ARD in 25-30-year-old karri regrowth stands on high quality sites underestimated the true levels of disease by 20-40%. Examination of roots showed that 30-60% of the dominant trees were infected (R. Robinson, CALM).

Native plant communities

Diseases

Biology, ecology, pathology and control of *Phytopthora* spp.

Work under the following grants is in progress at Murdoch University.

Special Research Grant. The interaction of phosphate and phosphite on *Phytophthora cinnamomi* control *in planta.* (Bernie Dell and Giles Hardy, MU).

PhD Theses in progress at Murdoch University

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**

Honours Projects.

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

Victoria

153. A paper on the the effects of repeated defoliation on the growth of E. globulus in plantations in north central Victoria has recently appeared in Australian Forestry. Studies are continuing to examine the longer term effects of this defoliation in more detail

154. Studies on the ecology of invertebrates on heathland in East Gippsland and the Grampians are in the process of being written up.

New South Wales

155. A number of eucalypt tree-improvement trials were assessed for pests and diseases this year. These have also been measured for growth and form characteristics. This is collaborative work between Forest Health and Tree Improvement at R&DD. Several reports on early results have been written.

PhD candidate Paul Angel, at Southern Cross University, main supervisors Dr Doland Nichols (SCU) & Dr Christine Stone (SFNSW), co-supervisors Dr Angus Carnegie (SFNSW) & Dr Deborah Kent (SFNSW), *The dynamics and regulation of populations of Creiis liturata and the responses of its host tree, E. dunnii in plantations in north-eastern NSW: an assessment of its pests status and the development of pest management strategies.*

Stem borer research in hardwood plantations is ongoing, including tree-host susceptibility, effects of genetics and silvicultural on susceptibility, identification of agents (cossids, cerambycids, xylorictids, decay fungi), and collaboration on impact of stem degrade continuing with QFRI.

Susceptibility of *Pinus* species and hybrids to *Sirex noctilio.* Collaborative research with QFRI.

Studies of the life cycle, host susceptibility and distribution of the unidentified Thaumastocoridae attacking urban trees at The University of Sydney in collaboration with the Australian Museum.

Softwood tree improvement trials have been assessed for *Dothistroma,* with ongoing assessments for health in future trials.

Health assessments of Dryland and Salinity planting trials, including identification of damaging agents.

Forest Health has established two trials near Grafton to determine what spraying regimes will control Ramularia shoot blight on *C. variegata* in the field. The trials will also quantify the impact of Ramularia shoot blight on growth and form of *C. variegata.* The FSHU is working closely with forest pathologists at QFRI on this problem, who are looking at chemicals such as Salacylic acid and silicon to increase disease resistance in trees.

Plant Pest and Disease Database: Funding was secured by Dr Debbie Kent for SFNSW to link up with the Australian Plant Pest Database using Biolink software. The SFNSW insect and fungal collections are very valuable assests, and regularly used by forest health officers. This funding is the initial phase in modernising access to the collections. A second round of funding has just been secured.

Application of RGAs, AFLP, Microsatellites and RAPD to develop MAS selection for Cyclaneusma minus *in* Pinus radiata: This project is developing marker assisted selection for *Cyclaneusma minus* in *Pinus radiata.* This fungus is the most common and widespread pathogen in *Pinus* plantations in N.S.W. and temperate Australasia. There are two main objectives:

(a) To develop a linkage map using multi locus marker systems such as resistance gene analogs (RGAs), AFLP, RAPD and Microsatellites (Tagged), that will be used to study polymorphisms among *Cyclaneusma minus* resistant and sensitive *Pinus radiata* and also within *Cyclaneusma minus* strains. The *Pinus radiata* will come from clones, parents and families of the State Forests of NSW breeding population.

(b) To develop tightly linked markers for *Cyclaneusma minus* resistant and sensitive *Pinus radiata* by performing bulk segregation analysis. The tightly linked marker will be mapped as linkage map of *Pinus radiata* (as outlined in objective 1). Efficient protocols for routine marker assisted selection (MAS) will be developed by using breeder's DNA analysis system.

Decays in young pruned eucalypt trees: Pruning offers prospect of increasing yield of high value clearwood from plantation grown trees. However, pruning is expensive and can provide entry sites for pathogens and wood boring insects. Pruning may also slow growth of trees, placing them under increased physiological stress and possibly making them more attractive to cerambycids and xylorictids. Trials have been established at Kennaicle Creek and Fridays Creek and investigation into the effects of pruning on different species of eucalypt, season of pruning, and height of pruning on incidence of attack by insect wood borers and of decay is continuing.

Bega Valley Dieback Rehabilitation Project (a Joint SFNSW/NHT): This collaborative project was partially funded by the National Heritage Trust. The study site of specific interest to SFNSW is within Yurammie SF and has been badly affected by bell miner dieback. Field measurements have been completed and the project will be written up by early 2003

Airborne Assessment of Forest Health (WAPIS) in Native Forests: This collaborative SFNSW/CSIRO FFP project was funded by FWPRDC has recently concluded. The team successfully developed an indicator of eucalypt canopy condition from high resolution, multispectral remotely-sensed imagery. The project has received positive attention, both nationally and internationally.

Olney Bell miner Dieback Study: This trial has been intensively monitoring the impact of Bell miner dieback since late 1998 in a study site in Olny SF. Measurements have now been completed and analysis of the results will commence before the end of 2002.

Cumberland SF Bellminer Dieback Study: This comprehensive multi-disciplinary study has just began with the collaboration of Cumberland SF management. It will attempt to identify the predisposing factors that are associated with eucalypt crown dieback observed in the presence of bell miners. The information will then be utilised to formulate recommendations on possible amelioration strategies.

Application of Multispectral Imagery to the Management of Pine Plantation Condition and Productivity: Contracts for this collaborative SFNSW/CSIRO FFP project have just been signed with FWPRDC. The project aims to provide recommendations for the acquisition, processing and incorporation of multispectral imagery of canopy condition into an operational GIS, with associated cost/benefit analyses. These recommendations will be supported by an operational manual and CD for use by plantation growers. Apart from the direct benefits relating to the monitoring and management of plantation health, optimising silvicultural prescriptions, and facilitating risk management the synergism arising from integrating this information with other spatial coverages (climate, terrain, soils) will greatly improve the capacity for spatial modelling

and the development of decision support systems and forecastingmodels for resource management (e.g MRVEL).

Eucalyptus Biological Agent Resistant Clones: The search for plantation trees exhibiting some degree of resistance to insect herbivory is on-going. Dr Stone is jointly supervising a PhD student based at ANU åfter the successful application of a SPIRT grant. The PhD project is entitled 'Insect resistance traits of Eucalyptus for the NSW forest plantation industry'.

Soil-applied Insecticides for Eucalypt Plantation Establishment: This is collaborative project with Bayer has involved the successfully completion of a series of glasshouse trials testing the the systemic insecticide Imidacloprid against chrysomelid larvae and adults. As a result of the encouraging results obtained from the glasshouse trials an experimental plantation was established on a site adjacent to the Mandalong Work Depot, near Morisset. Insect bioassays using foliage material from this plantation has commenced.

Taxonomic studies of leaf spot fungi of Myrtaceae: several new species are currently being described, including two species of *Mycosphaerella* and a *Phaeophleospora.*

Studies on the impact of possums in Monaro Region, in collaboration with Research Division and Softwood Plantations Division, are ongoing.

Tasmania

156. The research program has had emphasis on testing new insecticides for use against the eucalypt plantation pests, *Chrysoptharta* spp., *Uraba lugens* and *Mnesampela privata.* Research trials to gain registration approval for plantation use continues.

157. The invertebrate program in the Silvicultural Systems Trial in the Warra LTER site in southern Tasmania continues to be supported at a high level. The measurement of the impact of differing logging techniques and tree retention on biodiversity in wet eucalypt forests is of major importance to the forest industry. Warra is a core site in the IBOY program (International Biodiversity Observation Year) and is undertaking several cooperative projects.

158. An exclusion trial has been established to measure the impact of Mycosphaerella leaf blight on the growth and branch longevity of *E. globulus.* The trial is testing three exclusion treatments: (i) protected year 1 only; (ii) protected year 2 only; (iii) protected years 1 and 2. Protection involves fortnightly applications of fungicide during the "perceived" main infection period (winter – spring). After 2 months it appears that the fungicide being used (20g NustarDP®

in 100 litres water per Ha) used is providing insufficient protection. The fungicide F500® (BASF), a fungicide of the strobilurin group, will be used for protection for the remainder of this years treatment (applied at the rate of 150g a.i. in 100 litres water / Ha). A fungicide evaluation trial to control MLB has been established and fungicide applications will commence in August 2002. Three fungicides are being included in the initial screening: F500 (BASF), 480 27F (BASF), NustarDP (Du Pont). It is planned that the most promising fungicide will be further tested next season, in combination with a plant defence activator, to measure the level of protection provided at different intervals between spray applications.

CSIRO: Entomology

Parasitoids of autumn gum moth

159. Mark Short and Martin Steinbauer continued their work on parasitoids of Autumn gum moth. The emphasis continues to be on the family Ichneumonidae as this family contains eight of the twelve known parasitoids of the moth. Recently concluded was an experiment to measure the diversity of the ichneumonid community in a plantation as the trees age. In autumn 1999, when the trees were around 9 months old, the total number of ichneumonids caught was a very low 18, representing 10 species. Three years later, in autumn 2002, the number caught was 181, representing about 33 species.

Also conducted was a field experiment to test whether the presence of nectar (from five flowering herbaceous plants) in a plantation would lead to greater numbers of ichneumonid wasps. The data from this work is not yet available.

Longevity experiments continued in the laboratory with the offering of various species of flowers to the wasps. There has still not been found a flower that changes the wasps' lifespan by much. However, based on some field observations, an experiment was set up to test whether the wasps feed on scale-produced honeydew. It was found that they do and they lived an average of three times longer than wasps without access to this honeydew.

Mimic, now supplied by Dow AgroSciences (formerly supplied by Bayer), has just been registered for use against Autumn gum moth in eucalypt plantations thanks to a joint report using data provided by Jane Elek at Forestry Tasmania and data from CSIRO Entomology in collaboration with Lower Murray Water. Mimic will only kill Lepidoptera on application and for this

reason maybe more beneficial to populations of natural enemies. However, it is likley to cost about $60 per ha cf. about $20 per ha for alpha-cypermethrin (a synthetic pyrethroid).

Biology and ecology of *Essigella californica* on *Pinus radiata*

160. Morphological studies, developmental studies and field monitoring have all been completed, with data analysis and report writing now underway. Findings to date show that the aptera of *E. californica* have only three nymphal instars. This probably allows this very small aphid to maintain a high intrinsic rate of population growth despite a low fecundity rate. Development studies at various temperatures indicate that *E. californica* is able to successfully complete development on *Pinus radiata* seedlings from 10°C to 25°C. This helps to explain its successful colonisation of commercial pine plantations throughout the country. Field monitoring at three sites in the ACT showed that *E. californica* populations vary between sites, perhaps related to the overall health of trees in the stand. Populations did not vary significantly within sites, although some trees were more heavily infested than others. Population trends were seasonal, although trends varied between sites. Populations generally peaked from late summer into autumn. The production of alates was also seasonally dependent, with the highest numbers recorded in summer. The number of alates varied between sites, with the site that had the lowest total numbers of aphids, having a very high proportion of alates.

Genetic resistance of *Toona ciliata* and silvicultural control of the cedar tip moth, *Hypsipyla robusta*.

161. Research plantations of *Toona ciliata* and related species are being used to determine best forestry practice to reduce tip moth damage in Asia and Australia. Recent results indicate there is a chemical basis to tree selection by the tip moth, and that trees grown in low light environments are less attractive to egg-laying adults. We have isolated and identified a distinctive suite of terpenoid compounds in leaves of *Toona ciliata,* and are currently working to determine if these compounds are active in influencing oviposition and feeding choices by *Hypsipyla robusta*.

Insect diversity in farm forestry

162. We recently completed a survey of arthropod diversity in Eucalyptus globulus plantations in south-western WA, published in this report:

Hobbs, R.J., R.B. Floyd, S.A. Cunningham. P. Catling, J. Ive 2002 Farm Forestry: Quantifying conservation and environmental service benefits A report for the RIRDC/L&W Australia/FWPRDC Joint Venture Agroforestry Program

Compared to nearby native remnant forest, plantations had lower species diversity and were dominated by a few relatively abundant species. Among the dominant insect species in plantations were a number of Eucalyptus feeding pests. Gonipterus scutellatus, native to eastern australia, was the most common canopy beetle in remnant forest, where it was not previously recorded. It appears that plantations have facilitated the movement of this pest species into native vegetation.

Autumn gum moth pheromones

163. During the summer and autumn of 2001 and 2002, Martin Steinbauer tested synthetic sex pheromone lure of Autumn gum moth at experimental eucalypt plantings near Canberra. The synthetic lures were compared with virgin females. Synthetic lures caught approximately the same numbers of male moths but over a much longer period than virgin females, i.e. virgin females produce odours more attractive than the synthetic. The short period of attractiveness of the virgin females is simply a function of how long they will survive in a pheromone trap. Hence, there are still issues unresolved about the compounds needed in a synthetic lure but the existence of pheromone communication in the moth and the identity of one compound have been achieved.

Dr Fredrik Ostrand will arrive in Canberra on 17 August from Lund University, Sweden. He will work with Martin Steinbauer for one year to study the efficacy of sex pheromone lures for monitoring populations of Autumn gum moth, in particular the relationship between numbers of moths caught in traps and numbers in a plantation.

CSIRO: Pest Report From Western Australia

African black beetle, *Heteronychus arator*

164. African black beetle, previously a severe establishment-phase pest in wetter areas of south-western Australia is now effectively managed non-chemically using degradable plastic mesh barriers placed around the roots and lower stem of seedlings. These are now the product-of-choice for protecting seedlings against this pest. An additional positive result of this work is

that a regional sheltered workshop contracts with at least one major commercial tree growing company to fit the barriers to seedlings.

Heteronyx elongatus

165. 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 and determining whether the potting mix or the seedlings themselves are the target of feeding larvae.

Spring beetles, *Liparetrus spp.*

166. These small, abundant insects swarm onto seedlings from adjacent forest and can defoliate them very quickly. The unpredictability of swarming and rapid damage makes this pest both difficult to study and to manage. Attempts are being made, as part of the CRC-SPF project mentioned above to assess factors that make seedlings attractive to *Liparetrus* and whether surface coatings may limit attack by this insect.

Research and Development - Diseases - Australia

CSIRO Forestry and Forest Products

167. 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 Canberra, Hobart or Perth have significant input. The names of principal CSIRO contacts have been placed in parentheses.

***Puccinia psidii* (guava rust, eucalypt rust)**

168. A collaborative project between CSIRO, Federal University of Vicosa, Brazil and the Forestry and Agriculture Biotechnology Institute(FABI), Pretoria, South Africa has been underway with ACIAR support for two 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 for presence of the rust. Good progress has been made in all these areas and will be reported at the 8th International Congress of Plant Pathology in Christchurch February 2003. (Ken Old, Inez Tommerup)

Acacia diseases manual

169. A manual for safe international movement of acacia germplasm has been written by Ken Old, Rob Floyd, and Tim Vercoe of CSIRO and Mike Wingfield and his South African colleagues at FABI, Pretoria. The manual will be published by FAO International Plant Genetic Resources Institute (IPGRI) Rome. (Ken Old)

Phaeophleospora destructans

170. The exotic pathogen *Phaeophleospora destructans* (syn. *Kirramyces destructans*), which was previously recorded only on eucalypts in Sumatra, Indonesia and caused serious foliar damage to *E. camaldulensis* plantations in Thailand, was recently found by Ken Old on *E. urophylla* in East Timor. AQIS has been alerted to the presence of this pathogen in East Timor and images of the pathogen and symptoms of disease have been supplied. (Ken Old)

Foliar diseases of eucalypts

171. In Tasmania, Caroline Mohammed, who holds a joint CSIRO-University of Tasmania appointment, 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. (Caroline Mohammed)

Stem quality research

172. A collaborative project between University of Tasmania and CSIRO, with ACIAR support, is investigating the causes of heart rot of plantation acacias in Indonesia and stem defect in *E. globulus* in northern Tasmania. The research team is led by Caroline Mohammed. Work in Indonesia focuses on the incidence of heart rot in commercial plantations and the effects of species, provenance and silviculture. The identity and detection of heart rot fungi is also being studied. In Tasmania, the relationship between pruning wounds and stem defect and the biochemistry and histology of wound responses are being studied. In both countries the aim is to

increase the potential for sawn products from fast-growing hardwood plantations. The project was launched in Bogor, Indonesia, August 2001 at a workshop, the proceedings of which will be published shortly by ACIAR. (Caroline Mohammed)

Forest Health Assessment

173. Following research in mixed species coastal forests in NSW, which combined remote and ground assessment of eucalypt canopies to develop an indicator of forest health (eucalypt crown condition index - ECCI), the SFNSW/CSIRO team has used similar methods to assess pine health. The methodology was applied to radiata pine in Buccleuch SF affected by Dothistroma needle blight during the summer 2000-2001. Using a Compact Airborne Spectrographic Instrument (CASI) it was possible to distinguish individual tree crowns and assign disease ratings which were closely matched by ground assessment of disease impacts. The work was partially supported by AFFA and has led to funding by PTR, through FWPRDC, of a project to test this approach to disease surveillance of a range of pest, disease and environmental impacts on pines in Carabost SF, in NSW. (Ken Old)

Resistance selection for pine diseases

Pine pitch canker

174. Greenhouse trials for *Pinus radiata* resistance to Pine pitch canker (*Fusarium circinatum*) have been completed in California as part of the collaborative IMPACT studies. More than 500 CP and OP families from Australia, New Zealand, and Chile were tested. Seedlings were artificially inoculated and subsequently measured for lesion lengths and the frequency of stem girdling. Results suggest there are 'useful' levels of resistance, within a number of families from each of the three countries, and that resistance should respond to selection. However, the results provide some puzzles for genetic interpretation and the pattern of inheritance appears to be somewhat anomalous. Pedigree information for NZ and Chilean material will enable the further testing of ideas. Results from this work were presented at the New Zealand Radiata Pine Breeding Company Meeting in October 2001 and a draft report has been prepared. Further evaluations in field trials in California are anticipated to begin in 2003. (Colin Matheson, Mike Devey)

Dothistroma needle blight

175. Genetic markers associated with quantitative trait loci (QTLs) for resistance to Dothistroma needle blight (*Dothistroma septosporum* (syn *D. pini*)) have been identified and

validated in radiata pine. The markers were initially identified using progeny from six full-families, each having a common maternal or paternal parent. Putative QTLs were identified where significant associations with resistance occurred in two or more families. Marker data for putative QTLs and resistance data were then obtained from a large clonally replicated family established in field trials at two sites (near Tumut, NSW and Myrtleford, VIC respectively). From this information three QTLs for resistance appear to have been validated. Publication of this work is expected during 2002/2003. (Gavin Moran, Mike Devey)

EXTENSION LITERATURE AND RELATED MATERIAL

AUSTRALIA

Forest insect collection

176. The databasing of the Western Australia CALM Terrestrial Insect Collection has progressed during 2001-2002. Since July 2001 over 11 600 specimens have been databased. This constitutes approximately 75% of the collection. (T. Burbidge)

NEW ZEALAND

177. The Forest Health News newsletter continued to be produced each month, and attracts much interest in the wider forestry sector (see: http://www.forestresearch.co.nz/).

CONCLUSION

178. This report is the annual Pest and Disease Statement of the Forest Health Research Working Group 7 recording the 12-month state of forest health in Australia and New Zealand.

RECOMMENDATIONS

233. The Annual Pest and Disease Statement be accepted and noted by the Standing Committee.

FOR INFORMATION

Forest Health Research Working Group
(Nick Collett, Secretary and RWG7 members)
14 August 2002

ANNEX A: Forest pest, disease situation and quarantine reports 2000-2001 by states and country.

ANNEX A.

FOREST PEST, DISEASE AND QUARANTINE SITUATION REPORTS 2001-2002 BY STATES AND COUNTRY

1. SOUTH AUSTRALIA 2001/2002 – PESTS AND DISEASES

Plantations

Pinus radiata:

Pests:

Sirex: Aerial inspections in June 2002 revealed very few pine deaths in any forest areas.

In the Green Triangle Region numbers of *Sirex* are extremely low.
Trap tree plots from the 2000 program which were felled in August 2001 contained no Sirex. As a result no billets were collected from trap trees in the 2001-2002 emergence period. Billets collected from other dying trees contained very small numbers of Sirex larvae. No adult insects subsequently emerged from these billets.
No trap tree plots were established in 2001 due to logging activity in suitable areas and time constraints.

In the Ranges Region, Sirex populations have been low to very low. Nematode levels have been nil to low. Sixteen percent of trap tree plots were attacked by Sirex and 13.8% of these Sirex contained nematodes. All Sirex emerging from inoculated trees were infected with nematodes. None of the Sirex emerging from non-inoculated trees were infected with nematodes. Consequently we have been unable to supply sufficient nematodes to confirm infectivity.

No Sirex have been found in the Northern Forests.

Monitoring is continuing in all areas, as is the nematode inoculation program.

Ibalia adults have emerged from billets collected in all forest areas.

Ips: *Ips* has not been a serious problem this year in the South East or Ranges region, though odd infestations have occurred. There has been no damage to standing trees. *Ips* continues to be a problem in the Northern forests. Various management strategies are being examined to lessen the impact of *Ips* in this area.

Monterey Pine Aphid (*Essigella*): Significant damage has not been evident this year. Small numbers of trees have been affected but to the extent of previous years. Monitoring has been discontinued.

Diseases:
Sphaeropsis sapinea: Damage by *Sphaeropsis* has been slight in the South East. Areas which previously were severely affected have not shown any signs of the disease this year.

Environmental:
Salt: Deaths of pines and cypresses due to salt toxicity have not increased this year.

Birds: Black cockatoos have been destroying green cones in seed orchards in the Adelaide Hills. Many methods have been tried to discourage these birds but none has so far been successful.

Eucalypts:

Pests:

Autumn Gum Moth: is again the major problem in young plantations. Numbers have been low this autumn/winter – possibly due to very mild temperatures in autumn.

Chrysomelid Beetles: are of increasing concern. They are responsible for damage in most plantations. Control measures are occasionally taken.

Sawflies: There have been few reports of sawflies this year.

Diseases:

There have been no reports of diseases affecting eucalypt plantations in South Australia this year. However one farmer has had problems with the fungus Caliciopsis in Sugar gums (E. cladocalyx).

There have been some unexplained deaths in a few plantations in the South East but not significant.

There have been no problems in nurseries this year.

Forest Health Surveillance and Diagnosis

Monitoring for *Essigella* was discontinued this year as damage seems to be minimal.
No formal forest health surveillance is carried out apart from annual *Sirex* flights. Any unusual symptoms or deaths reported are investigated as necessary.

Other

ForestySA is part of the South Australian Phytophthora Technical Reference Group, recently formed to investigate and advise on the management of Phytophthora in the Adelaide Hills and on Kangaroo Island. Phytophthora is of increasing concern in the native forest areas.

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2. WESTERN AUSTRALIA 2001/2002 – PESTS

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PLANTATIONS
Pinus radiata

Sirex: In November 2000, 55 plots were established throughout the South-west between Wanneroo and Manjimup. Most plots had 5 trees per plot and were se tup according to specifications given by the National Sirex Control Strategy using Dicamba as the tree-stressing agent. An additional 45 plots were initially proposed to be installed in 2002 however this was later considered to be unrealistic given the time demands on the officer involved. A continual programme of establishing (given the loss of plots through harvesting) and maintaining a maximum of 50 Plots is now the target. Monitoring of these plots in 2002 again showed no sign of the Sirex wasp.
(S. Ward)

***Ips grandicollis*:** No reports on high numbers have been received for this past year. (JF)

***Essigella*:** The Commission Plantations Branch (CPB) continued their commitment to Essigella monitoring. The CPB Environmental Officer established these plots in December 2000 in line with the monitoring program that required the location of plots to take account for site quality and species differences. The plots have been monitored continually on a monthly basis, since they were established, until July this year when monitoring ceased. Populations have been low this year, with no evidence of canopy damage. Little impact of the aphid has been noted throughout the monitoring program, consequently, terminating the program in July 2002 was considered appropriate. (JF and S.Ward)

***Bursaphalenchus*:** Bursapahlenchus (Pine Wilt) nematode was first reported from Victoria in July 2000. A national alert was raised with sampling proposed from each state for rapidly killed or dying trees. Fifty samples were proposed for Western Australia however suspicious deaths were not common enough to provide 50 samples over the sampling period. For a period of time, CPB committed itself to providing 1 sample per month for nematode extraction with sample details recorded in the CPB Bursaphalenchus sample register. This target was removed from the environmental management system (EMS) since the only practical way to sample is by an opportunistic mode where samples are taken only when trees displaying suspicious symptoms are discovered. In terms of processing, samples are now sent directly to Victoria as the Ag WA representative felt that she was a redundant link in the process. For the 2001/02 reporting period, 4 samples were collected, recorded and sent. However the problem of results reporting still remains with no feedback of what was isolated from samples. (S.Ward)

Cutworm: Three plantations in the Midwest Eastern Cell were affected by cutworm in the early months after establishment. In total, 35 hectares were reduced to less than 25% survival however many of the pines re shot reducing the infill requirements. The cutworm problem was addressed by a single application of synthetic pyrethrins. (FPC)

Wingless Grasshoppers: All plantations in the Midwest Eastern Cell were prone to an ever-invading front of hoppers! These were quickly sorted with a misting of the ol' synthetic pyrethrins

followed by small platter of freshly pickled hopper bait! "Get em while there hot, there lovely". Hopper bait (a Midwest concoction of Chick Starter, not to be confused with the cocktail variety, and a lethal dose of malathion) forms a sort of safeguard around the pines like a firebreak and often lasts up to a week. (FPC)

Rutherglen bug: Several sites had varying degrees of Rutherglen infestation in the Midwest. This insect is most commonly associated with plantaions adjoining crops and areas of remnant bush. Control was necessary on sites throughout our planting zone, from New Norcia to Moora and out to Cataby. Standard applications of Alpha - Cypermethrin with 1% oil were used effectively, though since reinfestation could occur within two or three days a number of reapplications were necessary. Nevertheless no significant areas of plantation required infill operations from Rutherglen attack this year. (J. Lette and FPC)

Port Lincoln (28) Parrot: The effects of this pest are beginning to prove detrimental to the predicted returns of the pinaster plantations in the Midwest Region. Trapping on a small scale began in March 2002 however no parrots were trapped as after harvest in the agricultural areas, there is too much grain on the ground to entice them to their death. Trapping in July has resumed. Further control options are being discussed such as alternative food sources, baits and shooting programs which will be trialed in due course. (FPC)

Eucalyptus globulus (A. Loch)
Psyllids: The blue gum psyllid is common across the plantation estate but only rarely reaches large numbers to cause wilting or death of new shoots.

Autumn gum moth: Autumn gum moth has not been a significant pest during 2002. Only minor damage has been experienced on young plantations in the Albany region.

Leaf beetles: Several species of *Chrysophtharta* caused some damage to plantations two years and older throughout the plantation estate. Species of *Paropsis* were extremely rare in all ages of plantations. The cryptocephaline *Cadmus excrementarius* caused some defoliation but was late in emerging this year (January - February). Older plantations were also damaged by this species but not as severely.

***Heteronyx* spp:** Several species of *Heteronyx* have been recorded causing severe defoliation to the growing tips of all aged trees, but is concentrated mainly in the Wellstead area (100km east of Albany).

***C. fiscella*:** Positive confirmation was obtained of *Cardiaspina fiscella* by Mary Carver (CSIRO Canberra) on 6 Nov 2001. The host was *Eucalyptus robusta*, at an Albany, plantation on Hanrahan Rd which runs into Princess Royal Drive. The major insect collections at Dept Conservation and Land Management, AG WA and the Western Australian Museum were contacted on 6/11/2001 and all collections confirmed no records of *C. fiscella*. A *C. fiscella* incursion into WA was concluded. Authorities were alerted, however further searches established a wide spread distribution throughout the south-west. Consequently, since this insect was not considered a problem no further action was taken. (JF and A.Loch)

Eucalyptus occidentalis

Port Lincoln (28) Parrot / White Correllas: Not as much a problem in the Midwest this year as closer to Perth. To date the greatest damage seems to be to some of our Eucalyptus (mainly E. occidentalis) they produce a lot of mallee forms which is upsetting the Farm Forestry people. (J.Lette)

MANAGED NATURAL FORESTS
Eucalyptus marginata

Jarrah leaf miner: 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 two to three years. A project investigating the control of Jarrah leaf miner through selective retention of resistant trees has been initiated. The initial area was 9ha and this was cut down to a more manageable 1ha area, which was cleared of all susceptible coppiced trees in 2001. It is anticipated that this 1ha area will be kept clear of all susceptible trees in the future. (A. Wills, T Burbidge)

***Uraba lugens*:** Populations of gum leaf skeletonizer remain low in the southern Jarrah forest. A paper on the biology of this insect in WA has been published this year. A further paper on its spatial distribution during the outbreak period is near completion. (JF)

Defoliation Trial at Holmes Block near Dwellingup
The annual defoliation of the jarrah coppice at Holmes Block near Dwellingup was carried out last December. No new deaths of the jarrah coppice were recorded and the 100% defoliated trees put on very little or any new growth increment. (T Burbidge)

Biodiversity study: A biodiversity study has been initiated in the Western Australian Jarrah forest. This project, called FORESTCHECK, aims to measure the biodiversity of jarrah as influenced by forest management practices. The project is all encompassing and will measure 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, a total of 588 morphospecies > 1cm were collected. The next monitoring season will commence in spring 2002 at a new group of sites. (JF)

NATIVE PLANT COMMUNITIES
Eucalyptus wandoo

Monitoring of crown decline and recovery of *Eucalyptus wandoo* in Talbot forest block, using time series photography continued to autumn 2002. Jack Mercer, a consultant from Albany, has been asked to do a complete survey by Ken Wallace, CALM's Wheatbelt Regional Manager, of the *Eucalyptus wandoo* over its known range to find out how widespread the crown decline is. He was given three months to do this and his report on his findings will be published soon. (A. Wills)

URBAN TREES

Cape Lilac (White Cedar): The White Cedar Moth (*Leptocneria reducta*) outbreak in suburban Perth again became obvious in Victoria Park. Reports were made to CALM from concerned members of the general public. (T. Burbidge)

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT FOREST INSECT COLLECTION

The databasing of the CALM Terrestrial Insect Collection has progressed during 2001-2002. Since July 2001 over 11 600 specimens have been databased. This constitutes approximately 75% of the collection. (T. Burbidge)

3. WESTERN AUSTRALIA 2001/2002 - DISEASES

***Richard Robinson* (Compiler)**
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Plantations
Pinus radiata
Diseases
No major problems reported.

Eucalyptus globulus
Diseases
No major problems reported. Research continues on *Mycosphaerella* leaf blights and *Endothia gyrosa* and other cankers in *Eucalyptus globulus* plantations (see Research and Development).

Managed natural forests
*Jarrah forest (*Eucalyptus marginata*)Biodiversity study: A biodiversity study, called FORESTCHECK, has been initiated in the Western Australian Jarrah forest (see Pest Section). FORESTCHECK is not a strict pest and disease survey but a program to monitor ESFM. The first set of sites was established in the southern jarrah forest near Manjimup. Fungal diversity is included in the monitoring program and was completed in June 2002, with about 190 species of macro fungi being recorded (R. Robinson, CALM).*

Diseases
No new major pathological problems reported. Management and survey of *Phytopthora* root disease in jarrah (*Eucalyptus marginata*) forests and management of *Armillaria* root disease in karri (*Eucalyptus diversicolor*) continues to command attention (see Forest Health Surveillance and Diagnosis, and Research and Development).

Nurseries
No major problems have been reported in either hardwood or conifer seedlings in nurseries. One report of Hainesia lythri blight on *Eucalyptus torquata* seedlings (E. Davison ,Cutrin Uni.)

Native plant communities
Diseases
Management of *Phytopthora* root disease in susceptible plant communities. Treatments and outcomes for 2001 include; (1)Nineteen sites covering a total of 165 ha was aerially sprayed with phosphite in 2002, comprisng 126 ha in Stirling Range National Park and 39 ha on road reserves, nature reserves and private property south of Busselton. This was the second largest area sprayed in a year since operational application of phosphite commenced in 1995. (2) Twelve critically endangered and endangered species were treated with phosphite in the Stirling Ranges and three near Busselton. (3)All sites in the Stirling range burnt in the 2000 wildfires were sprayed at only half the normal rate because the target species were only small seedlings. (4) Rate of spread of disease front measurements in the Albany district show a rate of spread in sprayed areas 5 to 12 times less than in unsprayed areas. (5) Sampling for phosphite levels in plants at the Stirling Range N.P. shows rather low levels of uptake and re-spraying of some sites may be required this spring rather than next autumn. (6) Monitoring of survivorship of the endangered species at the Blackwood District sites shows no increase in deaths since last year (R. Smith, CALM)

Monitoring of a canker disease in a small population of the endangered *Eucalyptus phylacis* south of Busselton continues. Preliminary treatment that involved coppicing one individual has proved to be successful, with new vigorous growth showing no signs of the canker (R. Robinson, M. Spencer and K. Wiliams, CALM).

Urban and rural

Tuart (*Eucalyptus gomphocephala*) Decline

A decline in the health and vitality of tuart trees in the Lake Clifton-Yalgorup area, south of Perth, has been observed since the mid-1990s. The reason for the decline is unclear but is thought to include a declining rainfall, soil and hydrological factors and altered fire regimes. It is linked with heavy infestation of wood-boring insects. Government and Community based action is underway to investigate the causes behind the observed decline. An initial step was taken by the Minister for Environment and Heritage to establish a Tuart Response Group. The TRG recently held a Tuart Science Workshop to review current knowledge on the decline and to consider future directions for research (R. Robinson, CALM).

Wandoo (*Eucalyptus wandoo*) Decline.

Wandoo trees in woodlands and on farms east of Perth are currently experiencing an unexplained decline similar to the tuart decline. The decline was first noticed in the mid-1980s and intensified in the 1990s. A local community group, the York Land Conservation District Committee, has prepared an Action Plan that was endorsed by the Minister and CALM has initiated a preliminary monitoring program (A. Wills, M. Stukely, CALM).

Diseases

Mundulla Yellows

Monitoring has continued. Symptoms have been noted in several eucalypt species, and tests for MY-RNAs (by D.Hanold, The University of Adelaide) were positive in samples of symptomatic *C.calophylla*, *E.salmonophloia*, *E.loxophleba* and cultivated *E.camaldulensis*. 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 stands. An article was published in CALM's magazine *Landscope* [D.Hanold et al, 2002; Landscope 17(4): 41-47]; reprints are available on request (M.Stukely, CALM).

Forest health surveillance and diagnosis

Dieback mapping

In the period July 2000 to June 2001, CALM Forest Management Branch mapped the presence of *Phytophthora cinnamomi* disease symptoms and defined protectable areas on over 38,000 ha of native forest. Approximately 17,400 ha of previously mapped forest was rechecked. A variety of other mapping and inspections were carried out for other government agencies and private companies or individuals. During the preparation of the WA Forest Management Plan information was required to assess the impact of future disease on sustained timber yields. Investigations were carried out to define rates of spread of *P. cinnamoni* within different ecosystems. Prescriptions for planning of silvicultural operations were modified based on considerations of *P. cinnamomi* impact on vegetation complexes. Training programs were delivered for both Disease Detection and Hygiene Management (G. Strelein, CALM).

Between July 2001 and June 2002, a total of 1,155 samples were processed for *Phytophthora* identification by CALM's Vegetation Health Service (VHS). *P.cinnamomi* was detected in 440 samples, *P.citricola* (64), *P.cryptogea* (15), *P.megasperma* (2), and *Phytophthora* sp. (2). A small number of other tree health and nursery problems were investigated (M.Stukely, CALM).

Research and Development

Plantations
Eucalyptus globulus
Diseases
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)

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).

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.

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
Corymbia calophylla
Diseases
Honours Projects in progress at Murdoch University
Canker fungi associated with deaths of *Corymbia calophylla* (marri). Trudy Paap (Supervisors: G. Hardy, MU, Bryan Shearer, CALM and Jen McComb, MU)

Jarrah forest (Eucalyptus marginata)
Diseases
Dieback-resistant jarrah (*Eucalyptus marginata*): The second stage of a production seed orchard of dieback resistant jarrah clones is being established at the Forests Products Commission's Plant Propagation Centre near Manjimup in 2002. Field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have continued (M.Stukely, CALM).

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).

SPIRT Large. 2000-2003 at $200,000 (Alcoa, Worsley Alumina, CSIRO). A comparison of ectomycorrhizal biodiversity in rehabilitated mines and adjacent indigenous forest sites. (An emphasis on molecular tools for the characterisation of the different fungi on roots). (Investigators: G. Hardy, MU, Inez Tommerup, CSIRO, Ian Colquhoun- Alcoa World Alumina, Neil Bougher, CSIRO and Phil O'Brien, MU. Postdoctoral Fellow Morag Glen).

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: Rose Daniel (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

The uptake and distribution of phosphite in *Eucalyptus marginata* and how this effects *Phytophthora cinnamomi.* (R.Pilbeam; Supervisors G.Hardy, MU, and B.Shearer, CALM).

Early disease development of *Phytophthora cinnamomi* in *Eucalyptus marginata* growing in rehabilitated bauxite mines as influenced by waterlogging and drought. (Anne Lucas; Supervisors, G.Hardy and J. McComb, MU). **Funded by ARC LINKAGE.**

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.

Biochemistry of host plant defences induced by phosphite in response to *Phytophthora cinnamomi.* (Emma Groves; Supervisors Giles Hardy and Treena Burgess, MU).

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*)

Diseases

Armillaria root disease:

Recent research has shown that intensive above ground surveys for ARD in 25-30-year-old karri regrowth stands on high quality sites underestimated the true levels of disease by 20-40%. Examination of roots showed that 30-60% of the dominant trees were infected (R. Robinson, CALM).

Native plant communities
Diseases

Biology, ecology, pathology and control of *Phytopthora* spp.
Work under the following grants is in progress at Murdoch University.

Special Research Grant. The interaction of phosphate and phosphite on *Phytophthora cinnamomi* control *in planta.* (Bernie Dell and Giles Hardy, MU).

PhD Theses in progress at Murdoch University
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**

Honours Projects.
Potential fungal pathogens associated with the decline of Tuart (*E. gomphacephala*) in Western Australia. (Martin Landolt; Supervisors M. Calver and G. Hardy, MU).

4. VICTORIA 2001/2002 - PESTS

Plantations (Pinus spp.)

Sirex noctilio

In Victoria, the incidence of Sirex over summer 2001-2002 remained low. As in previous years, nematode samples collected from the field have been forwarded to Canberra to identify the strains of nematode currently present in Victorian plantations, in order to determine their infectivity and whether additional inoculations with the preferred strain are required.

Ips grandicollis

Apart from isolated minor outbreaks involving small plots of trees in the north-east of the state, *Ips grandicollis* and other bark beetle species (*Hylurgus* and *Hylastes*) have not presented a major problem *in P. radiata* plantations in Victoria during 2001-2002.

Essigella californica

Essigella 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*. Monitoring is continuing on both aphid population and defoliation levels at a number of sites around the state.

Eulachnus thunbergii (Pine Aphid)

Victoria has not recorded any E. thunbergii to date.

Plantations (Eucalyptus spp.)

Autumn Gum Moth

Mnesampela privata (Autumn Gum Moth) defoliation has occurred at low levels predominantly in E. globulus plantations throughout Victoria during autumn/winter 2001.

Leaf beetles

Species of leaf beetle including *Chrysophtharta and Paropsis* caused low to moderate defoliation of young stands in the Gippsland and north central regions of Victoria with damage predominant in the upper 50% of the tree crown.

Other beetle species

Christmas beetles (*Anoplognathus* spp.) have been observed at trace levels only defoliating young one-year old *E. globulus* plantations in the Latrobe Valley region of Victoria during summer 2001-2002 with no significant damage being recorded.

Sawflies

Sawflies have caused trace to low levels only of defoliation in north-central Victoria and Gippsland during autumn/winter 2002. Monitoring is continuing to assess further damage over the winter period.

Borers

Borers of the species *P. acanthocera* were observed in eucalypt plantations in East Gippsland attacking *E. saligna* although the attack was confined to individual trees within the stand. Cossid moth attack on individual trees was also observed. Monitoring will continue to observe whether levels of attack increase.

Psyllids

Cardiaspina retator has caused moderate defoliation to predominantly *E. camaldulensis* plantings in northern Victoria during summer/autumn 2002 although as with last year, this damage was confined to individual plantations and not widespread across the region.

Other Pests of Eucalypts

Minor damage to E. saligna and E. globulus plantations in Gippsland has been observed by cockatoos (species unknown) ringbarking trees in search of cossid moth larvae during summer 2001/02.

Managed Natural Forests (Eucalyptus spp.)

Didymuria violescens

In Victoria, *Didymuria violescens* which caused damage to Alpine ash and mixed species forests in the Kiewa area of north-east Victoria during the 2001 summer was observed at trace levels only during summer 2002. As this pest has a two year lifecycle, monitoring will continue as the pest could have been midway through its development. Sampling egg levels in the litter to determine populations this summer will be conducted over winter 2002 in conjunction with SFNSW.

Monitoring and Surveillance

Monitoring of three major Victorian ports (Melbourne, Geelong and Westernport) is continuing for the Asian Gypsy Moth over summer 2001-2002 as part of a nationwide monitoring program. No AGM were detected. A new reusable trap will be trialled this coming year in place of the disposable Delta trap used previously.

A Forest Health Surveillance program was commenced within Hancocks Victorian Plantations during 2001/2002. Monitoring is also continuing for specific pest insects within native forests in Victoria.

Research and Development

- A paper on the the effects of repeated defoliation on the growth of E. globulus in plantations in north central Victoria has recently appeared in Australian Forestry. Studies are continuing to examine the longer term effects of this defoliation in more detail

- Studies on the ecology of invertebrates on heathland in East Gippsland and the Grampians are in the process of being written up.

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123 Brown Street, Heidelberg, Victoria, 3084

5. VICTORIA 2001/2002 - DISEASES

RESEARCH WORKING GROUP 7 (FOREST HEALTH)

Forest Disease Situation VICTORIA July 2001

Ian W. Smith, Forest Science Centre, Department of Natural Resources and Environment, PO Box 137, Heidelberg, Victoria, 3084

1. Plantations

1.1. *Pinus radiata and other species*

A Forest Health Surveillance program was commenced within Hancocks Victorian Plantations during 2001/2002. No major outbreaks of disease were observed.

Dothistroma

Due to the continued dry conditions in Victoria, *Dothistroma septospora* continued to show low levels of disease, and no spray programs were conducted in the State for 2001/2002.

Cyclaneusma Needle Cast

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

Other

Diplodia in association with drought, is also causing dead topping and death of trees in some plantations throughout the State. High salinity is also causing deaths of *Pinus* and *Cupressus* shelterbelts, particularly in costal areas of Western Victoria and South Gippsland.

Bursaphelenchus

Surveys for exotic *Bursaphelenchus* nematodes continued to be a major focus of the Forest Health program within the Forest Science Centre. The following summarises findings to date:

- Since February 2000, '*Bursaphelenchus*' nematodes have been isolated from 35 pine trees out of 171 trees tested within a 60km radius of Melbourne that have died rapidly (generally over a 6-12 week period). With the continued eradication program, there has been a drop in the percentage of tested trees infested with the nematode from 22.4% (33 trees out of 147 tested from February 2000 to June 2001) to 8.3% (2 out of 26 tested in summer/autumn of 2001/2002) (Figure 1). All trees found to be infested with the nematode were removed and destroyed. *Bursaphelenchus* nematodes were not isolated from any of the 92 pine trees tested within Victoria, outside of the 60km zone around Melbourne.

- There were possibly two nematode genera isolated of concern as potential new incursions. A *Bursaphelenchus* sp (similar to *hunanensis*) and a possible *Ektaphelenchus* sp. closely related to the genus *Bursaphelenchus*. *Bursaphelenchus xylophilus* was not isolated from any of the samples collected as determined by morphological examination by Dr Mike Hodda of CSIRO. This was confirmed by DNA extraction by Ann Lawrie at RMIT University.
- These '*Bursaphelenchus*' type nematodes have only been isolated from dying trees within a 60km radius of Melbourne. No samples tested from interstate contained these nematodes. A different *Bursaphelenchus* sp. was isolated from Queensland and is believed to be similar to a species isolated from *Ips grandicolis* beetles in NSW in 1989.
- While some trees have had high numbers of nematodes within them (up to 700/g wood) most have had only a few (<1/1g wood). However this may just be a reflection of the different stages in the life cycle. The dispersive stage may be difficult to pick up within the tree.

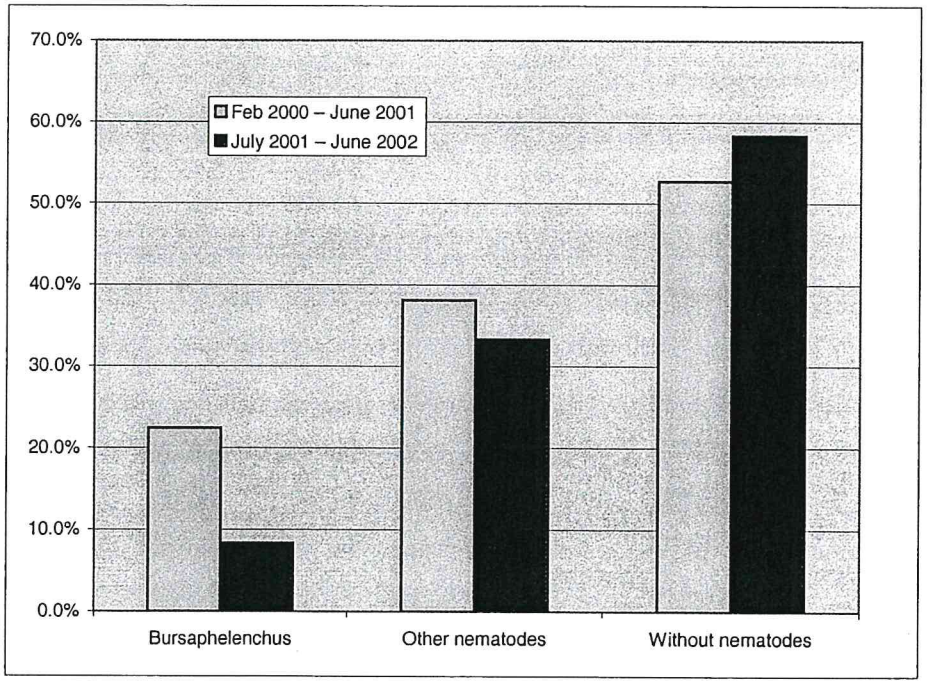

Figure 1. Percentage of dying pine trees within a 60km radius of Melbourne from which nematodes were isolated.

- Pathogenicity tests were conducted without success and therefore Koch's postulates have not been proven. Attempts to culture the nematode have not been successful. Wood samples and nematodes extracted from affected trees and placed back into healthy trees have not as yet produced any symptoms.

- *Arhopalus rusticus* (a pine longicorn beetle) have been recovered from caged billets from many of the dying trees taken following tree removal. These beetles are believed to only attack trees that are dying or under stress due to other factors. However the damage caused by these beetles in standing trees is of concern due to the extensive galleries created in the trunk which may lead to stem failure. '*Bursaphelenchus*' type nematodes were isolated from some *A. rusticus* beetles. In total 210 *Arhopalus* beetles emerging from caged wood billets from nematode infested trees were tested for the presence of nematodes but only 4 nematodes were extracted from beetles from 1 tree (from an extraction from a squash of 40 beetles). It is likely that only one beetle was carrying the nematodes. Exit hole of *Arhopalus* beetles and larvae in the trunks have also been observed in dying trees associated with other causes (eg. salt, ringbarking, poison, etc.). It appears that the beetle is well established in Melbourne and is spreading rapidly into areas in the outer environs of. Melbourne.
- *Ips grandicolis* have also been recovered from branches from many of the removed trees.
- No *Monochamus* species have been detected in either light or pheromone traps deployed over the summer.
- Pine trees affected have generally been large and over 40 years of age. Most over 60 years.
- In the 60km zone around Melbourne, rapid deaths of pine trees have also occurred in 136 trees from which no '*Bursaphelenchus*' were isolated. However sampling problems involving the stage of life cycle may have resulted in false negatives.
- Other nematode genera were isolated from around 38 and 33% of the trees tested in February 2000 - June 2001 & July 2001-May 2002 surveys, in the Melbourne zone from which no '*Bursaphelenchus*' spp. were isolated (Figure 1). These nematodes have been preserved for further identification at a later date (as part of the FWPRDC PhD project). They are believed to be secondary species feeding on blue-stain fungi.
- Although other conifers have also died (particularly Monterey Cypress), no nematodes have been isolated from them.
- Other factors involved in the tree deaths have included drought, poison, ring-barking, soil disturbance/root damage, high salinity, *Armillaria*, *Sphaeropsis* (for the pines) and Cypress canker (for the Cupressus). High salinity has been associated with most of the dying conifers occurring along the coastal regions of Victoria including many trees tested within the Southern and Western suburbs of Melbourne. The recently recorded exotic

Velvet Top Fungus (*Phaeolus schweinitzii*) was also associated with dieback and brown rot in some of the trees observed (Figure 2).

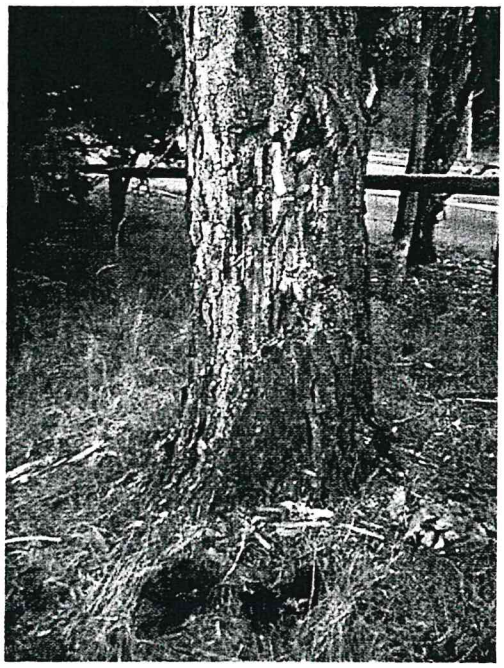

Figure 2. Brown rot in 50 year-old *Pinus radiata* in Melbourne associated with *Phaeolus schweinitzii*.

- The hypothesis (proposed by Dr Mike Hodda of CSIRO) that the population of nematodes present in Melbourne is possibly not a breeding population because the vector that introduced it may have failed to establish, appears to be holding as only two trees during this summer were shown to contain the nematode. On this basis the number of infested trees should continue to decline next year (approximate maximum lifespan of the nematodes is 2 years).
- While the identity and pathogenicity of the '*Bursaphelenchus*' spp. isolated is still unclear, it would appear that only 20% of the total number of dying pine trees tested within a 60km radius of Melbourne with the characteristic observed rapid death, contain the nematode, and at levels that could be considered not to be the primary cause of death. However, the isolation frequency and population levels may reflect the stage of the life cycle of the nematode.
- It is probable that other factors such as previous drought/salinity may be the predisposing factor that is leading to tree deaths by other causes such as nematodes, *Sphaeropsis*, etc.
- The National Coordinating Committee has recommended that the eradication program continue until June 2003 albeit in a reduced form. The program is to include:

- Continued monitoring for nematodes within any further dying pine trees within the Melbourne area to determine if eradication has been successful and/or that the population of the nematode has not established.
- Complete the rearing of any insects from wood billets taken from the two infested trees that were destroyed in 2001-2002, and check for nematodes.
- Continued deployment of light and pheromone traps over Spring/Summer 2002/2003 to check for the presence of *Monochamus* beetles and other potential vectors.

- FWPRDC has agreed to the funding of a PhD to undertake research into nematodes in pine and related conifers in south eastern Australia. It is proposed to conduct a systematically designed, stratified survey of the nematode fauna in *Pinus* in south eastern Australia to identify and characterise the nematode fauna. The biology and pathogenicity of *Bursaphelenchus* spp. will be determined and methods for reliable and efficient detection developed. The research is to be carried out by a student based out of Adelaide University under the supervision of Dr Ian Riley with external supervision by nematologists Dr Kerrie Davies (Adelaide University) and Dr Mike Hodda (CSIRO, Canberra) and Forest Pathologist, Mr Ian Smith (DNRE, Victoria). State Forest Pathologists and Forest Health Surveillance Officers will be approached to assist in collection of material for study. Regular progress reports will be circulated.

1.2 Eucalypts

Very little disease has been recorded in eucalypt plantations in 2001/2. *Mycosphaerella* spp. has caused severe defoliation of foliage in *Eucalyptus* plantations grown for foliage in south-central Victoria.

2. Managed natural forests

2.1. *Eucalypts*

Few diseases were reported from native forest during 2001/2.

3. Nurseries

3.1. Conifer

Monitoring of nurseries for *Phytophthora cinnamomi* remains a high priority so as to reduce the further spread of disease.

3.2. Eucalypt

Botrytis was the main pathogen causing disease in eucalypt nurseries in Victoria. Nutrient deficiencies were also prevalent.

4. Native Plant Communities

Few diseases were reported from native forest communities during 2001/2002.

5. Urban

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.

Symptoms similar to Mundulla Yellows were recorded from street, garden and parkland eucalypt trees from Lara (near Geelong).

6. NEW SOUTH WALES 2001/2002 – PESTS AND DISEASES

PINUS RADIATA (AND OTHER TEMPERATE PINES)

PESTS

Sirex Wood Wasp (*Sirex noctilio*)

The incidence of naturally struck trees remains low in State Forests of NSW pine plantations, with mainly suppressed trees attacked. Localised areas (~800 ha) in Buccleuch State Forest, Hume Region, had levels of *Sirex* mortality over 1% (up to 3%), similar to last year. *Sirex* was not significant in any other region in NSW.

Sirex was detected in trap trees in Mount Mitchell State Forest, east of Glen Innes, for the first time. There was also evidence of *Sirex* in trap trees at the Copeton Dam *P. radiata* plantation, south west of Inverell. Private plantations and shelter-belt plantings north to Tenterfield were also inspected for *Sirex* (in June 2002). Emergence holes (from last years flight season) were observed in a single tree in a private plantation at Tenterfield. This is the northern most detection of *Sirex*.

Five Spined Bark Beetle (*Ips grandicollis*)

There were no significant outbreaks of *Ips* in the pine plantations surveyed in 2002.

Wingless Grasshopper (*Phaulacridium vittatum*)

There were no serious outbreaks of wingless grasshoppers in the pines this year.

Monterey Pine Aphid (*Essigella californica*)

The area affected by *Essigella californica* had increased in 2001 compared to the previous year. This was observed as chlorosis of foliage and upper-crown needle cast, especially in older age classes. In Hume Region, approximately 40,000 ha were affected. Most of the damaged stands were older age classes (20-years-plus), where over 25% of trees had moderate to high damage levels. Vast areas in Buccleuch State Forest, Bago State Forest, Carabost State Forest, Green Hills State Forest and Munderoo State Forest were affected, with plantation having a "yellow" cast during the aerial survey. In Northern Region, over 600 ha in Hanging Rock State Forest were affected, again in older age classes. Lower levels of damage were observed in Armidale State Forest, Mt. Topper State Forest and Spirabo State Forest. Approximately 4500 ha were affected in Macquarie Region, in Mullions Range State Forest, Pennsylvania State Forest, Roseberg State Forest, Vittoria State Forest, Canobolas

State Forest and Glenwood State Forest. In Monaro Region, yellowing associated with *Essigella californica* was widespread in older age classes in the Moss Vale plantations.

Chlorosis of lower foliage on these trees, especially younger age classes, was also attributed to *Cyclaneusma minus*.

Monitoring for *Essigella californica* was carried out in 2001-2002 at two sites in Carabost State Forest, Hume Region. Both sites showed increased numbers both in affected trees and aphid numbers compared to 2000. This increase was the reverse of the trend seen in 2000. Another trend seen for the first time this year was the increased length of aphid activity, in past years aphid numbers had reduced significantly by June. However, this year the numbers are still high in June.

State Forests of NSW continues to contribute to funding for the PhD studies of Trudi Wharton, on the "Biology and ecology of *Essigella californica* (Hemiptera: Aphididae: Lachininae) on *Pinus radiata*".

Pine Aphid (*Eulachnus thunbergii*)

Eulachnus thunbergii was detected for the first time in Carabost State Forest in June 2002. The previous distribution of the aphid in NSW had it only as far south as Oberon; however, during the monitoring for *Essigella californica* a single individual was detected. Trudi Wharton has also recently found and identified *E. thunbergii* from the south coast of NSW and in southern Victoria. Other state agencies (Victoria and South Australia) were notified of this change in distribution.

Painted apple moth (*Teia anartoides*)

Damage from this insect was significant in NSW in 2001.

Diseases

Dothistroma septosporum

Levels of *Dothistroma* needle blight were higher in NSW than last year. This followed above average rainfall in many areas in NSW where *P. radiata* is planted. In the *P. radiata* plantations on the Northern Tablelands (Northern Region), over 2000 ha were severely affected. The area affected is similar to previous years, but the severity of damage was higher in 2001 than in 2000, with large areas having over 30% and higher severity. Plantations significantly affected were in Nowendoc State Forest, Nundle State Forest, Riamukka State Forest and Mt Mitchell State Forest. *Dothistroma* needle blight was more significant in Hume

Region, but mainly in localised areas in Buccleuch State Forest, Bago State Forest, Carabost State Forest and Green Hills State Forest. The area affected was slightly higher than previous years. Levels of *Dothistroma* were lower in Monaro Region than previous years, with just over 400 ha affected, mainly in Nalbaugh State Forest and Coolangubra State Forest. *Dothistroma* needle blight was not significant in Macquarie Region.

Cyclaneusma minus

Cyclaneusma needlecast was widespread in *P. radiata* plantations in all production regions. A Ph.D. student at Deakin University, a project sponsored by State Forests of NSW, is looking at variation in populations of *C. minus* in Australia and New Zealand, and seeking molecular markers for resistance in the *P. radiata* breeding population.

Sphaeropsis sapinea

Drought-related *Sphaeropsis* damage was a significant problem in Macquarie Region in 2001, with over 4000 ha affected. Damage was observed as dead tops and dead trees, and in some cases as high as 20% in localised areas. Pennsylvania State Forest and Vittoria State Forest were the worst affected, with lower levels of damage in Canobolas State Forest, Mount Davis State Forest and Gurnang State Forest. Approximately 3000 ha were affected in Hume Region, mainly in Buccleuch State Forest, with lower levels in Carabost State Forest. *Sphaeropsis* was not significant in Monaro or Northern Regions.

Armillaria novaezelandiae

Low levels of mortality (~1%) associated with *Armillaria* were observed in young *P. radiata* plantations on ex-*Araucaria* land north of Urbenville. Continued mortality is expected.

ENVIRONMENTAL

Drought

See related section on *Sphaeropsis*.

Frost

Frost had caused low levels of mortality and needle necrosis (<1% incidence) in several state forest in Macquarie Region (eg. Mount David State Forest).

Hail

Widespread hail damage occurred in Glen Allen State Forest (Monaro Region) in 2001, with approximately 50 ha "written off" due to severe damage levels of between 50-75% of trees

damaged. A further 200 ha were affected at reduced levels of damage ranging from 25% (55 ha) down to 10% (150 ha). More recently, a hailstorm damaged young pines in Bondi State Forest. This will be assessed in August 2002.

SITE RELATED PROBLEMS IN *P. RADIATA* PLANTATIONS

Weeds

Weeds, mainly *Acacia*, were a problem in younger age classes in Macquarie Region (Lidsdale State Forest, Sunny Corner State Forest, Gurnang State Forest and Vulcan State Forest), Hume Region (Buccleuch State Forest, Bago State Forest, Carabost State Forest, Green Hills State Forest and Maragle State Forest), Monaro Region (Bondi State Forest and Belanglo State Forest), and small areas in Northern Region (Nowendoc State Forest and Koreelah State Forest).

Nutrient disorders

Boron deficiency was the main problem observed, mainly in younger age classes grown on ex-pasture sites, eg in Northern Region (Crofts Knoll), Hume Region (Carabost State Forest, Maragle State Forest and Buccleuch SF), Macquarie Region (Vittoria State Forest and Vulcan State Forest) and Monaro (Oak Range) Regions. Areas were not significantly larger than previous years.

Vertebrate pests

Possums

Possum damage was again the main problem in Monaro Region in 2001. Possums had caused significant damage to pines in Bondi S.F., Coolangubra S.F. and Nalbaugh S.F. The area of plantation affected by possums in Monaro Region has not changed significantly from 2000. The incidence of damaged trees, however, has decreased from previous years, with fewer trees having fresh damage.

Wallabies

Browsing from wallabies was a problem in young stands in several compartments in 2001. In most cases levels were <1% incidence (eg Nowendoc State Forest and Mt Mitchell State Forest in Northern Region).

Hoop pine (*Araucaria cunninghamii*)

No significant pests or diseases were noted in the *Araucaria* plantations during the year.

Eucalyptus species

PESTS

Psyllids

Creiis liturata was not observed in high numbers during surveys in late 2001 to mid 2002. Only trace levels were observed. Damage from *Cardiaspina* spp. was also not significant.

Leaf beetles / Chrysomelids

The main pest species were again *Paropsis atomaria* and *Chrysophtharta cloelia*. Damage was lower than previous years. Moderate to high levels of damage were observed in several larger plantations of *E. dunnii* and *E. grandis*. In addition, a new species of chrysomelid was observed causing widespread damage in Dorrigo.

Monolepta beetles (*Monolepta australis*)

There were no significant outbreaks of *Monolepta australis* this year.

Sawflies (*Perga* spp.)

Little damage from sawflies was observed in mid-2001 to 2002. There was no repeat of the severe damage observed in early 2001.

Christmas Beetles (*Anoplognathus* spp.)

Moderate levels of damage were observed in *E. dunnii* plantations around Taree and Gloucester in late 2001, but no further damage was sustained, with many damaged plantations recovering by March.

Stem borers

Stem borers, cossids and cerambycids, were again the major problem in plantations older than 3 years old. In most cases damage was below 5% incidence, with *E. grandis* the most susceptible species.

DISEASES

Aulographina eucalypti

Target spot was not a significant disease this year. Damage from *Aulographina eucalypti* was mainly restricted to older foliage in the young eucalypt plantations. There were no severe outbreaks, with the majority of damage being less than 5% severity. *Eucalyptus pilularis* and *E. nitens* were the most susceptible hosts.

Phaeophleospora epicoccoides

Phaeophleospora epicoccoides (= *Hendersonia grandispora*, *Phaeoseptoria eucalypti*, *Kirramyces epicoccoides*) caused significant defoliation in several *E. grandis* and *E. grandis* x *E. camaldulensis* plantations in northern NSW this year. Defoliation occurred from the ground up, and often resulted in over 50% and up to 95% defoliation of trees. The majority of trees affected were in lower lying areas. The defoliation often left trees with a red appearance (red colour of branches and branchlets), giving diseased plantations the appearance of a "red tide", and this is what the "locals" termed the disease.

A new species of *Phaeophleospora* is currently being described from *Corymbia* spp. The fungus causes leaf spots and is common but relatively un-damaging in young plantations and native regeneration in northern NSW.

***Mycosphaerella* leaf spots**

Mycosphaerella leaf diseases were not observed in significant levels during the forest health surveys in northern NSW this year (December 2001-April 2002).

Two new species of *Mycosphaerella* are currently being described from *Eucalyptus*. Neither cause significant disease in plantations.

Coniella fragariae

This pathogen was not significant this year.

Corymbia leaf and shoot blight (*Quambalaria pitereka*)

Levels of *Quambalaria pitereka* were lower than previous years. However, significant damage was observed in early 2002 in several *Corymbia* plantations around Grafton. Field trials of fungicides have been destroyed by frost.

Phytophthora

No evidence of damage from *Phytophthora* observed this year.

OTHER

Mistletoe

Mistletoe was observed at significant levels in several 5-year-old *C. variegata* plantations in northern NSW. Several plantations had levels as high as 25% of trees infested. There was evidence that dry conditions had caused mortality of mistletoes in several plantations. Several *E. dunnii* plantations were also infested.

MANAGED NATURAL FORESTS

EUCALYPTUS SPECIES

No noteworthy disease outbreaks were recorded in native forests in NSW this year.

NURSERIES

CONIFER SPECIES

No noteworthy disease outbreaks occurred.

EUCALYPTUS SPECIES

No noteworthy disease outbreaks occurred.

Native plant communities

A large number of urban trees around Sydney have been severely damaged by a true bug [Hemiptera] from the suborder Heteroptera, family Thaumastocoridae. Gerry Cassis, Head of the Centre for Biodiversity and Conservation Research at the Australian Museum, has untaken the task of identifying the species involved. Since last year the number of *Eucalytpus* species affected has increased from *E. scoparia, E. nicholli* to include *E. globulus*, *E. maidenii*, *E. bicostata*, *E. punctata* and *Corymbia maculata*. The symptoms of attack are foliage turning brown or bronze and then falling. Complete defoliation has been reported in some cases. Affected trees do produce new growth and trees defoliated last year have grown new canopies the following spring. However, the long-term effects of this insect on the urban tree resource are yet to be determined.

Dr Harley Rose and Annie Noack, University of Sydney are undertaking research on the bug, including life cycle information and control options.

No noteworthy disease outbreaks were recorded.

Quarantine

Peat Moss Fungus

An undescribed species of *Galerina* formed abundant basidiomata on potting mix prepared from peat moss imported from New Zealand. The incursion was reported to AFFA.

Phaeolus schweinitzii

The brown rot causing root and butt rot fungus *Phaeolus schweinitzii* was found to be widespread in the Melbourne area on species of *Pinus*. All earlier records of *P. schweinitzii* from eucalypts and from other States are misidentifications. The fungus has not been detected in NSW.

Pine pitch canker - *Fusarium circinatum*

The Pine Pitch Canker Contingency Plan was completed. The Plan was endorsed by Forest Health Committee and is with FFPC for publication. Cultures of *F. circinatum* are now held at Royal Botanic Gardens Sydney. Molecular probes are available at Royal Botanic Gardens Sydney, Queeensland DPI and New Zealand FRI.

Pine wilt nematode- *Bursaphelenchus hunanensis* and *Ektaphelenchus* sp.

Neither nematode, nor the putative cerambycid vector, has been detected in NSW.

Siricid wasps

There have been three interceptions of *Uroceras gigas* in container terminals in Sydney this year. As far as can be determined all these interceptions have been traced and destroyed.

Forest health surveillance and diagnosis

Surveys of approximately half of the hardwood /eucalypt Joint Venture and Land Purchase plantations were conducted by the Forest Health Survey Unit during summer and autumn. The remainder were surveyed by field staff. Forest health surveys of all Softwood plantations were completed through winter and spring 2000.

Research and development

1. A number of eucalypt tree-improvement trials were assessed for pests and diseases this year. These have also been measured for growth and form characteristics. This is collaborative work between Forest Health and Tree Improvement at R&DD. Several reports on early results have been written.

2. PhD candidate Paul Angel, at Southern Cross University, main supervisors Dr Doland Nichols (SCU) & Dr Christine Stone (SFNSW), co-supervisors Dr Angus Carnegie (SFNSW) & Dr Deborah Kent (SFNSW), *The dynamics and regulation of populations of Creiis liturata and the responses of its host tree, E. dunnii in plantations in north-eastern NSW: an assessment of its pests status and the development of pest management strategies.*

3. Stem borer research in hardwood plantations is ongoing, including tree-host susceptibility, effects of genetics and silvicultural on susceptibility, identification of agents (cossids, cerambycids, xylorictids, decay fungi), and collaboration on impact of stem degrade continuing with QFRI.

4. Susceptibility of *Pinus* species and hybrids to *Sirex noctilio.* Collaborative research with QFRI.

5. Studies of the life cycle, host susceptibility and distribution of the unidentified Thaumastocoridae attacking urban trees at The University of Sydney in collaboration with the Australian Museum.

6. Softwood tree improvement trials have been assessed for *Dothistroma,* with ongoing assessments for health in future trials.

7. Health assessments of Dryland and Salinity planting trials, including identification of damaging agents.

8. Forest Health has established two trials near Grafton to determine what spraying regimes will control Ramularia shoot blight on *C. variegata* in the field. The trials will also quantify the impact of Ramularia shoot blight on growth and form of *C. variegata.* The FSHU is working closely with forest pathologists at QFRI on this problem, who are looking at chemicals such as Salacylic acid and silicon to increase disease resistance in trees.

9. Plant Pest and Disease Database: Funding was secured by Dr Debbie Kent for SFNSW to link up with the Australian Plant Pest Database using Biolink software. The SFNSW insect and fungal collections are very valuable assests, and regularly used by forest health officers.

This funding is the initial phase in modernising access to the collections. A second round of funding has just been secured.

10. *Application of RGAs, AFLP, Microsatellites and RAPD to develop MAS selection for* Cyclaneusma minus *in* Pinus radiata: This project is developing marker assisted selection for *Cyclaneusma minus* in *Pinus radiata*. This fungus is the most common and widespread pathogen in *Pinus* plantations in N.S.W. and temperate Australasia. There are two main objectives:

11. (a) To develop a linkage map using multi locus marker systems such as resistance gene analogs (RGAs), AFLP, RAPD and Microsatellites (Tagged), that will be used to study polymorphisms among *Cyclaneusma minus* resistant and sensitive *Pinus radiata* and also within *Cyclaneusma minus* strains. The *Pinus radiata* will come from clones, parents and families of the State Forests of NSW breeding population.

12. (b) To develop tightly linked markers for *Cyclaneusma minus* resistant and sensitive *Pinus radiata* by performing bulk segregation analysis. The tightly linked marker will be mapped as linkage map of *Pinus radiata* (as outlined in objective 1). Efficient protocols for routine marker assisted selection (MAS) will be developed by using breeder's DNA analysis system.

13. Decays in young pruned eucalypt trees: Pruning offers prospect of increasing yield of high value clearwood from plantation grown trees. However, pruning is expensive and can provide entry sites for pathogens and wood boring insects. Pruning may also slow growth of trees, placing them under increased physiological stress and possibly making them more attractive to cerambycids and xyloricticds. Trials have been established at Kennaicle Creek and Fridays Creek and investigation into the effects of pruning on different species of eucalypt, season of pruning, and height of pruning on incidence of attack by insect wood borers and of decay is continuing.

14. *Bega Valley Dieback Rehabilitation Project (a Joint SFNSW/NHT):* This collaborative project was partially funded by the National Heritage Trust. The study site of specific interest to SFNSW is within Yurammie SF and has been badly affected by bell miner dieback. Field measurements have been completed and the project will be written up by early 2003

15. Airborne Assessment of Forest Health (WAPIS) in Native Forests: This collaborative SFNSW/CSIRO FFP project was funded by FWPRDC has recently concluded. The team successfully developed an indicator of eucalypt canopy condition from high resolution, multispectral remotely-sensed imagery. The project has received positive attention, both nationally and internationally.

16. Olney Bell miner Dieback Study: This trial has been intensively monitoring the impact of Bell miner dieback since late 1998 in a study site in Olny SF. Measurements have now been completed and analysis of the results will commence before the end of 2002.

17. Cumberland SF Bellminer Dieback Study: This comprehensive multi-disciplinary study has just began with the collaboration of Cumberland SF management. It will attempt to identify the predisposing factors that are associated with eucalypt crown dieback observed in the presence of bell miners. The information will then be utilised to formulate recommendations on possible amelioration strategies.

18. Application of Multispectral Imagery to the Management of Pine Plantation Condition and Productivity: Contracts for this collaborative SFNSW/CSIRO FFP project have just been signed with FWPRDC. The project aims to provide recommendations for the acquisition, processing and incorporation of multispectral imagery of canopy condition into an operational GIS, with associated cost/benefit analyses. These recommendations will be supported by an operational manual and CD for use by plantation growers. Apart from the direct benefits relating to the monitoring and management of plantation health, optimising silvicultural prescriptions, and facilitating risk management the synergism arising from integrating this information with other spatial coverages (climate, terrain, soils) will greatly improve the capacity for spatial modelling and the development of decision support systems and forecastingmodels for resource management (e.g MRVEL).

19. Eucalyptus Biological Agent Resistant Clones: The search for plantation trees exhibiting some degree of resistance to insect herbivory is on-going. Dr Stone is jointly supervising a PhD student based at ANU after the successful application of a SPIRT grant. The PhD project is entitled 'Insect resistance traits of Eucalyptus for the NSW forest plantation industry'.

20. Soil-applied Insecticides for Eucalypt Plantation Establishment: This is collaborative project with Bayer has involved the successfully completion of a series of glasshouse trials testing the the systemic insecticide Imidacloprid against chrysomelid larvae and adults. As a result of the encouraging results obtained from the glasshouse trials an experimental plantation was established on a site adjacent to the Mandalong Work Depot, near Morisset. Insect bioassays using foliage material from this plantation has commenced.

21. Taxonomic studies of leaf spot fungi of Myrtaceae: several new species are currently being described, including two species of *Mycosphaerella* and a *Phaeophleospora*.

22. Studies on the impact of possums in Monaro Region, in collaboration with Research Division and Softwood Plantations Division, are ongoing.

7. TASMANIA 2001/2002 – PESTS AND DISEASES

Pests and diseases status report for Tasmania 2001-2

Pathology

Plantations

Pinus radiata

Foliage

Detection of moderate level of spring needle cast in the Plenty Valley area of southern Tasmania this year has expanded the known range of susceptible plantations. New plantations in the Ringarooma area (northeastern Tasmania) are also likely to increase the nett area of plantation affected by the disease. An analysis of management strategies to reduce the impact of spring needle cast was done for Rayonier.

Dothistroma was more prevalent this year (9.6% of trees) than in 2000-1 (3.6% of trees) in 3-year-old plantations across northern Tasmania. However severity of disease was low with only 1.5% of trees showing >25% defoliation. The greater incidence of *Dothstroma* follows 2-3 months with above-average rainfall during the 2001-2 growing season.

Isolated trees with severe needle bleaching have been found in a number of plantations throughout the State. Although culturing of bleached needles has yielded *Alternaria* sp., a confident diagnosis has not been made.

Shoots and stems (including Diplodia dieback)

Crown wilt due to *Shaeropsis sapinea* continues to be found at low incidence in plantations throughout the southeast.

Phoma sp. was isolated from cankers associated with top death of two trees in an 8-years-old plantation in the southern Midlands. The pathogenicity of the isolate remains undetermined.

Fusarium lateritium was associated with flagging in a small patch of 5-6 year-old trees in a

southern Midlands plantation. The flagging was confined to the lower crown of affected trees.

Dead branches in scattered trees were found in a young plantation in the Upper Derwent Valley. Fruiting bodies in the bark of the branches were identified as *Cytosporella.* This is the first time this genus has been recorded in Australia.

The undiagnosed stem gall problem, first detected in 1999, continues to be found in new areas at very low incidence. Two affected trees with galls formed on previous the seasons shoots, were found in Saddleback Plantation (northeastern Tasmania).

Roots

No root disease problems were detected in P. radiata during the past year's health surveys.

Environmental

No environmental problems were detected in *P. radiata* during the past year's health surveys.

Eucalyptus species

Foliage

Mycosphaerella leaf blight (MLB) continues to cause significant defoliation of *E. globulus.* The disease was active throughout the winter – early summer 2001 in response to a wet spring-early summer. All *E. globulus* plantation areas in the Circular Head (Smithton) are at risk from MLB. Crown damage index of 2-year-old *E. globulus* plantations largely reflected damage caused by MLB in the Circular Head area. Six of ten plantation areas had CDI's in excess of 30%, with the most severe almost reaching 90%. Severe MLB was also seen in the southeast at Weilangta..

The timing of the initial MLB epidemic was strongly influenced by proximity to an inoculum source. Plantations established adjacent to an inoculum source suffered severe infection during the winter-spring months coming into the second growing season. However, in plantations established more distantly from a source of inoculum the initial epidemic was delayed by several months, or escaped epidemic damage completely (ie. phase change to adult foliage occurred before epidemic infection).

Shoots

No shoot diseases were detected during the past year.

Stems

An outbreak of *Cryphonectria gyrosa* was detected in a 12-years-old *E. nitens* plantation south of Geeveston. A high proportion of trees (all rough barked) in the plantation had stem cankers. Bark infection was too recent to determine what proportion of infected trees had deep bark infection resulting in cambial damage. However, several trees had died as the result of girdling stem cankers. It is thought that severe summer-autumn droughts during the previous two seasons triggered the outbreak.

Cytonaema sp. was isolated from cankers in several *E. globulus* in a young plantation on the Tasman Peninsula. Affected trees appeared severely stressed indicating that it is likely that infection was secondary to site-related problems.

Roots

No root diseases were detected during the past year.

Environmental problems

Severe crown decline leading to mortality of many trees was detected in an 8-years-old *E. nitens* plantation in the Upper Derwent Valley. Affected trees showed a range of symptoms (other than crown dieback) including sapwood staining, gummosis around the root collar, root rot and borer attack. A *Fusarium* species was isolated from the root collar of one affected tree but was considered unlikely to responsible. Affected trees were concentrated on eastern and northern slopes. Trees on western slopes appeared largely unaffected. The cause of the problem remains undiagnosed.

Managed natural forests

Eucalyptus species

No problems were reported or investigated.

Other species

An unexplained mortality of young Huon pine (*Lagarostrobus franklinii*) was detected in some remote riverine stands in the World Heritage Area. The cause of the mortality has yet to be determined.

Nurseries

Conifer species

No problems were reported or investigated.

Eucalyptus species

Stem infection by *Botrytis cinerea* was associated with unacceptably high failure (>10%) in several areas of a planted *E. globulus* plantation on the West Coast. It could not be determined whether the infection developed post-planting or arrived with the seedlings from the nursery.

Urban and rural

Dr Frank Podger spent 3 days conducting surveys for symptoms of Mundulla Yellows in eucalypts throughout southern Tasmania during a visit in April. Suspicious symptoms were seen on several species but were most common on *E. sideroxylon* and *E. ficifolia*. Most symptomatic trees were confined to amenity street trees in the greater Hobart area although

Quarantine

A quiet year with no quarantine activities to report.

Research and development

An exclusion trial has been established to measure the impact of Mycosphaerella leaf blight on the growth and branch longevity of *E. globulus*. The trial is testing three exclusion treatments: (i) protected year 1 only; (ii) protected year 2 only; (iii) protected years 1 and 2. Protection involves fortnightly applications of fungicide during the "perceived" main infection period (winter – spring). After 2 months it appears that the fungicide being used (20g NustarDP® in 100 litres water per Ha) used is providing insufficient protection. The fungicide F500® (BASF), a fungicide of the

strobilurin group, will be used for protection for the remainder of this years treatment (applied at the rate of 150g a.i. in 100 litres water / Ha). A fungicide evaluation trial to control MLB has been established and fungicide applications will commence in August 2002. Three fungicides are being included in the initial screening: F500 (BASF), 480 27F (BASF), NustarDP (Du Pont). It is planned that the most promising fungicide will be further tested next season, in combination with a plant defence activator, to measure the level of protection provided at different intervals between spray applications.

Pest and Disease Report: State Forests
Entomology

Plantations
Pinus radiata

Sirex Wood Wasp (*Sirex noctilio*)
There has been an increase in the number of *Sirex* outbreaks around the State. Two private farm planting's contained enough killed trees to warrant the introduction of nematodes. At one of these sites, Ranelagh near Huonville, nematodes were inoculated into 31 trees. Heavy attack occurred in 7 year old planting's which had had a second pruning to 6.5 metres done in early February. In the second site, at Montagu near Smithton, dissected adults were found to have nematodes. The nearest site at which nematodes had been introduced in 1990 is Oldina some 70 km away. Low levels of *Sirex* killed trees (<1%) were located in seven Rayonier coupes in northern Tasmania. Several wood lots, on Flinders Island, containing *Sirex* killed trees were logged last winter. The permanent plots at Tower Hill and Branchs Creek do not currently have *Sirex* present.

Five Spined Bark Beetle (*Ips grandicollis*)
Has not yet been detected in Tasmania.

Other Bark Beetle Species.
Hylastes ater adults killed trees over several hectares of planted and regeneration one-year-old *Pinus radiata* seedlings at Scamander. At several other coupes where wildlings have been thinned to rows deaths caused by *Hylastes* is evident. Patch mortality of young trees in six northern coupes was often associated with animal browsing.

Monterey Pine Aphid (E*ssigella californica*)

This aphid is widely distributed at low population levels in southern Tasmania. There are no reports of sightings in the large plantation areas in the north of the State however two central south compartments were found containing aphids at low levels.

Pine Aphid (*Eulachnus thumbergii*)
Not recorded from Tasmania.

Other Insect Pests of *Pinus radiata*.

The Painted apple moth, *Teia anartoides,* was detected in three compartments in the central south. The incidence of larvae was high but causing minor damage.
The pine aphid *Pineus laevis* was encountered on 0.7% of assessed trees of the 4 year old estate. The highest incidence was in the NE of the State with 1.8% of assessed trees were lightly damaged.

***Eucalyptus* species.**

Autumn Gum Moth (*Mnesampela privata*)
Larvae were recorded on 0.5% of assessed *E. nitens* and *E. globulus* trees statewide, the highest incidence recorded in the NW at 1.4%. Damage levels were all below 25% defoliation.

Leaf Beetles (Chrysomelidae)
Routine monitoring of *E. nitens* and *E. globulus* plantations was conducted using the methodology set out in the Leaf Beetle IPM Technical Bulletin. 10% of the plantation estate aged <6 years required control operations using synthetic pyrethroid sprays.
The southern leaf beetle *Chrysoptharta agricola* was very common throughout the plantation estate with 2.2% of assessed trees showing damage. *C. bimaculata* was recorded on 1.1% of assessed trees.
The highest incidence levels were recorded in the central north of the state with 4.4% of assessed trees damaged.

Sawflies (*Perga* spp.)
Many wood lots and shelterbelts in the central Midlands were continue to be severely defoliated during the spring months. Mortality of trees following successive years of defoliation is now occurring.

Scarabs (*Heteronyx* complex.)

Operational control was not warranted in State plantations.

Stem borers

Phoracantha mastersii continues to cause tree death without being in outbreak proportions. Small patches of stressed trees in droughted or waterlogged sites aged 8 years or older seem most susceptible.

The incidence of stem damage by the transverse weevil, *Pelororhinus transversus*, is common in *E. globulus* and *E. nitens* planting's aged 8 years or older. As more plantations grow into this age bracket so the incidence is increasing. Thickness of bark is an important criterion for tunnelling by this weevil species. The impact on timber quality for sawn timber may be important when these trees are harvested.

Nurseries

Several inspections of Perth Nursery were made during the year. No insect pest problems were observed..

Quarantine

Monitoring of six Tasmanian ports was conducted for Asian Gypsy Moth between October and March. The target insect was not captured.

At two port sites the use of sticky trap bands was used on a range of *Acacia* and *Eucalypt* species to obtain a baseline collection of timber insects present within the port surrounds 5-kilometre area.

Research and Development

The research program has had emphasis on testing new insecticides for use against the eucalypt plantation pests, *Chrysoptharta* spp., *Uraba lugens* and *Mnesampela privata*. Research trials to gain registration approval for plantation use continues.

The invertebrate program in the Silvicultural Systems Trial in the Warra LTER site in southern Tasmania continues to be supported at a high level. The measurement of the impact of differing logging techniques and tree retention on biodiversity in wet eucalypt forests is of major importance to the forest industry. Warra is a core site in the IBOY program (International Biodiversity Observation Year) and is undertaking several cooperative projects.

Dick Bashford
28/07/2002

8. QUEENSLAND 2001/2002 – PESTS

Plantations

Pinus radiata (and other temperate pines)

Pests

Sirex Wood Wasp (*Sirex noctilio*)

Queensland remains free of Sirex but the insect is present at Tenterfield, approximately 60 km from the Queensland border. Trap tree plots and ground surveillance have been increased in the border area, and training provided for DPI Forestry District staff on detection and management of the pest.

Monterey Pine Aphid (*Essigella californica*)

This aphid is present in all radiata pine areas in southern Queensland but no damage has been evident to date.

Pine Aphid (*Eulachnus thunbergii*)

As with *E. californica*, *E. thunbergii* is present in all radiata pine plantation areas in southern Queensland but no serious damage has been evident.

Sub-tropical and tropical *Pinus* species

Pests

Sirex Wood Wasp (*Sirex noctilio*)

Joint investigations with State Forests NSW into the susceptibility of subtropical and tropical pines are continuing. Male Sirex have been reared from *P. caribaea,* and females have been observed ovipositing on F1 and F2 hybrid billets in the insectary.

Monterey Pine Aphid (*Essigella californica*)

This aphid has spread to most pine plantations in Queensland, the most northerly record being at Cardwell (between Townsville and Cairns). No damage has been observed.

Pine Aphid (*Eulachnus thunbergii*)

This aphid is present in all coastal areas up to the Cairns hinterland. No damage has been observed.

Five Spined Bark Beetle (*Ips grandicollis*)

The pest remains south of the quarantine border established in 1994 at Marlborough in Central Queensland (just north of Rockhampton). Populations have remained low, the only activity of any significance being in fire damaged *Pinus* spp. at Beerburrum.

Thrips (*Pseudanaphothrips araucariae*)

This native Australian species breeds in the male cones of *Pinus* and *Araucaria* species, and at Cardwell in north Queensland has occurred in such large numbers that it has caused public health problems. A school surrounded by *Pinus caribaea* plantations was invaded by these insects which caused distress to children by getting into their hair, eyes and mouth. The insects also got into food, making outside eating impossible.

Hoop pine (*Araucaria cunninghamii*)

Pests

There were no significant pest problems in hoop pine plantations this year.

***Eucalyptus* species**

Pests

Leaf beetles

Numbers of the two main species *Paropsis atomaria* and *Chrysophtharta cloelia* remained low this year, and there was no significant damage recorded by any leaf beetle species.

Swarming scarabs and Christmas beetles

Moderate to severe defoliation by *Automolus* sp., *Sericesthis* sp. and *Anoplognathus porosus* occurred in several joint venture plantations in southern Queensland during the year.

Erinose mite (*Rhombacus* sp.)

Early summer damage by erinose mite (*Rhombacus* sp.) in a number of spotted gum plantations (*Corymbia citriodora* s.sp. *variegata*) was severe (up to 90% defoliation). Dry conditions appear to favour the spread of erinose mite, as it has only been recorded at damaging levels during dry seasons. Height increment of trees was significantly affected over the period November to April, but trees could tolerate levels of up to 30% loss of leaf area before growth was reduced. Leaf area loss of 70% reduced height growth by about 50%.

Plate galler (*Ophelimus* sp.)

Winter-spring damage caused by this plate-galling eulophid wasp on western white gum (*Eucalyptus argophloia*) was severe in some plantations. Loss of photosynthetic area averaged 55% in several study plots. Most trees had recovered well by early-mid summer and were able to vigorously flush with new growth. However diameter increment of trees was significantly affected, with preliminary data indicating that trees may have little tolerance even to low levels of plate galler damage.

Stem borers

Assessment of trials at Mundubbera showed very high rates of attack by *Phoracantha* spp. longicorns on several taxa. Worst affected were: *E.* grandis x *E. tereticornis* (59.5% of trees attacked), *E. grandis* x *E. camaldulensis* (49.2%), *E. dunnii* (30.2%), *E. drepanophylla* (17.9%) and *E. longirostrata* (16.7%) . *E. globulus maidenii*, the best performing taxa at the site, was not attacked by any stem borer. A single wood moth was found attacking *E. argophloia*, which was a new record for this species.

Research continues on the management of the giant wood moth (*Endoxyla cinerea*), the most important economic pest of hardwood plantations in Queensland. The focus of current work is on

the isolation of sex pheromones of the moth for use in mating disruption, and on natural enemies such as the braconid wasp *Virgulibracon* sp. (parasitises larvae) and wasp egg parasitoids.

Quarantine

Pests

Japanese Pine Sawyer (*Monochamus alternatus*)

Following detection in May 2001 of live adults of *M. alternatus* at the Port of Brisbane and at Swanbank near Ipswich in pallets from China, pheromone trapping was conducted for one year around the latter site and dying pine trees sampled for nematodes. No adult beetles or the pinewood nematode they carry were found and the program has now ceased.

Bamboo Longicorn (*Chlorophorus anularis*)

An exotic longicorn beetle *Chlorophorus annularis* has been confirmed as established in Queensland. *C. annularis* is primarily a borer of dry bamboo and occurs throughout Asia from India and China to Papua New Guinea. Other hosts include teak *Tectona grandis* and meranti *Shorea robusta.* This insect was not known to occur in Australia, but has been frequently intercepted in bamboo goods at the quarantine border, and sometimes post-quarantine. The circumstances relating to this present finding are that a member of the public brought a piece of insect-damaged bamboo furniture to the Queensland Forestry Research Institute for advice, and adult bamboo longicorn emerged. The furniture was not imported but made by the householder from bamboo grown on his own property. A search of bamboo stands in the western suburbs of Brisbane indicated that the insect was established locally. Subsequently the insect was found in bamboo grown at Kilcoy, 100 km northwest of Brisbane and it appears that it is widely established. There are also records dating back several years of the insect infesting furniture made from locally-grown bamboo at Byron Bay in NSW. At that time, cross-infestation was assumed but the situation may be the same as in Queensland.

Red Imported Fire Ant (*Solenopsis invicta*)

The eradication program for this exotic pest is approaching the end of its first year. The insect is still found in just two main foci in Brisbane although the boundaries of these foci have extended as surveillance has proceeded. Most of the new finds are related to human-assisted movement, particularly earth fill associated with development of new building estates and landscaping. The treatment program itself is very effective with up to 90% kill per application (there will be 10-12

applications in all over 3 years). An external audit of the program is to be conducted in September 2002.

Forest Products.Pests

West Indian drywood termite (*Cryptotermes brevis*)

Ten houses in Brisbane and 8 buildings (mainly shops) and a boat in Maryborough were fumigated in 2001/02 to eradicate infestations of this pest. This concludes fumigation of buildings found infested during the past several years in the Maryborough Central Business District (CBD). A further 8 buildings in Brisbane and 1 in Maryborough were discovered infested during recent surveys and require fumigation. Five of these buildings are in new areas of infestation.

After several years of trying, there are positive signs that we will be able to source and import sulphuryl fluoride into Australia for use against this termite.

Subterranean termites

Termatrac™ is a microwave instrument that has been developed in Australia to detect termite movement within timber and wall cavities. We conducted an investigation into the usefulness of the instrument in detecting drywood and subterranean termites in timber. Details of the work are presented in:

Peters, B.C., and Creffield, J.W. (2002) - Termatrac™: microwave technology for non-destructive detection of insect pests in timber. 33rd Annual Meeting, *International Research Group (Stockholm) on Wood Preservation*, Cardiff, Wales UK, 12-17 May. Document No. IRG/WP 02-20253.

Lyctine pests

Peters, B.C., Creffield, J.W. and Eldridge, R.H. (2002) - Lyctine (Coleoptera: Bostrichidae) pests of timber in Australia: a literature review and susceptibility testing protocol. *Australian Forestry* **65**(2):107-119.

Peters, B.C., Creffield, J.W. and Eldridge, R.H. (2002) - Susceptibility testing protocol for powderpost beetles in Australia. 33rd Annual Meeting, *International Research Group (Stockholm) on Wood Preservation*, Cardiff, Wales UK, 12-17 May. Document No. IRG/WP 02-20242.

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9. QUEENSLAND 2001/2002 - DISEASES

Forest Health Surveillance and Diagnosis

The Queensland Forestry Research Institute continues to carry out formal forest health surveys throughout Queensland on behalf of the Department of Primary Industries Forestry and the Queensland Parks & Wildlife service: Sustainable Forest Practices Unit. Surveys were also carried out for a number of private plantation consortiums. Surveillance is initiated by undertaking systematic low-level light aircraft surveys followed by extensive vehicular and foot surveys. Locations and distributions of disorders are logged and mapped using GIS technology.

Surveys encompassed selected areas within the native forest estate as well as the majority of the native hardwood and softwood (*Araucaria*) and exotic (*Pinus*) plantations. The aim of the surveys is to detect, assess and report on the biotic (mainly insects & fungi) and abiotic agents, which are affecting tree health. An important component of these surveys are the detection and identification of exotic organisms before they become established within the plantation/native forestestate.

Plantations

Pinus radiata (and other temperate pines)

Diseases and environmental factors

Significant diseases recorded on *Pinus radiata* were *Dothistroma septospora*, *Sphaeropsis sapinea*, *Phytophthora cinnamomi* and *Armillaria novae-zelandiae*.

Dothistroma Needle Blight (*Dothistroma septospora*)

For a number of years now favourable climatic conditions have enhanced the severity of *Dothistroma* within the Gambubal State Forest (Warwick area). Resultant extensive and widespread foliage loss has been occurring on an annual basis during the July/August period. Infection is more prevalent within the unpruned younger age classes, where there are weed problems and especially on the higher open exposed slopes. Control of this disease is currently not believed to be economically viable within this small plantation estate.

Diplodia Shoot Blight (*Sphaeropsis sapinea*)

Sphaeropsis sapinea induced dieback was again prevalent in mature 1R and young 2R plantations in site stressed areas within Passchendaele State Forest (Warwick area). Within the more mature stands *Sphaeropsis* has apparently invaded tissues following an extended period of drought resulting in widespread severe upper stem/branch dieback. This disease in combination with *Phytophthora cinnamomi* and primarily drought has continued to cause widespread mortality and patch death within the Passchendaele estate. Shallow rocky sites, which are a common feature of the Passchendaele estate, are the sites where patch death is frequently situated.

Sphaeropsis still frequently causes stem/leader malformation/loss especially within young 2R trees. Symptoms such as whorl cankers are still a common occurrence within particular compartments at Gambubal State Forest. Incidence/severity of this disease is regularly linked with abiotic events such as frost, hail and drought. This year following a severe hail event *Sphaeropsis* contributed to severe widespread dieback and tree mortality over the entire plantation estate at Gambubal State Forest. Poor sites (soil types/depth & nutrition) have also been found to predispose trees (especially young trees) to this disease. Although widespread in Queensland on other host species (*Pinus*) this disease is currently only of consequence in the southern border plantations.

Armillaria Root Disease (*Armillaria novae-zelandiae*)

This root rot fungus is still active and continues to cause scattered mortality throughout a number of compartments within the Gambubal State Forest. Where present, infection levels tend to be high, resulting in productivity losses. Scattered mortality suggests spore dissemination although distinctive disease foci are evident indicating root-to-root spread. *Armillaria* sp. was also detected within a half-hectare ridge-top site killed by lightning strike. In this case *Armillaria* is believed to be a secondary invader. Other than the mountainous Gambubal estate *Armillaria* has not been detected within any other *P. radiata* plantations.

Phytophthora Root Rot (*Phytophthora cinnamomi*)

Phytophthora is still causing scattered establishment losses to newly planted *P. radiata* within the Passchendaele State Forest. Mortality directly attributable to this disease dramatically declines after 1 year and then is rare for the duration of the rotation. Movement of contaminated nursery stock is believed to have led to the establishment and now widespread distribution of this disease in the plantation estate. Little-leaf symptoms are obvious throughout this estate and there is little

doubt that the widespread occurrence of this disease at Passchendaele has contributed to the chronic poor health of *P. radiata* (especially older age classes), so long a characteristic of the plantation there.

Animals (Possums)

Possums have continued to extensively damage *Pinus taeda* within Gambubal State Forest. Their preference for the bark on the upper stems and limbs of this species resulted in ringbarking followed by upper crown dieback. The majority of *P. taeda* at Gambubal displayed past and present possum activity. As the plantings of *P. taeda* are limited within this estate control is not considered necessary.

Environmental (drought)

Dieback of *P. radiata* is widespread throughout Passchendaele State Forest. Evidence suggests long-term and recent decline. Although both *S. septospora* and *P. cinnamomi* contribute to the poor health of this plantation estate, drought stress is still undoubtedly the primary cause of the present problems. Root infection by *P. cinnamomi* can also aggravate moisture stress problems during drought periods as this disease often leads to poor root formation. The fact that the Passchendaele area is marginal for *P. radiata* indicates that problems of this nature can be expected in periods of drought stress.

Environmental (hail)

Early 2002, severe dieback and tree mortality was reported to be rapidly developing within the Gambubal State Forest. Investigations by the Forest Health Surveillance group found that 80% of *P. radiata* within this estate had been damaged by a recent severe hail event. Total crown mortality was measured at 20% of the estate with another 30% of trees displaying hail/*Sphaeropsis* induced dieback. Death of upper crown stem/limbs followed mechanical ringbarking by the hail and/or fungal invasion of stem tissue through the open hail induced wounds. Within the plantation, damage was generally restricted to the upper canopy/stem/limbs with more extensive damage occurring to trees exposed along compartment boundaries, roads etc. *Pinus patula* planted within the same estate sustained equivalent hail damage but as it is not as susceptible to *Sphaeropsis* infection, dieback was minimal.

Subtropical and tropical *Pinus* species

Diseases and environmental factors

Significant diseases recorded were *Sphaeropsis sapinea, Phytophthora cinnamomi, Ophiostoma ips* and *Armillaria pallidula.*

Diplodia Shoot Blight (*Sphaeropsis sapinea*)

Sphaeropsis sapinea was frequently identified as the agent associated with the death of leading shoots within young coastal *Pinus* spp. plantings. Site investigations indicate that in the majority of occasions infection resulted from pre-exposure to short periods of extreme air temperatures, drought, unfavourable soil depth/type, nutritional disorders etc. Insolation induced S*phaeropsis* dieback within young *Pinus* spp. was confirmed within Beerburrum State Forest (Beerburrum District) and Byfield State Forest (Rockhampton District). In both cases *Sphaeropsis* was the secondary agent. Affected species were 1-year-old F1 hybrids (*P. elliottii* var. *elliottii* X *P. carebaea* var. *hondurensis*) at Beerburrum and 2 year-old *P. carebaea* var. *hondurensis* at Byfield. At Beerburrum, symptoms varied throughout the compartment i.e. from browning off of a few terminal needles to complete leader loss. Severity (in terms of the numbers of plants with damaged leaders) was restricted to patches but within these patches up to 75% of the trees was affected. Overall, the damage at Beerburrum was classified as minor. At Byfield the young trees were pre-disposed to fungal invasion as a result of severe nutrient disorders exuberated by drought. In south east Queensland *Pinus carebaea* var. *hondurensis* planted on podsolic soils frequently suffer from copper deficiency. *Sphaeropsis* is a common secondary invader at these sites.

Phytophthora Root Rot (*Phytophthora* spp.)

Phytophthora cinnamomi was first recognised as a problem in coastal *Pinus* plantations in 1957 at Beerburrum. Movement of contaminated nursery stock is again believed to have led to the establishment and now widespread distribution of this disease in the coastal plantation estate. Although present, *Phytophthora* has tended to have little visible impact on tree health in the coastal plantations. Recent isolation of *Phytophthora* from the roots of mature *Pinus,* thought to have fallen due to windthrow (Beerburrum, Byfield & Kuranda State Forests), suggests that *Phytophthora* is active throughout the rotation. Where active *Phytophthora* may be a limiting factor re optimum growth.

Ophiostoma ips

The pathogenic fungus *Ophiostoma ips* (carried by the exotic Five Spined Bark Beetle *Ips grandicollis*) was identified as a potential problem at Beerburrum following a intense wildfire, which burnt out 517 hectares of *Pinus* spp. in the latter part of 2001. In the months following the fire, populations of *Ips* beetles, which are established in the southeast corner, could have quickly escalated. *Ophiostoma* when "inoculated" into a tree by these beetles' results in eventual tree mortality, and the associated blue-stain in the timber reduces returns. A quick operational response by DPI Forestry (removal of burnt/stressed trees) resulted in minimal infection levels. *Ophiostoma ips/Ips grandicollis* were detected in dead *Pinus* stems throughout the plantation estate up to Rockhampton. In all cases *Ophiostoma ips/Ips grandicollis* were not the primary agents causing tree decline.

Armillaria Root Disease (*Armillaria pallidula*)

Armillaria has been recorded as causing significant mortality within *Pinus* spp. at Toolara State Forest (Maryborough District). To date no other occurrences have been detected within the coastal exotic plantation estate.

Nutritional

Large but well-defined areas of the exotic coastal plantations in southeast Queensland are chlorotic to various degrees. Within the exotic plantation estate in southeast Queensland soil types, soil profiles and rainfall are highly variable, and this dramatically influences the nutritional status across the plantation estate. Nutritional disorders may therefore be widely associated with the observed chlorosis. In many instances chlorosis has been demonstrated to be due to nitrogen deficiencies induced by intense grass competition. At Byfield an investigation established that the widespread leader decline, proliferation of basal shoots and large resinous stem cankers within 2 year-old *P. carebaea* var. *hondurensis* was the result of nutritional disorders. Interpretations of the study revealed that Manganese (Mn) levels were high, possibly toxic. Boron levels in the unhealthy plants were in low concentrations, Zinc (Zn) was very low and Copper (Cu) marginal. Reduced nutrient uptake during drought conditions has probably exacerbated nutritional disorders within the plantation estate.

Physical (poor root configuration)

Poor root configuration within young stands of *Pinus* Hybrids (seedlings & cuttings) is now more frequently being identified as the cause of scattered mortality and windthrow. At Beerburrum a lack of lateral root development within a stand of 4 year-old *Pinus* hybrids allowed excessive stem movement in the wind, which resulted in stem damage/ringbarking, followed by mortality.

Hoop Pine (*Araucaria cunninghamii*)

Diseases

Significant root rot diseases recorded were *Rigidoporus vinctus*, *Phellinus noxius* & *Rosellinia* sp.

Root rot continues to be one of the major influencing factors in tree loss in hoop pine plantations in Queensland. *Rigidoporus vinctus* has been detected in all hoop pine growing areas and is becoming a more significant factor in early tree loss in 2R plantings.

Phellinus noxius has significantly affected some 1R and 2R sites particularly in North Queensland plantations at Wongabei and Gadgarra State Forests. Counts of tree losses within 2 compartments at Wongabel State forest indicated losses in 6 and 8 year old plantings of 113 trees/hectare and 147 trees/hectare respectively.

Rosellinia sp. continues to cause scattered mortality in 2R plantings of hoop especially in areas where high levels of trash are retained following harvesting.

A biological and chemical control research program has now been initiated to address root disease within the hoop pine estate.

Eucalyptus species

Diseases

Ramularia shoot blight (*Quambalaria pitereka*)

Quambalaria pitereka has been detected in a large number of spotted gum (*Corymbia citriodora* subsp. *variagata* and subsp. *citriodora*) plantations within Queensland. The disease has also

been noted on hybrid material in north Queensland. Isolates of *Q. pitereka* have been collected from throughout the state with variability, based on morphological characteristics, apparent.

Cylindrocladium leaf blight (*Cylindrocladium quinqueseptatum*)

Cylindrocladium quinqueseptatum caused defoliation and seedling death in a large percentage of *Eucalyptus argophloia* and *Corymbia citriodora* subsp. *variagata* in Walkamin Nursery, north Queensland. Prior to the identification of *Cylindrocladium* at Walkamin Nursery, large numbers of *C. citriodora* were transported to southeast Queensland and planted out. Widespread establishment losses resulted from utilising this diseased material. Low levels of *Cylindrocladium* were also detected in plantations of *E. urophylla* in Kuranda State Forest (Atherton District).

Mycosphaerella Leaf Crinkle (*Mycosphaerella* spp.)

Mycosphaerella spp. has not had a large impact on plantation development in Queensland this year. Disease occurrence has occurred in isolated areas affecting species such as *E. cloeziana*, *E. grandis* and *E. tereticornis*. In trial sites *E. camaldulensis*, *E. tereticornis* and hybrids of these species have been affected to varying degrees.

Other leaf spot fungi detected at low levels on *Eucalyptus* spp. included:

Purple leaf spot – *Phaeophleospora epicoccoides*

Leaf blotch – *Coniella fragariae*

Target spot – *Aulographina eucalypti*

Stem cankers with associated kino flow have been detected in southern Queensland. An unknown fungal agent has been isolated but is yet to be identified.

Brown root rot (*Phellinus noxius*) was detected for the first time causing tree death on spotted gum (*Corymbia citriodora* subsp. *variagata*) in ex hoop pine sites.

Nurseries

Diseases

Pinus hybrids

No major disease issues were detected within *Pinus* at any of the nurseries inspected. There was however a number of deaths associated with Zinc and Copper deficiencies.

Wollemi Pine (*Wollemia nobilis*)

Phytophthora cinnamomi has again been detected in association with tree death in both pots and hedges of Wollemi Pine. Following pruning *Dothiorella* sp. and *Colletotrichum* sp. have been detected on unhealthy shoots.

Eucalyptus spp.

Cylindrocladium quinqueseptatum was detected in association with shoot and stem blight on E. argophloia and leaf blight on *Corymbia citriodora* subsp. *citriodora* in Walkamin Nursery in north Queensland.

Native plant communities

A number of plant pathogens were detected during pest and disease surveys conducted in Cape York. These included:

Phellinus spp. – *Eucalyptus tetrodonta*, *Eucalyptus* spp.

Phellinus noxius – various genera and species within the Lockerbie Scrub.

Ganoderma spp. – various species within the Lockerbie Scrub.

Racospermyces sp. – *Acacia* spp.

Uromycladium sp. – *Acacia* spp.

Phyllachora sp. – Unknown hosts.

Meliola sp. – *E. tetrodonta*, other unknown hosts.

Urban and Rural

Phellinus noxius has been detected in association with tree death in number of residential areas within Brisbane as well as parks and gardens in central and northern Queensland.

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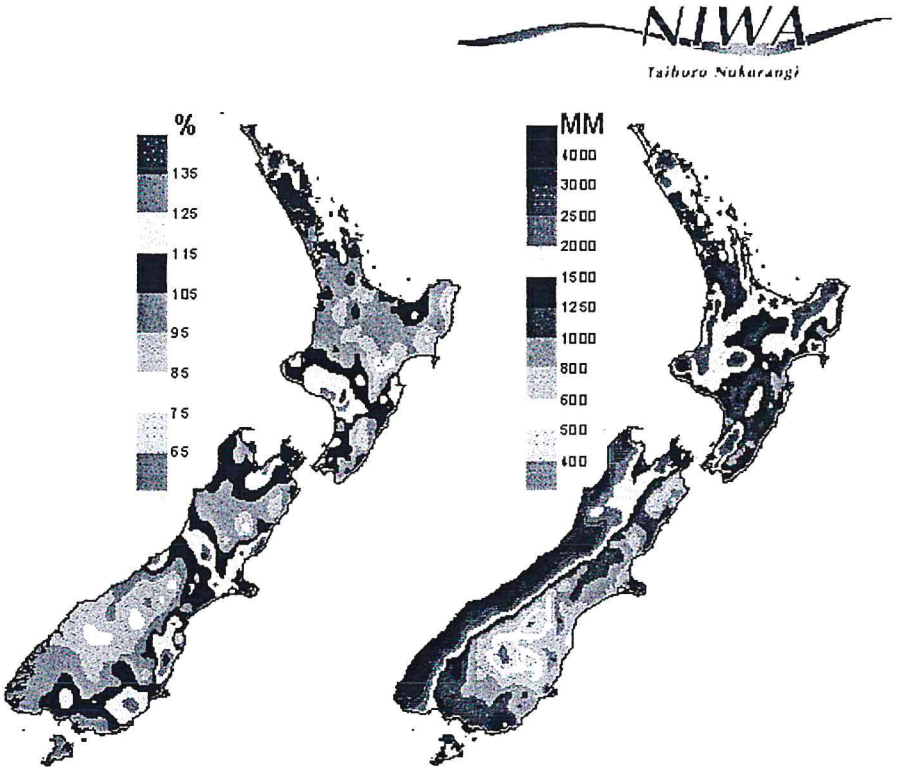
10. NEW ZEALAND 2001/2002 – PESTS AND DISEASES

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

1. Weather conditions:

According to the New Zealand MetService Annual Report, the weather patterns during 2001-2002 featured slow moving anticyclones interspersed with depressions that tracked over the centre of the country during winter and spring, and to the north of New Zealand during summer. This situation led to the driest growing season for 70-100 years in the centre and south of the country (Marlborough, Nelson, Wellington, Wairarapa, South Canterbury), whereas Northland, Coromandel and the Bay of Plenty experienced wet conditions this year. Mean temperatures were warmer than normal in many parts of the country, but extremes occurred, with cold conditions in November and heat waves in December. There were periods of strong winds from the west between September and January, which caused localised storm damage, and snowfalls occurred in late May. These irregular rainfall patterns influenced the development of some diseases during the 2001-2002 year (see below).

Rainfall anomaly for 1 July 2001 to 30 June 2002



Percentage of average rainfall

Rainfall pattern for this period

Maps supplied by the National Institute of Water and Atmospheric Research (NIWA).

2. Plantations:

Pinus radiata:

Pests:

Foliage:

Essigella californica was first found in New Zealand in 1998 and has now spread throughout the country and has been recorded from *Pinus radiata, P. michoacana, P. montezumae, P. muricata, P. patula, P. pinea* and *Pseudotsuga menziesii.* In October 2000, a programme to monitor populations of the aphid in *Pinus radiata* forests in the Bay of Plenty region and in Hawke's Bay was started. The following is a summary of the work carried out in the Bay of Plenty. The data from Hawke's Bay has not been analysed as yet.

During the winter *E. californica* populations were composed solely of wingless adults in very low numbers. Numbers increased during late February and peaked between late March and early May. Winged individuals appeared in mid May and typically comprised less than 5% of the population at any one time.

Aphid numbers were low in the youngest age class stands (1- to 10-year old) but medium or high in older stands (11- to 20- and 21- to 30-year old). This trend was consistent in both sampling years across a range of altitudes suggesting that aphid development might be influenced in some way by tree age, differences in foliage structure, tree architecture or size. In addition, there was a negative trend relating aphid density and altitude. Numbers during peak periods were very high in low altitude stands (below 300 m a.s.l.) but low in mid-altitude stands (301 – 600 m a.s.l.) and absent above 600 m.

The distribution of aphids within the canopy was also investigated. In general aphid numbers appeared to vary randomly with crown depth, and between trees within stands. However, in a young stand at one of the study sites significantly more aphids were present on trees on a sunny, north-facing aspect than elsewhere. Warmer temperatures on such sites may allow aphid populations to develop earlier in the year and over a longer period.

E. californica was most prevalent in April. At this time it was common to find aphids feeding at the bases of the fascicles and along the full length of the needles throughout the canopy. Generalist predators such as syrphid, neuropteran and coccinellid larvae were associated with these high aphid numbers but there was no evidence of parasitism. Infested trees varied considerably in appearance; some were completely green but others exhibited yellowing foliage. No cause and effect was demonstrated.

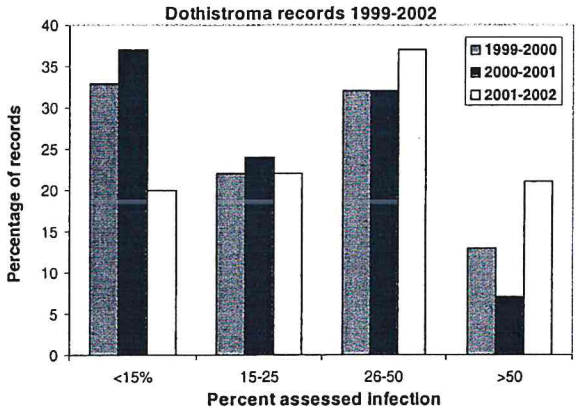
Although not comprehensively investigated in these studies, it appears that *E. californica* population growth is linked to trends in mean ambient temperature and day length. *E. californica* may therefore be cause for concern in lowland *P. radiata* plantations should favourable weather conditions extend into late autumn. However, at present *E. californica* is not considered a significant pest of *P. radiata* plantations in New Zealand.

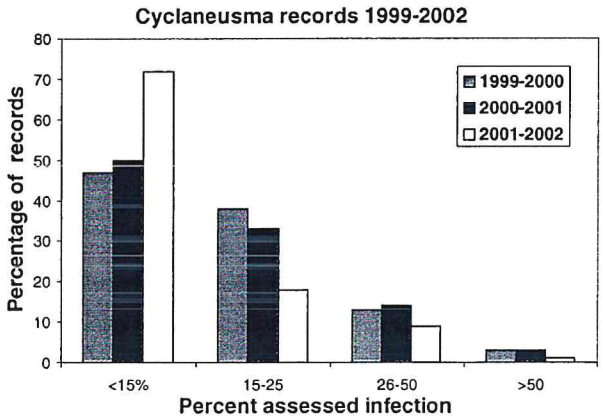
No other insect problems of any note were recorded in *P. radiata* plantations.

Diseases:

Foliage:

The total number of Forest Health Database records of *Dothistroma* for 2001-2002, at 1115, was well up on the previous two years (837 in 2000-2001 and 909 in 1999-2000). When compared by frequency of records in different infection severity assessment classes (figure, below left), the proportion of records greater than 50% was found to have increased significantly in the 2001/02 year over the previous two seasons.





The increase in *Dothistroma* infection during 2001-02 is independently demonstrated by data on the aerial spraying of diseased forest with copper fungicide. An area of 106,451 ha was sprayed during 2001-02, 101,053 ha being in the North Island and the remainder (5398 ha) in the South Island. This is the largest area treated in recent years (68,000 ha in 2000-2001, 47,000 ha in 1999-2000, and about 90,000 ha in 1998-99). The high *Dothistroma* disease levels are associated with prolonged wet weather in many parts of the country in the months preceding the spray operations, particularly those during summer (Section 1). Although the area sprayed is a separate indicator of the annual impact and extent of *Dothistroma* throughout the whole country, it is somewhat coarse and may be influenced by other forces driving company activities.

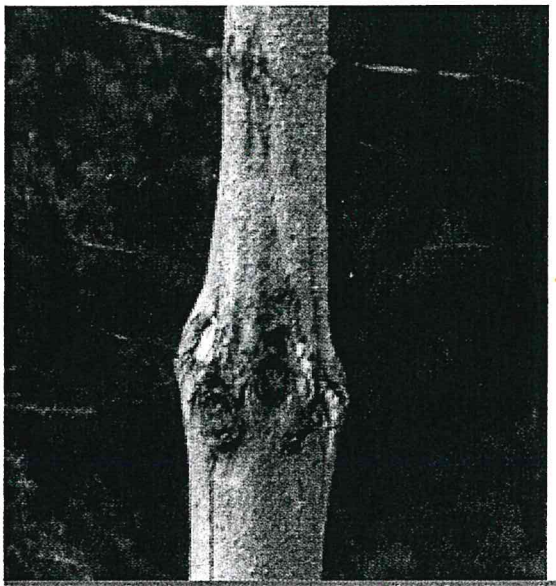
In contrast, the severity of Cyclaneusma needle-cast was lower than in the previous two years (figure, above right). Disease severity was assessed at lower than 15% for over 70% of the Cyclaneusma needle-cast records for the 2001/02 year, compared with roughly 50% of the records for the preceding two years. The lower disease levels are attributed to the prolonged autumn drought conditions experienced over much of the country (Section 1), followed by a drier-than-average winter.

There were no instances of the severe defoliation that has been associated with *Strasseria* and other needle-infecting fungi in 1995, 1998, and 2000. Presumably this was also due to the dry autumn and winter.

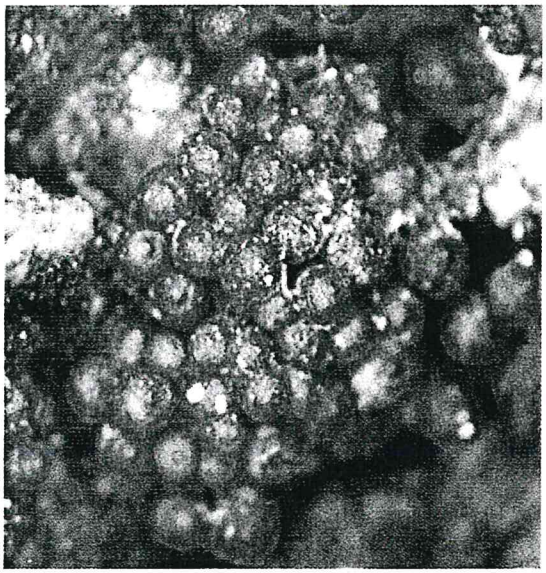
Stems, shoots:

There were a number of records of Diplodia dieback and Diplodia whorl canker (both caused by *Sphaeropsis sapinea*), but the incidence of both diseases was considerably lower than in the previous year.

Although *S. sapinea* is the most common invader of pruned stubs, other fungi are also capable of infecting *P. radiata* stems in this way. One that has been recorded on a number of occasions in recent years is a species of *Bionectria.* It is very like *B. aureofulva,* which is widely present in New Zealand but is usually found on dead wood of indigenous plants. The red ascomata are very striking when they form on the wood around infected branch stubs. Studies which will examine whether the fungus has a parasitic role, or is colonising tissue killed by other means, will be carried out, and the identity of the fungus will be clarified.



Infection of pruned stubsresulting in whorl canker



Bionectria* sp. fruitbodies on*Pinus radiata

Roots:

Armillaria root disease remains widespread at variable incidence in generally non-lethal form in many pine plantations through much of the country. *Armillaria* was recently investigated as a possible cause of resin soaking in potentially high-value pruned butt logs from certain forests, on clay soils in warmer parts of the North Island. The resinous zone extends up to 4 m above ground level from sunken furrows present at the base of the tree. Impregnated wood is downgraded as not amenable to gluing, staining, or mechanical sanding, and lacking in visual appeal. The problem has been attributed to various causes including damage or stress from production thinning, pruning, wind exposure or cattle activity, but the answer remains elusive. *Armillaria* became implicated when it was found associated with sunken resin soaked depressions at the base of trees in affected forests and on stacked resin-impregnated logs. In a study to resolve the issue, a number of recently created pine stumps on cleared sites were uprooted, washed, dissected, and examined for evidence of resin impregnation and infection by *Armillaria.* It was found that although the incidence of resin soaking was high, infection was low in this first-rotation plantation on a non-indigenous forest site. It was concluded that although *Armillaria* may make a minor contribution to resin soaking degrade, it was ruled out as the main reason for the problem.

There were no records for *Peniophora*, *Junghuhnia* or *Rosellinia* for 2001-2002.

Root death and mortality of 4- to 8-year-old *P. radiata* occurred at a number of locations with no clear indication as to the cause. All affected stands were on ex-pasture sites and experienced very dry conditions for part of the year, but forest owners maintained that the deaths began before the drought started. None of the well-known root pathogens (eg *Phytophthora cinnamomi, Armillaria* spp., *Junghuhnia vincta, Gleocystidiellum sacratum* (syn. *Peniophora sacrata*)) were cultured during a series of examinations and isolation attempts from the root systems of affected trees. However, soils at some sites yielded cultures of *Phytophthora cryptogea*, a species found to be pathogenic to young pines (*P. ponderosa* and

P. lambertiana) in the United States and to *P. radiata* in Australia. It has also been implicated as one of the fungi contributing to decline of *P. radiata* in shelterbelts in New Zealand.

Other:

A series of plots has been established in a large central North Island *P. radiata* plantation to provide long-term monitoring of forest health and sustainability. Along with routine health recording, data will be collected from soil and foliage sampling, understorey vegetation surveys, insect population studies, and growth and yield measurements. Health monitoring will include assessments of crown density, foliage dieback, resin bleeding, crown depth, Cyclaneusma needle cast and Dothistroma needle blight. The system was developed at Forest Research and trial work carried out over an 18-month period has shown that assessments of this type can be carried out effectively and with low variability, provided the assessor is experienced. It is believed that the collection of such data over the long term will provide essential information with which to base management decisions in the future. The goal at Forest Research is to initiate a nationwide long-term forest health-monitoring programme in *P. radiata* plantations, akin to programmes in the United Kingdom and Europe, but modified to suit New Zealand conditions.

Douglas fir (Pseudotsuga menziesii):

Diseases:

Foliage:

Swiss needle cast disease (*Phaeocryptopus gaeumannii*) was recorded throughout New Zealand (159 reports in the FHDB) and remains the most significant disease of Douglas fir.

Recently it was possible to determine the impact of Swiss needle cast disease on the growth of Douglas fir, by making use of records of when *P. gaeumannii* was first found in specific forests during the three decades it took for the fungus to spread throughout New Zealand. Growth data from 1500 permanent sample plots were standardised in relation to the onset of infection by converting them to numbers of years since or prior to the first observance of the fungus in each forest. The data were then analysed as two discrete sets for the significance in growth difference between records before and after infection, respectively. The results showed that a clear reduction in site basal area growth had occurred in different forests following the appearance of *P. gaeumannii*. Early analyses indicated a decline in per hectare volume growth as a result of disease of ca. 20%. However, there are grounds for optimism that breeding and selection may enable most of the lost growth potential to be recouped. The current move to using seed sources originating from the Californian fog belt should go a long way towards offsetting the effects of the disease.

Roots:

There was some mortality in Douglas fir associated with *Armillaria* infection (11 records).

***Eucalyptus* spp.:**

Pests:

Foliage:

In June of this year during a routine risk site survey in the vicinity of Auckland Airport an Australian psyllid, *Creiis lituratus* (Froggatt), was found in New Zealand for the first time. It was identified by David Hollis (BMNH, London). So far they have been found over an area up to nearly 4 km from the airport mainly on *Eucalyptus botryoides.*

Creiis lituratus, which produces shell like lerps, has been found in *Eucalyptus grandis* and *E. dunnii* plantations in New South Wales and has caused significant damage mainly

in 2-3 year old *E. dunnii* in northern NSW. Other hosts are *E. ovata, E. saligna, E. goniocalyx, E. cordieri, E. botryoides, E. paniculata and E. robusta.* This species is considered to be a potential pest species for New Zealand. It is currently in outbreak numbers on the north coast NSW and populations can build up very rapidly in localised areas (Debbie Kent, pers. comm.)

During the *C. lituratus* delimitating surveys, another Australian psyllid, *Anoeconeossa communis* Taylor, was discovered and identified by Pam Dale (Auckland). This is another new record for New Zealand. The nymphs of this psyllid frequently occupy deserted lerps of other psyllids. However, nymphs will also occupy locations such as between leaves tied together by lepidopterous larvae, in the shelter provided by the curling of leaf edges caused by other psyllid species, and even inside leaf mines if the epidermis has been broken. In Auckland, nymphs of *A. communis* are being parasitised by a wasp. The identity of this wasp has not yet been ascertained (no adults found) but it may be *Psyllaephagus gemitus,* a self-introduced species that attacks *C. fiscella.* Where *A. communis* has been parasitised under *C. lituratus* lerps, the lerp bears the characteristic emergence hole made by the exiting adult parasitoid. At this stage, there is no evidence to suggest that *C. lituratus* is being parasitised. The current distribution status of *A. communis* is presumed to be similar to the *C. lituratus.* In Australia, *A. communis* has been recorded on: *Eucalyptus brevifolia, E. calcicultrix, E. camaldulensis, E. exserta, E. leucoxylon, E. loxophleba, E. microtheca, E. odorata, E. raveretiana, E. rudis.* The importance of *A. communis* is not known.

A Western Australian strain of the egg parasitoid *Enoggera nassaui* was released in 1987/88 to control *Paropsis charybdis*, the eucalyptus tortoise beetle. *E. nassaui* proved successful in controlling *P. charybdis* over much of New Zealand, particularly in plantations of *Eucalyptus nitens*, except in colder areas. To provide better control in these colder areas a Tasmanian strain of *E. nassaui* has been successfully introduced. However, any potential gains from this introduction are likely to be negated by the self-introduction of an obligate hyperparasitoid, *Baeoanusia albifuncicle* (Encyrtidae). *B. albifunicle* invades the eggs of *P. charybdis* but is unable to develop further, and is attacked in turn by *E. nassaui.* When this occurs, *B. albifunicle* consumes the larva of *E. nassaui* and eventually emerges as an adult wasp. Eggs of *P. charybdis* not attacked by *E. nassaui* are able to hatch normally even if *B. albifunicle* is present. Because of its behaviour, there is a risk that *B. albifunicle* may check the population development of *E. nassaui* and prevent it from multiplying as rapidly as it has in past seasons. This is likely to have serious consequences for plantations of *E. nitens*, since until now *E. nassaui* has been the only biological control agent effective against *P. charybdis* in New Zealand.

Another self-introduced parasitoid associated with *P. charybdis* eggs was found earlier this year. It is a species of *Neopolycystus* (Pteromalidae) and like *E. nassaui* is a primary parasitoid of paropsine eggs. As yet it has not been specifically identified. Another species of *Neopolycystus*, *N. insectifurfax* was released in New Zealand at the same time as the original introduction of *E. nassaui* (1987/88) but it failed to become established. There is hope that the new species of *Neopolycystus* may exert some control of *P. charybdis*. Certain species of *Neopolycystus* are believed to be immune to attack by *B. albifunicle.*

Both these two recent self-introductions have so far been found only in the central North Island.

The *Nambouria* sp. (Pteromalidae) first found in New Zealand in October 1999 and mentioned in this report last year has now been described – *Nambouria xanthops* Berry and Withers. It has now spread from Auckland to the Coromandel Peninsula and has been recorded from *Eucalyptus glaucesens, maidenii, nicholii, ovata* and *viminalis.* Although very abundant on some of these hosts there is no evidence that it is causing any damage.

Uraba lugens (Nolidae) which was first found in New Zealand in 1997 at Mount Maunganui was found on four *Eucalyptus cinerea* trees at one site in Auckland in August 2001. At both sites it was present in very low numbers and has not been seen in many months now. Further surveys will be conducted this spring and there are still hopes that the struggling populations might be yet eradicated. Forest Research has supplied Hort Research with eggs to start a laboratory population in their quarantine facility to enable them to carry

out work on identifying the insect's sex pheromone. If this work is successful a synthetic pheromone should be available to monitor *Uraba* populations and hopefully confirm eradication.

Acrocercops laciniella (Gracillariidae) was first recorded in Auckland in January, 1999. It is a significant pest in coastal New South Wales, where it causes outbreaks of damage from time to time on blackbutt (*Eucalyptus pilularis*). *A. laciniella* has a wide host range, which also extends to species within the eucalypt sub-genus *Symphyomyrtus*. It continues to spread quite rapidly and is now found in Northland, Auckland, Coromandel, Waikato, Bay of Plenty, Hawke's Bay, Taupo and Taranaki. Populations of *A. laciniella* have increased significantly in the Bay of Plenty and it is now common to find it on young, flushing juvenile and sometimes adult foliage of *Eucalyptus nitens*. There is no funding to support a biological control initiative against this insect and its increase and spread is being viewed with some apprehension. *A. laciniella* was found mining the leaves of *Lophostemon confertus* in the Bay of Plenty in October 2001. This is a new host record for this species.

Stems:

This report last year commented on distinctive "scribbles" that were observed on *Eucalyptus racemosa* in Northland in May 2000. The identity of the insect causing these "scribbles" has still not been ascertained. It might be an established Australian species or an opportunistic New Zealand insect.

Diseases:

Foliage:

Herbarium material of *Pseudocercospora* on a range of eucalypt species, and on the closely related *Lophostemon confertus*, has been examined by Dr Uwe Braun (Halle, Germany), a specialist in this group of fungi. The *Lophostemon* fungus was identified as *P. sawadae,* which was described on guava (another close relative of *Eucalyptus*) in Taiwan. On eucalypt foliage, three new species of *Pseudocercospora* were recognised in addition to the widespread *P. eucalyptorum.* One of these is associated with a number of eucalypt hosts from the subgenus Monocalyptus. *Eucalyptus regnans* is particularly prone to infection by this species and young trees can be severely affected. The other two new species both occur on *E. nitens*, Descriptions of these new species of *Pseudocercospora* will be published shortly (*NZJFS*, in press).

Severe defoliation of *Eucalyptus globulus* ssp. *globulus* and *E. globulus* ssp. *maidenii* associated with leaf spotting by two species of *Mycosphaerella* was recorded in a sewage effluent disposal area where the treated sewage is sprayed onto the trees. The species found were *Mycosphaerella nubilosa*, which occurs only on juvenile foliage, and *M. suberosa*, which can also infect adult leaves. The second species was first recorded in New Zealand in 1998 and this was a new location record. It is not regarded as one of the more virulent species of *Mycosphaerella* overseas but the potential to cause severe leaf spotting in this type of environment is unknown. Serious *Mycosphaerella* defoliation is associated with wet and humid conditions. The vigour of these young trees was also adversely affected by rampant grass growth, and this may have been an important factor in the high levels of fungi found on the foliage.

Defoliation of *E. delegatensis* associated with *Phytophthora* sp. and *Vermisporium* spp. continues to be a problem in Southland.

The development of Septoria leaf blight caused by *Phaeophleospora eucalypti* has been ascertained in young plantations of *Eucalyptus nitens*. It was found that although new leaves remain susceptible for only several weeks, spores are produced on infected foliage over much longer periods, so that infection levels accelerate during spring and summer leading to severe leaf shedding on warmer, coastal, disease-prone sites. These findings have focused research towards finding ways of recognising suitable growing sites where conditions will prevent the pathogen from developing epidemically. Field trials have shown that provenances of *E. nitens* from central Victoria are more susceptible to the disease than those from New South Wales. Other species in section *Maidenaria* are also resistant to the disease, but substitute selections must also be resistant to premature defoliation caused by *Mycosphaerella* species.

***Acacia* spp.:**

Pests:

The painted apple moth (*Teia anartoides*) which was first found in Auckland in May 1999 and has been the subject of an eradication campaign is still present there. Up until January 2002 the campaign was based on ground spraying (using Decis and Btk) and host removal. In January this year aerial spraying was begun and up until the end of July there have been seven sprays over an area of about 600 ha. Plans are being drawn up to spray as much as 8000 ha and another $12 million has been injected into the project. For further details see http://www.maf.govt.nz/biosecurity/pests-diseases/forests/painted-apple-moth/index.htm

In December 2000 a tortricid caterpillar, thought at the time to be that of the eucalypt leaf roller, *Strepsicrates macropetana*, was found on an *Acacia longifolia* tree in Auckland. The caterpillar could not be reared but because of the very unusual host association it was retained. Subsequent to this more larvae were found on *A. longifolia* and identified by John Dugdale (Landcare Research) as *Holocola* sp. near *triangulana*. Dugdale first found this Australian species at Nelson in 1989 and Robert Hoare (also Landcare Research) had caught it in light traps in Auckland. Further searching has shown that this species is quite widespread in the North Island (Auckland, Coromandel, Bay of Plenty, Gisborne, Wanganui and Wellington). Recorded hosts are *Acacia longifolia, A. floribunda, A. melanoxylon* and *A. sophorae*. The literature suggests that species of *Holocola* feed within the galls caused by rust fungi on acacias but this introduced species behaves differently. Some larvae tie or web the phyllodes together and feed on the enclosed tissues, producing a characteristic gouging pattern, while others bore into the elongating soft shoots. It is interesting to note that *Acacia longifolia* is a significant weed in a number of *Pinus radiata* plantations in Northland and some forestry companies are hopeful that *Holocola* will be a successful, naturally introduced, biological control agent.

During a routine risk site survey in October 2000 chrysomelid larvae were discovered on a small group of trees of *Acacia retinodes* in a park a few kilometres from Wellington airport. Adults were reared in containment and subsequently identified by Tom Weir (CSIRO, Canberra) as *Faex suturalis*, a species not previously known in New Zealand. Because of the small number of trees involved the Ministry of Agriculture and Forestry decided to attempt eradication and all the infested trees were sprayed with Decis. The site is monitored at approximately 6 weekly intervals and no signs of beetles have been seen since November 2001. There were no significant incidences of disease of acacias in plantations.

3. Nurseries:

There were few records of pests or diseases in forest nurseries this year. There was some Phytophthora root rot in nurseries that have had similar problems in the past, but the incidence was relatively low in 2001-2002.

4. Urban and rural:

Dutch elm disease:

The eradication campaign for Dutch elm disease in Auckland still continues, with disease detection surveys and surveys to determine the incidence of *Ophiostoma novi-ulmi* in the inner growth rings of asymptomatic elms. Over the 2001/2002 season seven infected trees were found at seven separate locations, six in the Howick-Pakuranga area and one in Remuera. In the previous season ten diseased trees were found at eight locations.

A survey was carried out in the Waikato to determine the incidence of staining of elms in a region where Dutch elm disease has not been recorded. The incidence of staining was significantly lower in Waikato (4%) than in Auckland (13%). It appears likely that *O. novi-ulmi* was responsible for some of the staining found in Auckland but the fungus was not recovered because it was no longer viable, or the sampling intensity was not sufficient to guarantee its recovery.

Early in 2002 the Ministry of Agriculture and Forestry commissioned an independent review of the Dutch elm disease eradication programme in New Zealand. Jay Stapes (Virginia Tech University) and Mike Winfield (University of Pretoria) carried this out. The major conclusions of this review were that, with sustained effort, eradication is still possible and that the *Scolytus multistriatus* pheromone trapping should be reinstated. A subcommittee of the Dutch Elm Disease Control Advisory Committee is meeting in August to consider the programme for 2002-2003.

Cypresses:
Diseases:

Cypress canker disease caused by species of *Seiridium* continues to affect many plantations and woodlots of cypresses, particularly *Cupressus macrocarpa*. Collaborative research between Forest Health and Alternative Species groups at Forest Research, and the Institute of Natural Resources Horticultural Plant Protection section at Massey University, is attempting to find cypress material that is less susceptible, besides being desirable in other characteristics, such as rapid growth and fine branching. Cuttings for field trials are being established from stool beds derived from seed collected from a selection of families of *C. macrocarpa*. Forest Health staff will examine additional cuttings from the same stools by testing their response to inoculation with cultures of the cypress canker fungi. Some of the initial work will involve an investigation of the variability in pathogen virulence.

Stigmina thujina caused typical death of foliage of *Chamaecyparis* spp. in a number of locations, this year. The host range of *Phyllosticta spinarum* expanded and this fungus was recorded in a number of new locations (refer new records, Section 6). Tip dieback on affected trees can be considerable.

Other hosts:

There were no new or significant pests or diseases recorded on other hosts this year.

5. **Native vegetation:**

A two–year monitoring and assessment study of declining mangeao trees, *Litsea calicaris* (Lauraceae), was completed at several localities near Rotorua. It was found that new epicormic growth compensated for ongoing dieback, so that overall crown appearance did not change greatly during the monitoring period. It was established that the decline was not caused by possum browsing or insect feeding, and no recognisable fungal pathogens were isolated, so that the likely cause of the syndrome appears to be physiological, in relation to environmental conditions.

6. **Diagnostics (Forest research Forest health Reference Laboratories)**:

In the year from 1 July 2001 to 30 June 2002, records of disorders of forest trees in the Forest Health Database totaled 8,894, slightly less than last year. Of these, 4,268 were fungal and 1,395 insect pest disorders, with the remainder being environmental and other miscellaneous disorders. Over this period the Forest Health Diagnostic Services processed 1,209 Pathology and 992 insect pest identifications.

New records:

New to New Zealand:

Fungi

- *Coryneum brachyurum* on *Betula pendula*, Wellington Biogeographic region
- *Pseudocercospora lupini* on *Lupinus arboreus*, Wanganui Biogeographic region
- *Cercospora nogalesii* on *Chamaecytisus palmensis*, Auckland Biogeographic region

Insects

- *Hyalinaspis* sp. on *Eucalyptus botryoides*, Auckland Biogeographic region

New Host (forest trees):

Fungi

- *Coniothyrium ovatum* on *Eucalyptus leucoxylon*, Wellington Biogeographic Region
- *Phyllosticta spinarum* on *Cupressus sempervirens*, Auckland Biogeographic Region
- *Cyclaneusma minus* on *Pinus tabulaeformis* var. *yunnanensis*, South Canterbury Biogeographic Region
- *Fairmaniella leprosa* on *Eucalyptus approximans*, Wellington Biogeographic Region.
- *Pseudocercospora eucalyptorum* on *Eucalyptus baxteri*, MC, 26/09/2001, new host record, risk site survey.
- *Phaeothyriolum microthyrioides* on *Eucalyptus maculata*, Northland Biogeographic Region.

Insects

- *Acizzia uncata* on *Virgilia* sp., Wanganui Biogeographic region
- *Acrocercops laciniella* on *Eucalyptus delegatensis*, Taupo Biogeographic region
- *Acrocercops laciniella* on *Eucalyptus obliqua*, Auckland Biogeographic region
- *Acrocercops laciniella* on *Eucalyptus microcorys*, Auckland Biogeographic region
- *Acrocercops laciniella* on *Lophostemon conferta*, Bay of Plenty Biogeographic region
- *Agapanthida pulchella* on *Chamaecyparis lawsoniana*, Taupo Biogeographic region
- *Ceroplastes sinensis* on *Eucalyptus ficifolia* Bay of Plenty Biogeographic region
- *Ctenarytaina* sp. on *Eucalyptus pulverulenta*, Taranaki Biogeographic region.
- *Eriococcus coriaceus* on *Eucalyptus cladocalyx*, Wanganui Biogeographic region.
- *Gastrosarus nigricollis* on *Agonis flexuosa*, Auckland Biogeographic region
- *Glycaspis granulata* on *Eucalyptus cladocalyx*, Wanganui Biogeographic region
- *Holocola* sp. on *Acacia floribunda*, Wanganui Biogeographic region
- *Holocola* sp. on *Acacia longifolia* subsp. *sophorae*, Wanganui Biogeographic region
- *Megastigmus* sp. on *Ophelimus eucalypti*, Gisborne Biogeographic region
- *Nambouria xanthops* on *Eucalyptus ovata*, Coromandel Biogeographic region
- *Navomorpha lineata* on *Abies nordmanniana*, Wellington Biogeographic region
- *Paropsis charybdis* on *Eucalyptus gobulus* subsp. *pseudoglobulus*, Hawkes Bay Biogeographic region
- *Prionoplus reticularis* on *Cupressus lusitanica*, Bay of Plenty Biogeographic region
- *Prionoplus reticularis* on X *Cupresocyparis leylandii*, Bay of Plenty Biogeographic region
- *Quadraspidiotus perniciosus* on *Acmena smithii*, Waikato Biogeographic region
- *Stenopotes pallidus* on *Pinus monticola*, Bay of Plenty Biogeographic region
- *Strepsicrates macropetana* on *Eucalyptus fraxinoides*, Wanganui Biogeographic regionregion
- *Strepsicrates macropetana* on *Eucalyptus maculata*, Northland Biogeographic region

7. Biosecurity preparedness:

Pine pitch canker:

A management plan for response to an incursion of pine pitch canker in Australia and New Zealand was prepared for the Forestry and Forest Products Committee and presented in March 2002. The 119-page document was written by Dr Peter Gadgil, with input and assistance from the RWG 7 pine pitch canker sub-committee.

The effectiveness of several fungicide treatments for reducing levels of *Fusarium circinatum* in infested seedlots has been examined by Dr Tom Gordon's team at UC Davis on behalf of the New Zealand Forest Health Research Collaborative. Two of the fungicides treatments seem to be effective: *Fusarium circinatum* was not recovered from any of the seed treated with either of these materials, nor any of the seedlings which emerged from the treated seed. Seed in untreated controls was 100% infected and *F. circinatum* was isolated from 62% of the seedlings that germinated in this treatment. Validation of these results is desirable and is being carried out by Dr Gordon.

Western gall rust:

The North American Western gall rust fungus (*Endocronartium harknessii*) is still considered to be a serious threat to New Zealand *Pinus radiata* plantations, because no alternate host is required for the completion of its autoecious, microcyclic life cycle, and aeciospores may travel several hundred kilometers. Early diagnosis is hampered by the lengthy time period of two years between infection and aeciospore production, and by the fact that *E. harknessii* cannot be cultured from juvenile galls. A project has therefore been initiated to find an alternative detection method. One option may be to use a DNA-based molecular tool to identify *E. harknessii* in non-sporulating galls, by extending a procedure developed by Dr Det Vogler of the Institute of Forest Genetics, USDA Forest Service. The project has been started by holding discussions with Dr Vogler, and extracting DNA from aeciospores released from rust galls collected from *P. contorta* var. *latifolia* and *P. ponderosa* trees in British Columbia. The aim is to produce a rapid and simple molecular technique for the early detection of *E. harknessii* in infected host tissue, in the event of an introduction, to enable prompt action to be taken to prevent its establishment.

Post entry quarantine services:

On 25 March a meeting was organised by MAF Biosecurity (Plants) in order to discuss the lack of post entry quarantine (PEQ) services in this country. It is now Government policy that the provision of such facilities is not core government business and has to be provided by industry. However, there is a general consensus from industry that Government is rejecting its responsibility in this matter, and the current situation is that New Zealand no longer has an all-purpose PEQ glasshouse facility. There is also considerable apprehension that the lack of a reasonably priced PEQ facility may result in the smuggling of plant material into the country. MAF Biosecurity Authority has had discussions with the Minister of Agriculture and Biosecurity. They still consider the contestable model valid and that various sectors of the agricultural and horticultural industries have to work together to solve this problem. No substantial progress was made at the meeting, but agreement was reached on the formation of a committee to explore "Alternative options for a Level 3 PEQ facility for New Zealand. Industry to explore with government the extent of public good and hence associated crown funding in this most important aspect of biosecurity". At present the lack of a general PEQ glasshouse in New Zealand has not had any serious repercussions in forestry due to the low volume and infrequent importation of tree material. However there is the potential for long term problems if breeding programmes are forced to wind down due to the difficulty in importing new genetic stocks because of the lack of a PEQ glasshouse.

8. **Administration and policy:**

An informal group known as the Forest Health Information Working Group (FHIWG) has been formed with interests in forest surveillance and the application of spatial analyses and technologies to forest health. This group meets several times a year. It has championed such projects as the evaluation of hand held Global Positioning System units, which led to an ongoing series of related workshops, a low level helicopter surveillance trial, and greater use of Geographic Information Systems in the analysis of forest health data. The group is exploring new initiatives in the forest health information area in association with input from the wider forestry sector.

9. **Extension:**

The Forest Health News newsletter continued to be produced each month, and attracts much interest in the wider forestry sector (see: http://www.forestresearch.co.nz/).

11. CSIRO 2000/2001 – PESTS AND DISEASES

Research and Development
Pests
CSIRO Entomology

Parasitoids of autumn gum moth

Mark Short and Martin Steinbauer continued their work on parasitoids of Autumn gum moth. The emphasis continues to be on the family Ichneumonidae as this family contains eight of the twelve known parasitoids of the moth. Recently concluded was an experiment to measure the diversity of the ichneumonid community in a plantation as the trees age. In autumn 1999, when the trees were around 9 months old, the total number of ichneumonids caught was a very low 18, representing 10 species. Three years later, in autumn 2002, the number caught was 181, representing about 33 species.

Also conducted was a field experiment to test whether the presence of nectar (from five flowering herbaceous plants) in a plantation would lead to greater numbers of ichneumonid wasps. The data from this work is not yet available.

Longevity experiments continued in the laboratory with the offering of various species of flowers to the wasps. There has still not been found a flower that changes the wasps' lifespan by much. However, based on some field observations, an experiment was set up to test whether the wasps feed on scale-produced honeydew. It was found that they do and they lived an average of three times longer than wasps without access to this honeydew.

Mimic, now supplied by Dow AgroSciences (formerly supplied by Bayer), has just been registered for use against Autumn gum moth in eucalypt plantations thanks to a joint report using data provided by Jane Elek at Forestry Tasmania and data from CSIRO Entomology in collaboration with Lower Murray Water. Mimic will only kill Lepidoptera on application and for this reason maybe more beneficial to populations of natural enemies. However, it is likley to cost about $60 per ha cf. about $20 per ha for alpha-cypermethrin (a synthetic pyrethroid).

Biology and ecology of *Essigella californica* on *Pinus radiata*

Morphological studies, developmental studies and field monitoring have all been completed, with data analysis and report writing now underway. Findings to date show that the aptera of *E.*

californica have only three nymphal instars. This probably allows this very small aphid to maintain a high intrinsic rate of population growth despite a low fecundity rate. Development studies at various temperatures indicate that *E. californica* is able to successfully complete development on *Pinus radiata* seedlings from 10°C to 25°C. This helps to explain its successful colonisation of commercial pine plantations throughout the country. Field monitoring at three sites in the ACT showed that *E. californica* populations vary between sites, perhaps related to the overall health of trees in the stand. Populations did not vary significantly within sites, although some trees were more heavily infested than others. Population trends were seasonal, although trends varied between sites. Populations generally peaked from late summer into autumn. The production of alates was also seasonally dependent, with the highest numbers recorded in summer. The number of alates varied between sites, with the site that had the lowest total numbers of aphids, having a very high proportion of alates.

Genetic resistance of *Toona ciliata* and silvicultural control of the cedar tip moth, *Hypsipyla robusta*.

Research plantations of *Toona ciliata* and related species are being used to determine best forestry practice to reduce tip moth damage in Asia and Australia. Recent results indicate there is a chemical basis to tree selection by the tip moth, and that trees grown in low light environments are less attractive to egg-laying adults. We have isolated and identified a distinctive suite of terpenoid compounds in leaves of *Toona ciliata,* and are currently working to determine if these compounds are active in influencing oviposition and feeding choices by *Hypsipyla robusta*.

Insect diversity in farm forestry

We recently completed a survey of arthropod diversity in Eucalyptus globulus plantations in south-western WA, published in this report:

> Hobbs, R.J., R.B. Floyd, S.A. Cunningham. P. Catling, J. Ive 2002 Farm Forestry: Quantifying conservation and environmental service benefits A report for the RIRDC/L&W Australia/FWPRDC Joint Venture Agroforestry Program

Compared to nearby native remnant forest, plantations had lower species diversity and were dominated by a few relatively abundant species. Among the dominant insect species in plantations were a number of Eucalyptus feeding pests. Gonipterus scutellatus, native to eastern australia, was the most common canopy beetle in remnant forest, where it was not previously

recorded. It appears that plantations have facilitated the movement of this pest species into native vegetation.

Autumn gum moth pheromones

During the summer and autumn of 2001 and 2002, Martin Steinbauer tested synthetic sex pheromone lure of Autumn gum moth at experimental eucalypt plantings near Canberra. The synthetic lures were compared with virgin females. Synthetic lures caught approximately the same numbers of male moths but over a much longer period than virgin females, i.e. virgin females produce odours more attractive than the synthetic. The short period of attractiveness of the virgin females is simply a function of how long they will survive in a pheromone trap. Hence, there are still issues unresolved about the compounds needed in a synthetic lure but the existence of pheromone communication in the moth and the identity of one compound have been achieved.

Dr Fredrik Ostrand will arrive in Canberra on 17 August from Lund University, Sweden. He will work with Martin Steinbauer for one year to study the efficacy of sex pheromone lures for monitoring populations of Autumn gum moth, in particular the relationship between numbers of moths caught in traps and numbers in a plantation.

PEST REPORT FROM WESTERN AUSTRALIA

African black beetle, *Heteronychus arator*

African black beetle, previously a severe establishment-phase pest in wetter areas of south-western Australia is now effectively managed non-chemically using degradable plastic mesh barriers placed around the roots and lower stem of seedlings. These are now the product-of-choice for protecting seedlings against this pest. An additional positive result of this work is that a regional sheltered workshop contracts with at least one major commercial tree growing company to fit the barriers to seedlings.

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 and determining whether the potting mix or the seedlings themselves are the target of feeding larvae.

Spring beetles, *Liparetrus spp.*

These small, abundant insects swarm onto seedlings from adjacent forest and can defoliate them very quickly. The unpredictability of swarming and rapid damage makes this pest both difficult to study and to manage. Attempts are being made, as part of the CRC-SPF project mentioned above to assess factors that make seedlings attractive to *Liparetrus* and whether surface coatings may limit attack by this insect.

Research and Development - Diseases - Australia

CSIRO Forestry and Forest Products

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 Canberra, Hobart or Perth have significant input. The names of principal CSIRO contacts have been placed in parentheses.

***Puccinia psidii* (guava rust, eucalypt rust)**

A collaborative project between CSIRO, Federal University of Vicosa, Brazil and the Forestry and Agriculture Biotechnology Institute(FABI), Pretoria, South Africa has been underway with ACIAR support for two 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 for presence of the rust. Good progress has been made in all these areas and will be reported at the 8th International Congress of Plant Pathology in Christchurch February 2003. (Ken Old, Inez Tommerup)

Acacia diseases manual

A manual for safe international movement of acacia germplasm has been written by Ken Old, Rob Floyd, and Tim Vercoe of CSIRO and Mike Wingfield and his South African colleagues at

FABI, Pretoria. The manual will be published by FAO International Plant Genetic Resources Institute (IPGRI) Rome. (Ken Old)

Phaeophleospora destructans

The exotic pathogen *Phaeophleospora destructans* (syn. *Kirramyces destructans*), which was previously recorded only on eucalypts in Sumatra, Indonesia and caused serious foliar damage to *E. camaldulensis* plantations in Thailand, was recently found by Ken Old on *E. urophylla* in East Timor. AQIS has been alerted to the presence of this pathogen in East Timor and images of the pathogen and symptoms of disease have been supplied. (Ken Old)

Foliar diseases of eucalypts

In Tasmania, Caroline Mohammed, who holds a joint CSIRO-University of Tasmania appointment, 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. (Caroline Mohammed)

Stem quality research

A collaborative project between University of Tasmania and CSIRO, with ACIAR support, is investigating the causes of heart rot of plantation acacias in Indonesia and stem defect in *E. globulus* in northern Tasmania. The research team is led by Caroline Mohammed. Work in Indonesia focuses on the incidence of heart rot in commercial plantations and the effects of species, provenance and silviculture. The identity and detection of heart rot fungi is also being studied. In Tasmania, the relationship between pruning wounds and stem defect and the biochemistry and histology of wound responses are being studied. In both countries the aim is to increase the potential for sawn products from fast-growing hardwood plantations. The project was launched in Bogor, Indonesia, August 2001 at a workshop, the proceedings of which will be published shortly by ACIAR. (Caroline Mohammed)

Forest Health Assessment

Following research in mixed species coastal forests in NSW, which combined remote and ground assessment of eucalypt canopies to develop an indicator of forest health (eucalypt crown condition index - ECCI), the SFNSW/CSIRO team has used similar methods to assess pine

health. The methodology was applied to radiata pine in Buccleuch SF affected by Dothistroma needle blight during the summer 2000-2001. Using a Compact Airborne Spectrographic Instrument (CASI) it was possible to distinguish individual tree crowns and assign disease ratings which were closely matched by ground assessment of disease impacts. The work was partially supported by AFFA and has led to funding by PTR, through FWPRDC, of a project to test this approach to disease surveillance of a range of pest, disease and environmental impacts on pines in Carabost SF, in NSW. (Ken Old)

Resistance selection for pine diseases

Pine pitch canker

Greenhouse trials for *Pinus radiata* resistance to Pine pitch canker (*Fusarium circinatum*) have been completed in California as part of the collaborative IMPACT studies. More than 500 CP and OP families from Australia, New Zealand, and Chile were tested. Seedlings were artificially inoculated and subsequently measured for lesion lengths and the frequency of stem girdling. Results suggest there are 'useful' levels of resistance, within a number of families from each of the three countries, and that resistance should respond to selection. However, the results provide some puzzles for genetic interpretation and the pattern of inheritance appears to be somewhat anomalous. Pedigree information for NZ and Chilean material will enable the further testing of ideas. Results from this work were presented at the New Zealand Radiata Pine Breeding Company Meeting in October 2001 and a draft report has been prepared. Further evaluations in field trials in California are anticipated to begin in 2003. (Colin Matheson, Mike Devey)

Dothistroma needle blight

Genetic markers associated with quantitative trait loci (QTLs) for resistance to Dothistroma needle blight (*Dothistroma septosporum* (syn *D. pini*)) have been identified and validated in radiata pine. The markers were initially identified using progeny from six full-families, each having a common maternal or paternal parent. Putative QTLs were identified where significant associations with resistance occurred in two or more families. Marker data for putative QTLs and resistance data were then obtained from a large clonally replicated family established in field trials at two sites (near Tumut, NSW and Myrtleford, VIC respectively). From this information three QTLs for resistance appear to have been validated. Publication of this work is expected during 2002/2003. (Gavin Moran, Mike Devey)