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ANNUAL PEST, DISEASE, AND QUARANTINE STATUS REPORT FOR AUSTRALIA AND NEW ZEALAND

1999-2000

CONTENTS

INTRODUCTION

1. This report presents the annual statement of forest pest and disease conditions throughout Australia and New Zealand for the year 1999-2000, and also incorporates the disease quarantine statement for the two countries. It comprises the second such combined pests and diseases report under the newly constituted RWG 7 (Forest Health). The report follows from Outcome 2 in the 1999-2000 Transitional Operating Plan for RWG 7, and is summarised from the individually submitted State and Country reports (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 Standing Committee on Forestry for its information, consideration, and any action deemed necessary.

CONSIDERATION

AUSTRALIA

Plantations:

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

***Pests*:**

*Sirex wood wasp (*Sirex noctilio*)*

3. Although Queensland remains free of *Sirex*, the insect is now only 100 km across the border in New South Wales (see next paragraph). Trap tree and ground surveillance has been increased in the border area and arrangements made for the training of more DPI Forestry District staff on detection and management of this pest.

4. In New South Wales, *Sirex* damage was observed for the first time near Inverell in June 2000, the most northerly record in the State. Very low levels of damage (<1% incidence) were observed in ca. 450 ha of *Pinus radiata* plantations at Mount Topper State Forest, approximately 20km south of Inverell. The incidence of naturally attacked trees remains very low in all State Forests of NSW plantations. Most of the infested trees are suppressed, and in stands that are overdue for thinning. However, levels are higher in a number of privately owned plantations around Walcha on the Northern Tablelands. Several owners have been approached with regard to implementing management through nematode release, and a *Sirex* workshop will be run by State Forests of NSW at Tumut in October, 2000. *Sirex* emergence numbers from trap tree billets remains low in Monaro, Hume and Macquarie Regions, with the main concentration of effort for *Sirex* control in Northern Region.

5. *Sirex* incidence was low throughout 1999-2000 in most pine areas in Victoria. However, due to the dry conditions experienced over the past two years, growers have been advised to thin where practical, or in unthinned stands to increase the incidence of trap tree plots for inoculation with nematodes, to ensure that *Sirex* populations are maintained at manageable levels.

6. In the past year *Sirex* was located at two sites in Tasmania. One is a private, 5 ha stand planted in 1980 in the northeast, where approximately 10% of trees have been killed over several years, including 2% in the current year. The other site is at Beulah, where three trees were attacked during the past year. All trees were tested for the nematodes *Deladenus* and *Bursaphelenchus* (tests were negative for the former, and it is now five years since nematodes were last recovered in Tasmania). Surveys will not be conducted this winter, except for the monitoring of two 100-tree plots established at Tower Hill and Branch's Creek, at the request of Rayonier, who now

manage the softwood joint venture. In the future there will be greater reliance on the forest health surveys for the detection of *Sirex* attacked trees.

7. Observation flights in late May 2000 showed *Sirex* to be relatively inactive in the southeast of South Australia. There were no deaths attributable to *Sirex* in areas where mortality has previously been high. Despite the low incidence of *Sirex*, nematode inoculations are continuing. Ten million nematodes have been ordered this year for the South East region and 25 million for the Central and Northern regions. Nematodes were not found in live *Sirex* collected by contractors at Mt Burr in South East Region. In this region the ongoing inoculation program is focusing on localised populations that build up spasmodically as plantations become susceptible. The trap tree program is continuing, and some *Megharyssa* that have emerged will be used in the breeding and release program.

8. In Western Australia only two trapping sites were installed this year, and these did not detect infestation by *Sirex*. Evidence of *Sirex* was also not found during visual assessments, which were undertaken while performing other work because of the limited number of trap sites. A larger number of monitoring plots will be established strategically in November, 2000, near larger road transport routes such as the Great Eastern Highway, South West Highway and Old Coast Road, incorporating stands of different age classes.

*Five spined bark beetle (*Ips grandicollis*)*

9. *Ips grandicollis* continues to remain south of the quarantine border established in 1994 at Maryborough in Queensland. *Ips* activity has generally been low this year, the only attack of any significance being on fire-damaged *Pinus caribaea* var. *hondurensis* trees at Beerburrum in the southeast of the State.

10. In New South Wales, greater numbers of adult *Ips grandicollis* were collected during the flight season than in 1998-1999. The main concentration of these beetles was in Hume region with numbers also on the increase in *Pinus* forests managed by A.C.T. Forests. Forest management practices have been employed where possible, including harvesting outside the flight season, and prompt log removal from storage areas to minimize attack. Reduction of adult beetle overwintering material has been encouraged by the use of chopper rolling with spot cultivation, and rough stacking and burning. The *Ips* monitoring program is to be continued in New South Wales during the 2000 flight season.

11. Apart from a minor infestation in the south west of the State, where approximately 30 two-year-old *P. radiata* trees were affected, no major *Ips* outbreaks occurred in Victoria. *Ips grandicollis* has not yet been detected in Tasmania. There were also no reports of damage by *Ips* in South Australia, although it has been found in *Sphaeropsis*-affected trees in this State.

12. A dry autumn in Western Australia resulted in an increase in the incidence of attack by *Ips grandicollis* in some plantations, particularly in three- to six-year-old trees on second rotation sites in the Blackwood Valley.

Other bark beetle species

13. There was no evidence of damage to newly established pine plantations from *Hylastes ater* in New South Wales or Victoria, this year, and there was only minor damage in three plantations in the northwest of Tasmania.

14. No outbreaks of the golden haired bark beetle (*Hylurgus ligniperda*) were reported in Victoria.

*Monterey pine aphid (*Essigella californica*)*

15. *Essigella californica* is present in all radiata pine areas in southern Queensland. Although it has sometimes been associated with needle chlorosis, no causal relationship has been proved. Many chlorotic trees have no aphids at all, and the symptoms may indicate nutritional changes. No significant damage has been evident to date.

16. *E. californica* was found in the Casino area in northern New South Wales in *Pinus elliottii* × *P. caribaea* F1 and F2 hybrids, and in the northern tableland area around Walcha in *P. radiata*. Aphid numbers were low in both areas and there was no sign of foliage damage. Aphid incidence was monitored over three consecutive months at two Casino sites from March, 2000, and at an additional site at Crofts Knoll State Forest in the Walcha area from June, 2000. Monitoring for *E. californica* has also continued at six sites in central and southern New South Wales (Hume, Monaro, and Macquarie regions). This year, all sites monitored for more than 12 months showed reductions in numbers of affected trees and incidence of aphids per tree. The oldest sites, in Hume region, also showed a shortening of the period of aphid activity (aphid numbers, still plentiful at the end of July, 1998, were significantly reduced in June, 1999 and again to the same extent in June, 2000).

17. *Essigella californica* is now widely established throughout the pine growing areas in Victoria. Trees defoliated over the past two years showed signs of refoliation during summer, 2000, especially in northeastern Victoria, Latrobe Valley and Ballarat. However, 15-year-old and older stands of *P. radiata* in southwestern Victoria, where the aphid arrived only during the past year, are significantly defoliated. Ladybirds have been recorded in large numbers in all areas where the aphid is present. A workshop on *Essigella* was run in November, 1999, for government and private representatives.

18. *Essigella californica* was found in late summer at two sites in southern Tasmania, associated with up to 50% needle loss. Good control was obtained at one of the sites, a seed orchard, by spraying with a synthetic pyrethroid.

19. *Essigella californica* is now widespread throughout the pine growing areas of the South Australia. Although aphid numbers were again high, particularly in southern plantations, defoliation levels were low, even in areas that were badly damaged last season, suggesting that previous damage may not have been solely due to the aphid. Ladybirds have been prolific in all affected areas.

20. The occurrence of *Essigella californica* in Western Australia was confirmed in June, 2000, and a survey found the aphid to be present in pine plantations throughout the southwest of the State, including stands of *Pinus pinaster*. Significant defoliation occurred in the Blackwood Valley, where the aphid was first found. Damage does not seem to be severe on *P. pinaster*, but it is not yet clear if the aphid is responsible for tip defoliation observed on this species. A monitoring program, which will include sampling for aphid predators, is expected to start in spring.

*Pine aphid (*Eulachnus thunbergii*)*

21. *Eulachnus thunbergii*, like *Essigella californica*, is present in all radiata pine plantation areas in southern Queensland, and both aphids are often found on the same trees. *E. thunbergii* has also been found in all coastal areas up to Kuranda in north Queensland, on pine species other

than radiata pine. Again, it is sometimes associated with chlorotic foliage but no serious damage has been evident.

22. Surveys monitoring the distribution of *Essigella californica* in New South Wales were used to collect distribution data on *Eulachnus thunbergii*. The distribution of *E. thunbergii* did not change during 1999-2000, with the southernmost record in this State still being at Oberon. *E. thunbergii* was not recorded from Tasmania.

Other Pests of pine

23. In Queensland, heavy infestations of pink wax scale (*Ceroplastes rubens*) were present this year on *Pinus caribaea* var. *hondurensis* × *P. elliottii* var. *elliottii* hybrid stands in Tuan State Forest near Maryborough. This insect has been an occasional problem on exotic pines, mainly *P. taeda*, in the south of the State.

24. In New South Wales, painted apple moth (*Teia anartoides*) caused moderate levels of defoliation (up to 15% on isolated trees) in young *Pinus radiata* in Hume region (Tumut-Tumbarumba). Larval feeding by this insect also resulted in severe defoliation on individual, two- to four-year-old trees of *P. radiata* at several sites in Tasmania.

25. Although there were no serious outbreaks of wingless grasshoppers (*Phaulicridium vittatum*) in New South Wales, this year, monitoring will continue during spring and summer, 2000, in Tumbarumba where this pest has previously been a problem. However, minor wingless grasshopper damage was recorded in newly established radiata pine plantations in Gippsland, Victoria, this year, and widespread defoliation of pines occurred for the first time in Tasmania, apparently caused by severe drought conditions in autumn, that resulted in a lack of pasture feed. Trees in *P. radiata* shelterbelts up to 15m in height throughout the central midlands were totally defoliated but adjacent older trees suffered little damage. Trees along the margins of rural blocks were also defoliated.

26. Shoots on young, drought stressed trees at the edges of several blocks in northeastern Tasmania, were affected by the pine aphid, *Pineus laevis*, resulting in a stunted appearance.

27. Adult *Scotasmus carnirostris* weevils caused severe defoliation to a small number of 1995-planted trees on a pasture site in the Plenty Valley, Tasmania.

28. Possums have caused extensive damage in Bombala, New South Wales, in recent years, and the affected area increased further this year. Damage in other regions in this State is less significant and restricted to small pockets adjacent to native bush. Top death following ringbarking by brushtail possums continues to be a problem in localised areas in Tasmania, in high altitude plantations south of Burnie and in plantations in the Tyenna Valley and middle reaches of the Derwent Valley.

29. Wallaby browsing damage occurred in young pine stands adjacent to native bush and retention strips in many regions in New South Wales. Often up to 90% of young trees were attacked, but less than 1% of trees were killed. Stem stripping by wallabies affected approximately 230 ha of three-year-old *P. radiata* in northern Tasmania. The problem was most prevalent in the steep, weedy compartments in Springfield Block where 57% of trees were affected. Most (98%) of the affected trees were only partially stripped and the only sign of adverse effect was a slight yellowing of the foliage.

30. Browsing from rabbits caused significant mortality in newly planted *P. radiata* plantations east of Glen Innes, New South Wales.

***Diseases*:**

Foliage

31. Dothistroma needle blight, caused by *Dothistroma septosporum* (synonyms, *D. pini*, *Eruptio pini*, *Mycosphaerella pini*), continued to defoliate *Pinus radiata* at Gambubal, in southeastern Queensland.

32. *Dothistroma* was a significant problem (>50% defoliation or infection) in Northern Region of New South Wales, and was also observed at higher than previous levels in Monaro and Hume Regions. Up to 1700 ha were affected in Northern Region (including Walcha and Casino plantations), while Monaro had 2250 ha and Hume approximately 800 ha. Spraying, thinning and pruning operations are carried out in Northern Region to reduce *Dothistroma* levels, while thinning is the main form of control elsewhere in this State.

33. Routine surveys undertaken in Victoria in October, 1999, continued to show low levels of disease caused by *Dothistroma septosporum*, and no spray programs were conducted in this State during 1999-2000. *D. septosporum* was again also at very low levels during the year in Tasmania. Health status surveys of three-year-old plantations assessed a total incidence of only 0.95%, three-quarters of which was trace infection.

34. In New South Wales, *Cyclaneusma minus* needle cast was observed at higher levels than previously in Monaro, and at Walcha in Northern Region. In Northern Region, up to 1000 ha of *P. radiata* was damaged by *Cyclaneusma minus*. While widespread in other Regions, the levels were lower than previous years.

35. Spring needle cast remains the major foliage disease problem in Tasmania. Higher altitude plantations in the northeast that have suffered high levels of spring needle cast are being progressively converted to *E. nitens* after harvesting.

36. No other major foliage disease problems were found this year in Tasmania. *Cladosporium* sp. and *Pestalotiopsis* sp. (near *P. persea*) were isolated from infected areas at the bases of drooping needles on apical shoots, from a localised area in a compartment at Springfield in the northeast of the State. However, these fungi are considered to be secondary infections of stressed trees due to poor drainage.

37. No major problems were reported in pines in Western Australia.

Shoots and stems

38. Diplodia dieback, caused by the fungus *Sphaeropsis sapinea* (synonym, *Diplodia pinea*), was relatively quiescent in plantations of *P. radiata* at Paschendaele, in Queensland, this year. The same disease was encountered occasionally, causing insignificant damage in tropical *Pinus* species in this State.

39. Damage in New South Wales from *Sphaeropsis sapinea* was much less significant this year than in previous years. There were fewer deaths related to drought and *Sphaeropsis* in all regions of the State.

40. Diplodia, in association with drought, caused dieback and death of trees in southwestern Victoria. Outbreaks of dieback, also caused by *Sphaeropsis pinea*, occurred in plantations at Mt Burr and Mt Gambier in the southeastern region of South Australia. The most severe occurrences

were in the Myora and Caroline plantations where large numbers of trees died in 21- to 37-year-old stands. This disease is endemic to the area but it is normally rare. It appears to have been promoted by severe lack of rain over several years.

41. In southern Tasmania, a ten-year-old plantation in the Plenty Valley area suffered extensive top death following *Sphaeropsis sapinea* infection. Approximately 10% of trees were affected, ranging in severity from dieback in the top metre of the terminal shoot, through to death of the whole above-ground portion of the tree. The affected compartment has a history of boron deficiency and it is thought the combination of this with the record drought that occurred during the past 12 months triggered the outbreak. *S. sapinea* infection was very rare in ca. 3,000 ha of three-year-old plantations surveyed this year for health status.

Galls, Tasmania

42. No further plants were found affected by the stem gall problem detected last year in Tasmania. The problem remains undiagnosed. Three affected plants were removed from the field and transferred to the glasshouse in an attempt to accelerate gall development. Unfortunately the trees failed to survive the transplant shock and all died within six months.

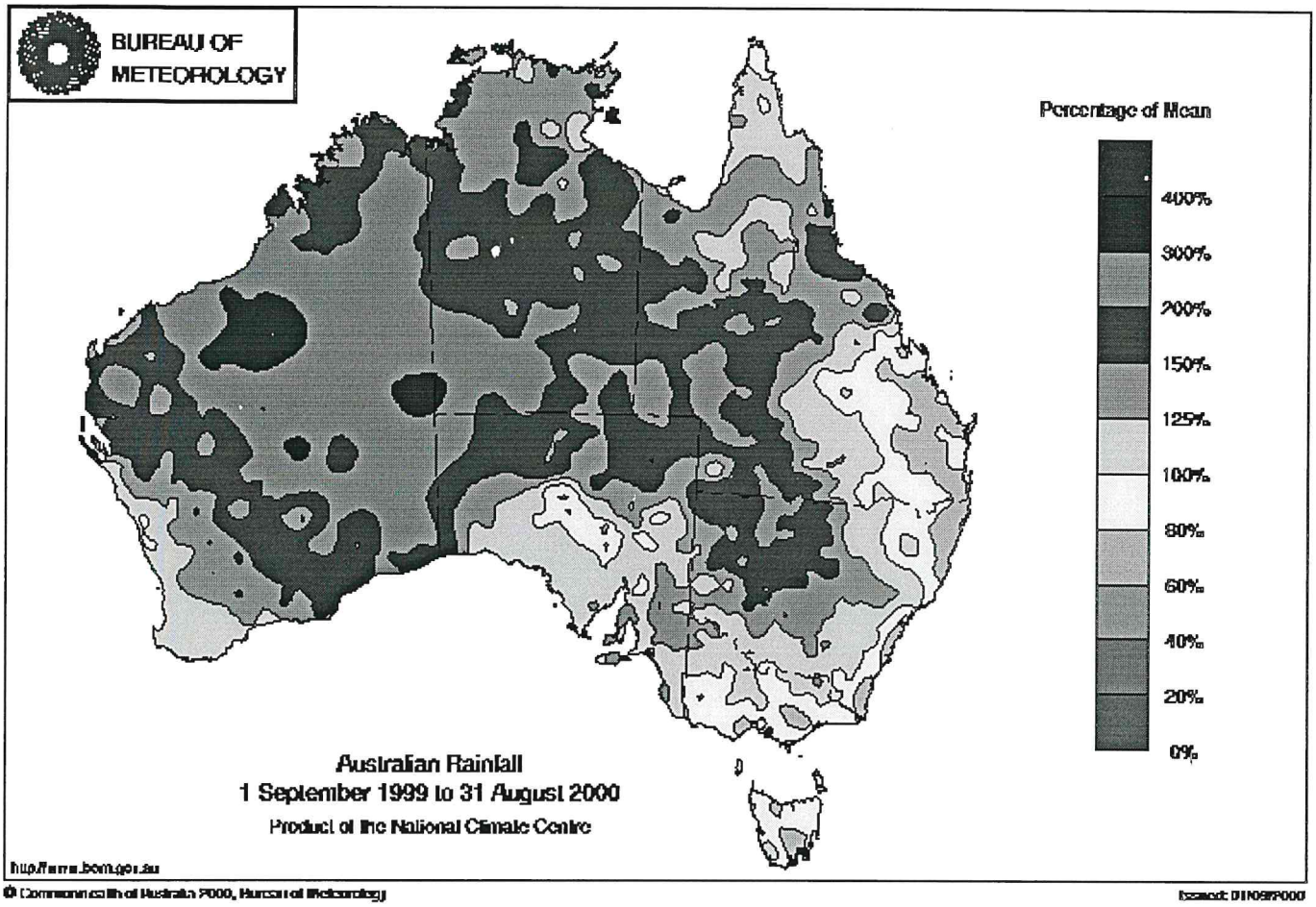
Roots

43. Root rot caused by *Phytophthora cinnamomi* continued to give rise to scattered deaths in plantations of hybrid *Pinus caribaea* var. *hondurensis* × *P. elliottii* var. *elliottii* in southeastern Queensland, especially on excessively wet sites, but overall damage is usually insignificant.

44. *Armillaria* was not a significant issue in the *P. radiata* plantations in New South Wales, this year. No dead or dying trees infected by *Armillaria* were detected in health status surveys of three-year-old plantations in Tasmania.

Environmental

45. As in previous years, high levels of needle chlorosis associated with drought and natural senescence were observed, mainly in *P. taeda* and *P. elliottii*, in plantations at Casino, New South Wales. Southern Victoria, and in particular Western District, are also still being affected by rainfall deficiencies. Severe drought affected a diagonal strip from the central northwest coast of Tasmania to the southeast of the State. Dead tops could be seen in several older plantations on moderate slopes in drier areas east of Devonport. Generally affected trees were scattered and showed a low incidence (<1%). However, in the worst affected area (Branch's Creek Block) approximately 10-20% of trees in several patches of 1-2 ha had dead tops.



46. Frosts caused damage to the lower needles of young pine trees (<3-year-old) in New South Wales this year, in Hume and Macquarie regions. Incidence was higher than previous years, but the affected area was still less than 200 ha, and deaths were minimal.

47. Scattered shoot blight on lateral branches occurred in patches of trees in older plantations in the Lisle and Springfield areas in Tasmania. It is suspected that the problem was the result of hail damage (with subsequent *Sphaeropsis* infection). However, this diagnosis has yet to be confirmed. While a large area was affected, the severity of damage was low and negligible adverse impacts are expected.

48. Establishment problems, such as poor site quality and waterlogging, resulted in infection from *Macrophomina phaseolina*, and deaths of newly planted seedlings occurred in localised areas mainly in Hume Region in New South Wales.

Other

49. In Queensland, scattered mortality in young stands of F1 *Pinus* hybrid clones (*P. caribaea* var. *hondurensis* × *P. elliottii* var. *elliottii*) was associated with poor root configuration of the trees derived from containerised stock. This is possibly because pots are no longer treated with copper in order to discourage root coiling, but may also be influenced by the small size of the pots used, and by planting delays. Nematodes, of genera other than *Bursaphelenchus*, together with *Ips* beetles and blue-stain fungi, were found in most of the affected plants, but all of these are considered to be secondary to root coiling and root compression, as the cause of mortality.

50. Weed competition, mainly by *Acacia* spp. and grasses, was a problem this year in the younger age classes (up to four-year-old) in Hume, Macquarie, Monaro and Northern regions in New South Wales.

Hoop pine (*Araucaria cunninghamii*):

***Pests*:**

51. Hoop pine plantations were generally free of insect pest problems throughout Queensland and New South Wales, this year.

***Diseases*:**

52. Root rot and mortality, caused by the fungi *Junghuhnia vincta* (Poria root disease; synonyms, *Rigidoporus vinctus, Poria vincta*), *Phellinus noxius* (synonym, *Fomes noxius*), and *Rosellinia* sp., continued to affect young second rotation plantations in southeastern and far north Queensland. Most of these deaths were caused by Poria root disease, which appears to be the main root rot disease encountered in second rotation plantations, whereas *P. noxius* was the main pathogen in first rotation stands. Dothiorella dieback of branches and leading shoots, associated with *Botryosphaeria ribis* (anamorph, *Dothiorella* sp.), continued to occur, but rarely caused significant crop damage. The teleomorph and anamorph states were both present at the base of young trees and on the branches of older trees in north Queensland.

53. There were no significant diseases observed in the *Araucaria* plantations in New South Wales.

***Other*:**

54. Hoop pine stands at Imbil in southeastern Queensland are seriously affected by the exotic vine Cat's Claw (*Macfadyena unguis-cati*). This rampant woody vine can climb to a height of 30m and the diameter of its stem can reach 15cm. It has distinctive small tendrils, each of which end in three sharp, hooked claws (hence the name). The vine can smother tree canopies causing crown death. It is difficult to kill and almost impossible to remove manually, which hinders the milling of logs. Biocontrol options are being investigated.

***Eucalyptus* species:**

***Pests*:**

Psyllids

55. *Creiis liturata* again caused significant damage to young plantings of *Eucalyptus dunnii* near Casino and Kyogle in New South Wales, and is now considered a potentially significant pest of young eucalypt plantations in the northern part of this State. In one instance, approximately 100 ha were affected by an outbreak in April, 2000, and recent observations indicate that up to 20 ha of this has not recovered, although frost may also be a factor. Observations indicate that this insect can build up to high and damaging numbers in less than four weeks. *Creiis* was observed in a greater number of plantations this year, and has also been found attacking *E. grandis, E. grandis* × *E. camaldulensis*, and *E. grandis* × *E. tereticornis.*

56. In Victoria, low levels of *Cardiaspin*a spp. were recorded on *E. camaldulensis* plantations in the Shepparton irrigation region during summer, 2000. Populations observed do not warrant the implementation of control measures, but activity levels are being monitored.

57. The blue gum psyllid, *Ctenarytaina eucalypti*, was present in most *E. globulus* and *E. nitens* stands in Tasmania and Western Australia, but caused no significant damage.

Autumn gum moth (Mnesampela privata)

58. *Mnesampela privata* was not observed in commercial plantations in New South Wales, but severe damage occurred on roadside plantings of *Eucalyptus globulus* around Tumut in June, 2000.

59. Populations remained at predominantly trace to low levels across the eucalypt plantation estate in Victoria during 1999-2000, apart from isolated localised occurrences causing minor defoliation. An outbreak in a trial planting of *E. globulus* in central Victoria required control spraying to prevent significant damage occurring.

60. In Tasmania populations of autumn gum moth varied in incidence from low to severe in different plantations. Severe defoliation occurred in some stands where control spraying had been carried out too late because of an early season, late detection, and poor weather conditions. In some stands an additional spray operation was required to control the second generation population. Early detection and spraying with synthetic pyrethroids resulted in good pest control and little damage. Moths emerged continuously from mid November, 1999, until late February, 2000, in one *E. globulus* plantation that was severely defoliated last winter. Despite this, few eggs were laid, no defoliation occurred, and there was no 'autumn' emergence.

61. Autumn gum moth continues to be the major insect pest of eucalypts in South Australia, mainly in two- to three-year-old trees. However, numbers this season have so far been low, although a few plantations have required spraying.

62. Autumn gum moth was not a significant pest in Western Australia during 2000. One 1999 planting was heavily infested near the Porongurup Ranges.

Leaf beetles

63. *Paropsis atomaria* is the major defoliating species in young eucalypt plantations in the southern half of Queensland, and insecticide spraying was necessary in several joint-venture stands.

64. In New South Wales, damage from chrysomelids was generally much lower this year, but some plantations of *Eucalyptus dunnii* were severely defoliated. *Chrysophtharta cloelia* and *Paropsis atomaria* were amongst the most destructive pests in young eucalypt plantations in the north of the State, affecting mainly *E. dunnii*, *E. grandis* and *E. pilularis*. Several damaging outbreaks of Monolepta beetles were localised on the tops of hills and ridges in young *E. pilularis* plantations in New South Wales. The largest area affected was less than one hectare in size, but in severe cases young seedlings and one-year-old trees died. Attack in one plantation extended to some adjacent *Corymbia maculata*, giving rise to a new host record.

65. In Victoria only low levels of damage by the leaf beetles *Chrysophtharta agricola* and *Paropsis* spp. were observed in *E. globulus* plantations in East Gippsland and in the north-central part of the State. Damage was not widespread and tended to be confined to small sections of the plantation estate in the upper 50% of the tree crown. Control measures were not required.

66. In Tasmania spraying operations were required in some areas to control populations of *Chrysophtharta bimaculata*, *C. agricola*, and *Cadmus australis*. Routine monitoring was

conducted in stands of *E. nitens* and *E. globulus* during the summer, and late season defoliation by adult *Chrysophtharta* beetles continued to be a problem.

67. Leaf beetles are present in most plantations in South Australia, but have caused little damage.

68. Several paropsine chrysomelids, mainly species of *Chrysophtharta* and *Paropsis*, caused defoliation during the summer in plantations in Western Australia. However, damage was not as serious as that caused by the eucalyptus weevil. *Cadmus excrementarius* extensively defoliated trees even as young as six months during summer, mainly in the Rocky Gully and Mt Barker areas, but this species was only a minor problem elsewhere.

Sawflies (Perga, Pergagrapta *spp.*)

69. Species of *Perga* and *Pergagrapta* caused occasionally severe defoliation in joint venture and trial plantings in north Queensland. These insects are most prevalent on the tablelands and in the drier areas of the coast.

70. Minor damage to eucalypt plantations in New South Wales was attributed to sawfly larvae.

71. In Victoria, moderate levels of damage by the steelblue sawfly (*Perga affinis affinis*) were recorded in *E. globulus* plantations in the north central irrigation area. Damage tended to be confined to isolated and small groups of trees, with the upper 50% of the tree crown suffering the most defoliation. Control measures, including spraying, were implemented on some of these sites to prevent excessive defoliation and subsequent loss of growth occurring.

72. In Tasmania a number of woodlots again suffered severe defoliation due to attack by *Perga affinis insularis*, particularly throughout the Midlands region. At some sites, three seasons of severe defoliation pressure has resulted in mortality and stunting. Larvae are currently feeding in these stands, so an increase in mortality levels is anticipated. Sawflies have so far not been a problem in State plantations.

73. Sawflies are widespread, but were not always present in large numbers in South Australia, although spraying was occasionally necessary in some stands.

74. Sawfly numbers were low in plantations in Western Australia. *Perga schioedtei* was one of the main species encountered.

Leaf blister sawfly (Phylacteophaga froggatti)

75. Minor damage was attributed to leaf blister sawfly larvae in eucalypt plantations in New South Wales.

76. Only low levels were recorded on young juvenile foliage of *E. grandis* in northern Victoria. Most of the damage was restricted to the lower crown and no control measures were implemented.

77. Several one- to two-year-old plantations in the Albany area in Western Australia had up to 50% damage to juvenile foliage as a result of attack by leafblister sawfly.

*Christmas beetles (*Anoplognathus *spp.)*

78. Christmas beetles caused defoliation in late spring and early summer in many young eucalypt plantations in northern New South Wales, with *E. grandis*, *E. dunnii* and *Corymbia maculata* being the most severely damaged.

79. No significant Christmas beetle damage was recorded during the year in Victoria.

80. *Anoplognathus* sp. was found attacking a young *E. nitens* plantation in southeastern Tasmania. Although damage was not significant this represents the first time *Anoplognathus* has been found causing damage to plantation eucalypts in this State.

Stem Borers

81. Longicorn stem borers (*Phoracantha* sp., probably *P. solida*) are a common problem in north Queensland, and up to 50% of trees were attacked in a joint venture planting of *Eucalyptus pellita* near Julatten. This is of major concern given the likely timber degrade caused by this beetle. Plantations of *E. pellita* in the higher rainfall areas of the coast showed no signs of significant insect attack. It is apparent that this host is very susceptible to severe insect damage when planted off-site.

82. Stem borers are a major pest in young eucalypt plantations in New South Wales. Cossid moths and several species of cerambycids were observed causing damage to trees in two- to five-year-old plantations. *Eucalyptus grandis* was by far the most damaged host, but *E. dunnii*, *E. pilularis, C. maculata*, and *C. variegata* on poor quality sites were also attacked.

83. Longicorn stem borers (*Phoracantha* spp.) were recorded in a small number of isolated *E. globulus* trees in southwestern Victoria.

84. Several trees of *E. nitens* and *E. globulus* were killed by the cerambycid *Phoracantha mastersi* on the edges of plantations aged older than 10 years in Tasmania. However, *P mastersi* is mainly a problem in farm woodlots and in areas where trees may be drought stressed.

85. Horizontal cambial tunneling by weevil larvae of *Pelororhinus transversus* was frequently associated with cerambycid attack in Tasmania. Many species of smooth barked eucalypts carry the characteristic banding on trees 15cm or more in diameter. Cracking of the bark and emergence holes provides sites for subsequent *Phoracantha* oviposition.

86. Weevil larvae were observed at low levels (<1% incidence) tunneling through the cambium of young *E. nitens* in several plantations in southern New South Wales. Decay and staining was associated with this damage.

87. Axil boring by the cossid *Culama australis* was common in one- to two-year-old *E. nitens* stands in Tasmania, but mortality of larvae seems very high and only a few develop to cause large tunnels. *Aenetus lignivorus* was occasionally detected in Tasmania, and this may have serious implications for later development of stem decay.

88. Several water-stressed plantations on poor sites in Western Australia experienced infestations of *Phoracantha semipunctata*. An unidentified species of shoot borer was observed at low levels across the plantation estate.

Other pests of eucalypt plantations

89. An unusual problem encountered in a joint-venture plantation at Somerset Dam in southern Queensland was an erinose mite infestation on spotted gum (*Corymbia variegata*). An initial survey showed an incidence of approx. 75% of trees showing symptoms, although a much smaller proportion of these were severely affected.

90. In New South Wales, gum tree scale (*Eriococcus* spp.) was observed mostly at very low levels (<1 % incidence) in young plantations of mainly of *E. grandis*. Heavily infested trees were usually situated on waterlogged sites. Low levels of gum tree scale were also observed on young *E. globulus* trees around Ballarat, in Victoria. No control measures were required.

91. A heavy infestation of *Eriococcus coriaceous*, associated with progressive leaf loss from the inner crown outwards, was present in a number of young plantations of *E. nitens* with juvenile foliage in the north of Tasmania. Patches of up to ten trees were affected, with the worst affected trees losing three-quarters of the crown. The attack appeared to be site related.

92. In South Australia there were outbreaks of scale insects during the past year in several plantations. Control is difficult and in most cases trees were left untreated, and the scale eventually disappeared, though the associated sooty mould will remain for some time.

93. Minor gumleaf skeletoniser damage was caused by *Uraba lugens* on *E. camaldulensis* in northern Victoria and in trees around Melbourne, but control measures were not required. *U. lugens* caused severe defoliation in 7- to 9-year-old *E. nitens* plantations in the Birralee area, West Tamar, in Tasmania. Up to 100 ha was heavily defoliated resulting in some mortality. Spraying will be undertaken shortly, as appreciable egg populations are currently present.

94. Severe damage was caused by *Heteronyx* scarabs to several eucalypt seedling plantations in Tasmania. At least three plantations failed because of heavy damage.

95. The African black beetle (*Heteronychus arator*) was a significant problem in wetter areas in Western Australia, encouraged by the practices of planting trees on mounds and removing all inter-row vegetation (beetles move to the mounds from the inter-rows as the season progresses). Larvae of *Heteronyx elongatus* also caused severe damage to seedlings in some areas of the Great Southern, and damage by this pest may have been confused with that caused by African black beetle larvae. Larvae of *H. elongatus* appear to be attracted to the seedling potting mix, and both species apparently inhabit the pasture before seedlings are planted.

96. *Liparetrus* adults also caused locally severe damage to seedlings in Western Australia. A feeding-mating frenzy stimulated by volatile emissions either from the attacked seedlings or the insects, or both, resulted in a 'swarm' of beetles that often obliterated the small plants.

97. The *Eucalyptus* weevil, *Gonipterus scutellatus* was the most significant insect pest of *Eucalyptus globulus* plantations aged two years and older in Western Australia. Larvae and adults caused significant defoliation to growing tips (up to 100% on some trees) in spring, 1999. Large areas were sprayed from the air.

98. Leaf-tiers have caused significant growth malformation to trees in their first year of growth, in Western Australia. A gelechiid moth, *Ardozyga stratifera*, was identified, although there are likely to be several species involved.

99. The European wasp *Vespula germanica* continued to be reported by Tasmanian forestry workers as a nuisance and disruption to work. The English wasp, *Vespula vulgaris*, is now widespread through the wet southern forests where it causes a similar problem.

100. Damage to young eucalypt plantations by browsing mammals continued to be a major problem in Tasmania. Poisoning with 1080 gives sufficient protection to allow young seedlings to escape the risk of severe browsing, when properly applied, but appreciable areas still suffer significant damage. Excessive browsing and associated site problems resulted in poor survival in two 1998-established eucalypt plantations, each ca. 100 ha in area, in this State.

***Diseases*:**

Foliage

101. *Cylindrocladium quinqueseptatum* (teleomorph, *Calonectria quinqueseptata*) caused leaf blight on *Eucalyptus microcorys* and many other *Eucalyptus* species and hybrids in far north Queensland, mainly in the period February to June, with only *E. pellita* and *E. deglupta* showing acceptable resistance. Development of the disease was very rapid on all trees within affected plantations, giving rise to the shedding of much of the foliage and the death of young shoots. The anamorph of the pathogen was readily seen on affected foliage from February to May but then virtually disappeared.

102. Leaf crinkling caused by *Mycosphaerella cryptica* was quite common and damaging in southeast and far north Queensland this year, affecting both immature and mature juvenile foliage of a number of *Eucalyptus* species and hybrids. *E. globulus*, *E. grandis*, *E. tereticornis*, *E. camaldulensis*, and various hybrids of the two latter species were particularly affected. This fungus has also been noted affecting adult foliage of three-year-old *E. globulus* at Binga. Provenance differences occur within species such as *E. camaldulensis*, but these are generally quite small. However, differences between individual trees can be very large, especially in the hybrids between resistant and susceptible species.

103. Other eucalypt leaf spot fungi observed at low levels in Queensland associated with leaf necroses or senescent foliage of isolated eucalypt trees included: *Phaeophloeospora epicoccoides* (synonyms, *Kirramyces epicoccoides*, *Phaeoseptoria eucalypti*) on juvenile foliage in the lower crown of *E. pellita*, *E. cloeziana*, and *E. resinifera* in the far north, and on *E. camaldulensis*, *E. cloeziana*, *E.grandis* and *E. tereticornis* in the southeast; *Coniella fragariae* or *Cryptosporiopsis eucalypticola* on leaves of several species damaged by insect pests and on leaf tips; various *Mycosphaerella* spp., *Hainesia lythri, Dichomera eucalypti*, and species of *Coniothyrium*.

104. *Mycosphaerella cryptica* was common in many plantations in New South Wales, but in most cases only at trace to low levels. *Eucalyptus saligna, E. nitens* and *E. pilularis* were the most susceptible hosts. However, in several plantations severe infection and defoliation (over 50% of the tree crown) was observed.

105. Due to the dry conditions through the 1999-2000 year, very few foliage diseases were reported from eucalypt plantations in Victoria. *Mycosphaerella* is present in many plantations in South Australia, but has caused causing no problems.

106. *Mycosphaerella* (mainly *M. cryptica*) leaf infection affected 15% of the three-year-old *E. nitens* and 2% of the 18-month-old *E. globulus* plantations in Tasmania. *Mycosphaerella* infection was very rare (<0.1%) in the 18-month-old *E. nitens* plantations. In more than 90% of

affected trees the infection levels were very low (trace-<25% crown infection) and unlikely to have economic impacts. A two-year-old *E. globulus* plantation in the Circular Head area suffered heavy "bottom-up" defoliation (50-70% crown infection) by *M. nubilosa* and *M. cryptica*. This outbreak occurred despite below average summer rainfall and is likely to have been caused by a dense woody weed understorey present in the compartment. A young *E. globulus* plantation in the West Tamar area suffered heavy infection by *M. cryptica*. No obvious reason for this outbreak could be identifed.

107. Damage from *Aulographina eucalypti* was mainly restricted to older foliage in the young New South Wales eucalypt plantations. There were no severe outbreaks, with the majority of damage being less than 5% in severity. *Eucalyptus pilularis* and *E. nitens* were the most susceptible hosts.

108. Leaf spot caused by *Coniella fragariae* was common on lower foliage in many young *E. dunnii* plantations in New South Wales, at similar levels to those in previous years. Trees growing in boggy or waterlogged areas were more infected.

109. Unexplained damage and defoliation of lower leaves of *E. dunnii* and *E. grandis* was observed at high levels in several plantations in New South Wales, this year. The damage was similar to that caused by herbicide spray, but there was no evidence of this. Although the leaf fungus *Pestalotiopsis* sp. was consistently isolated from damaged leaves, this fungus is not normally a significant pathogen.

110. Minor damage from *Phaeophleospora eucalypti* was observed in *E. nitens* plantations in southern New South Wales (Bombala). *P. eucalypti* leaf infection was recorded only from the Circular Head area in Tasmania during the past 12 months. Infection was much more prevalent in three-year-old *E. nitens* (20% trees) than 18-month-old trees (<0.1% of trees) but severity was generally low (trace-25% crown infection).

111. Defoliation of *E. nitens* in the Hampshire and Surrey Hills areas in Tasmania associated with infection by *E. tasmaniensis* was less severe this year in comparison with the previous two to three years.

112. No major disease problems were reported in *E. globulus* plantations in Western Australia.

Shoots

113. In Queensland, Ramularia shoot blight, caused by *Sporothrix pitereka* (synonym, *Ramularia pitereka*), was seen on *Corymbia* spp. throughout the year in several joint venture plantations, in research trials, and in other farm forestry areas in southeastern Queensland. Although resistant trees are now apparent in low numbers in most provenances, they are much more common in certain provenances such as those from Woondum and Coomingla in Queensland. As this "resistance" has held up over three years at widely-separated sites, it is now considered that the former provenance exhibits sufficient tolerance towards the disease for it to be recommended for inclusion in the planting program. It is still recognised that a small proportion (<10%) of these "*Ramularia* resistant trees" will require culling because of the effects of this disease.

114. Damage from *Ramularia pitereka* was not as severe in the young *Corymbia* plantations in New South wales, this year. Although recorded in many plantations, the severity of infection was very low. Evidence of previous years' infection was observed as tip dieback, often with little new flush.

115. Apical and lateral shoot blight, mainly due to infection by *Botrytis cinerea,* affected 0.7% and 0.4% of 18-month-old *E. globulus* and *E. nitens*, respectively, in Tasmania. The problem was concentrated in *E. globulus* plantations in moist situations in the Circular Head and Tasman Peninsula areas.

Stems

116. Bacterial wilt, caused by the bacterium *Ralstonia solanacearum* (synonym, *Pseudomonas solanacearum*), was again encountered on young *E. pellita* near Cardwell and Innisfail in Queensland this year. Only a few scattered trees were affected.

117. Stem cankers, associated with copious flows of kino, occured on young trees of *Corymbia variegata* in various parts of Queensland. The cause has not been determined, but associated fungi include a sooty mould, tentatively identified as *Ophiocapnocoma phloiophila*, and an unidentified ascomycete.

118. There were no new *Endothia gyrosa* canker infections observed this year in New South Wales. Older cankers in two- to three-year old *E. dunnii* trees infected in previous years have now started to occlude.

119. Alcoholic flux, first reported in March 1998 on the stems of three- to four-year-old *Eucalyptus nitens*, was again observed in April-June 2000 in plantations in north-east and south west Victoria. No further work to elucidate this condition has been undertaken this year.

120. *Botryosphaera dothidea* was associated with top death of previously vigorous two-year-old *E. nitens* in Tasmania. Two plantations in the Deloraine and Cressy areas were affected. At the Cressy site affected trees were scattered through the plantation at an incidence of about 5%, while at Deloraine the incidence was much lower (<0.1%). It is thought that drought conditions experience during the past year were a predisposing factor.

Roots

121. *Phytophthora* root and collar rot was reported in plantations of *E. cloeziana* and *E. pilularis* up to two years of age in Queensland. Affected trees died suddenly with foliage still attached. The roots and root collar were decayed, with a defined live margin present at, or just above, ground level.

122. In New South Wales there was no repeat of the high levels of mortality from *Phytophthora* root rot as was observed the previous year. This season was not as wet as last year.

123. Mortality due to root and collar rot caused by *Phytophthora cinnamomi* occurred in two *E. nitens* plantations in the northeast of Tasmania this autumn. In one, a two-year-old plantation near Pipers River, scattered mortality (totalling approx. 10%) occurred throughout an area of more than 40 ha. Mortality appeared to occur equally on both flat and moderately sloped areas of the plantation. The other, a one-year-old plantation on a steep site north of Fingal had a low incidence of mortality (1-5%) scattered throughout. This outbreak was unexpected given the steep, seemingly well-drained nature of the site. Seasonal weather conditions of high summer rainfall followed by an autumn drought may have contributed to these outbreaks.

124. The *Cryptosporiopsis* sp. root rot disease detected in several *E. nitens* plantations in Tasmania two years ago has continued to develop at one site (Western Creek) with mortality

increasing by a further 5% this year. Aerial inspection of the other two sites indicated that the problem had stabilised, with little new mortality occurring over the past 12 months.

125. *Armillaria* (probably *A.luteobubalina*) caused significant mortality in a three-year-old *E. nitens* plantation on a steep, well-drained site at Kamena, near Burnie, in Tasmania. Mortality occurred in patches and approximately 10% of the initial stocking had been killed.

Environmental

126. Despite record drought in the south-east of Tasmania, damage has been limited. The only report of mortality was in an *E. nitens* plantation at Clifton Vale (southern Midlands). Scattered trees in a two-year-old *E. nitens* plantation near Geeveston suffered severe leaf scorch. Limited and shallow root development on affected trees combined with the drought was thought to be the cause.

127. Poor form, caused by forking and kinking, was a problem in 18-month-old *E. nitens* plantations established on very exposed sites at high altitude (>750-800 metres) in the northeast of Tasmania. It is thought that wind stress, rather than possum damage or cold, leading to breakage or death of the apical shoot, was the cause of the poor form. In the worst affected areas between 30-50% of trees had stem forks rendering the stands unsuitable for sawlog management.

128. Marginal leaf reddening and scorch, suspected to be due to frost damage, affected a substantial number of trees at the margins of grassy plains in a two-year-old *E. nitens* plantation near Deloraine in Tasmania. Although the worst affected trees suffered appreciable leaf loss (50% crown) negligible adverse impact is expected.

Other hardwood plantations:

129. Young red cedar trees (*Toona ciliata*, Meliaceae), less than one-year-old, were killed by Poria root disease in research plantings in Queensland during the year (*Junghuhnia vincta*; synonyms, *Rigidoporus vinctus*, *Poria vincta*).

Managed natural forests:

***Eucalyptus* species:**

***Pests*:**

130. No noteworthy pest outbreak was recorded in New South Wales, this year.

131. In Victoria, recently completed surveys indicated that populations of the mountain ash psyllid (*Cardiaspina biliobata*) are currently at a very low incidence, and the associated defoliation is barely detectable.

132. *Cardiaspina* sp. caused premature leaf senescence in areas of mature *E. delegatensis* forests in the central highlands of Tasmania. It is anticipated that this outbreak will decline as parasitoid populations develop.

133. Three coupes were deferred from commercial thinning in Tasmania due to severe stem damage and early mortality caused by insect borers, including various cerambycids and cossid moths.

134. Cutout boundary surveys showed that the jarrah leaf miner outbreak area in Collie, Western Australia, has moved north, increasing the affected area. However, the damage is only of moderate intensity.

135. Populations of the gum leaf skeletonizer, *Uraba lugens*, remained low in the southern jarrah forest in Western Australia.

136. A decline of tuart (*Eucalyptus gomphocephala*) on nutrient poor alkaline soils near Lake Clifton and Yalgorup National Park, Western Australia, appears to have been caused by enhanced branch boring Cerambycid attack (*Phoracantha impavida*) in stressed trees. Stands are subject to increased competition from the coastal peppermint, *Agonis flexuosa*, due to a reduced fire incidence, and nutrient uptake may be limited as a result of dry conditions during 1997 and 1998.

***Diseases*:**

137. Mortality of mainly *E. viminalis* resulting from drought was extensive this autumn in a number of areas in the lower Derwent Valley in Tasmania. A small number of eucalypts also died from drought in native forests east of Devonport.

138. There have been no major disease problems reported in managed natural forests in Western Australia. Management and monitoring of Phytophthora root disease in *E. marginata* (jarrah) and management of Armillaria root disease on *E. diversicolor* (karri) continued to command attention. Crown decline of *Eucalyptus wandoo* has been reported in Talbot forest block, Western Australia.

139. Few diseases were reported from Victoria, or from other States.

Nurseries:

Conifer species:

***Pests*:**

140. An outbreak of *Essigella* in stool beds in the nursery at Glencoe, South Australia, was controlled by spraying.

***Diseases*:**

141. In southeastern Queensland, "Phytoclean" has now replaced formalin for *Phytophthora* control in foot and wheel quarantine baths at Toolara nursery.

142. The problem of red needle symptom expression and mortality in *Pinus* hybrid cuttings (*P. caribaea* var. *hondurensis* × *P. elliottii* var. *elliottii*) has been particularly severe in Queensland this year, with many families affected at Beerburrum and Toolara Nurseries, despite the avoidance of families which performed poorly last year. The condition seems to be related strongly to the host provenance and batch, and does not appear to respond to applications of fungicides. Age of the hedge plants from which the cuttings are taken also appears to be important for some of the families involved. Unshaded cuttings do not appear to be susceptible to this condition.

143. Wollemi pine (*Wollemia nobilis*, Araucariaceae) were occasionally affected by *Dothiorella* shoot blight following the pruning of large stems to provide cuttings. The same fungus was also commonly found on the dead apices of cuttings under mist propagation, and appears to be similar to the fungus often found on young hoop pine trees (*Araucaria cunninghamii*, Araucariaceae). Several other fungi occurred on the foliage and stems of Wollemi pine, and the roots of many plants were severely affected by *Phytophthora* following over-watering of heavily-pruned, pot-bound stock plants under glasshouse conditions.

144. No noteworthy disease outbreaks were reported in nurseries in New South Wales or Western Australia, this year.

145. In Victoria, monitoring of nurseries for *Phytophthora cinnamomi* remained a high priority so as to reduce the further spread of disease. A scorching of the tops of cuttings and seedlings was investigated, but no cause of damage could be ascertained. High levels of soil nematodes have also caused problems in one nursery and action was taken to alleviate these problems.

146. *Phytophthora cinnamomi* root rot caused localised losses of *P. radiata* seedlings in two nurseries in Tasmania. Treatment with Ridomil contained the outbreaks and extensive isolation attempts fail to detect the pathogen on symptomless seedlings in the near vicinity of affected plants. *Sphaeropsis sapinea* caused scattered top deaths of *P. radiata* seedlings at Perth nursery in Tasmania. The crop had been topped and affected plants tended to be those below topping height, suggesting that wounding during topping may have allowed infection to occur.

Eucalyptus species:

***Diseases*:**

147. Shoot blight caused by the fungus *Cylindrocladium scoparium* (teleomorph, *Calonectria scoparia*) led to mortality among young *E. cloeziana* plants in Ingham nursery, Queensland, following a period of above average rainfall. Control was achieved by spraying with fungicides. Leaf spots of indeterminate cause commonly give rise to chlorosis and necrosis on the leaves of young *E. cloeziana* at all nurseries surveyed in both southeastern and far north Queensland. Older plants appeared to be unaffected by such disorders.

148. *Botrytis cinerea* remained the most important pathogen of eucalypt seedlings in forest nurseries in New South Wales. Improved management of watering regimes, keeping plants in full sun, and application of fungicides ensures that *B. cinerea* causes minimal damage.

149. Few problems were reported from eucalypt nurseries in Victoria.

150. *Botrytis cinerea* caused low to moderate damage in an early season batch of containerised *E. nitens* seedlings at Perth Nursery, in Tasmania. Although management of *B. cinerea* was difficult because of overcrowding in the nursery this year, further losses were minor.

Native plant communities:

***Diseases*:**

151. Leaf crinkling caused by the fungus *Mycosphaerella cryptica* was detected on coppice shoots in native forest of *Eucalyptus tereticornis* near Childers in Queensland. This host species, is widespread in the southeast of the State, and is therefore regarded as a likely major source of inoculum for the outbreaks of the disease in research trials containing susceptible species.

152. Acacia rust caused by a new species of *Atelocauda* was collected during surveys of native forests in Queensland during the year. Gall rust affecting the pods of *Acacia glaucocarpa* has also been noted in seed orchard stock at Byfield recently.

153. No noteworthy disease outbreak was recorded in native plant communities in New South Wales.

154. Dieback continued within isolated stands of native forest in Victoria. No evidence has been found that fungal pathogens are the primary cause of the symptoms. Bell miner and psyllid interactions appear to contribute to the problem.

155. *Armillaria luteobubalina* continued to be a problem within parks of the Dandenong Ranges near Melbourne, infected trees becoming hazardous to tourists and residents of the area.

156. Mundulla Yellows continued to cause concern in northwest Victoria and across the border into South Australia.

157. No new problems were reported in native plant communities in Western Australia. Management of *Phytophthora* continued in susceptible plant communities. Twelve sites covering 171 hectares were aerially sprayed with phosphite during 1999-2000 in the Albany and South West Capes districts. Eight *Phytophthora*-susceptible DRF (declared rare flora) species were treated in Albany district and four in South West Capes. Fourteen sites at Walpole and Narrogin, were sprayed by knapsack power mister or had trunk injections of phosphite applied. A CALM officer travelled to Kangaroo Island in November 1999 to assist the SA Department for Environment, Heritage and Aboriginal Affairs set up a phosphite application and monitoring trial in Flinders Chase National Park, and to train local staff in the use of phosphite.

Urban and rural:

***Pests*:**

158. In Western Australia, flooded gum (*Eucalyptus rudis*) showed a dramatic decline along the Swan River in the Perth Metropolitan Area, associated with high numbers of *Creis* psyllids and other leaf feeding arthropods, in summer, 1999.

159. White cedar or cape lilac trees continue to be plagued by white cedar moth, *Leptocneria reducta*, in Perth, Western Australia.

***Diseases*:**

160. No unusual or significant reports were made on urban and rural trees in Queensland, this year.

161. Cypress canker was identified from dieback of cypress shelterbelts from several locations in Victoria.

162. *Endothiella* and *Botryosphaeria* sp. were isolated from twig and trunk cankers respectively, from a drought affected historic *Eucalyptus ficifolia* in western Victoria.

163. Two *Eucalyptus sideroxylon* street trees in Hobart with symptoms resembling Mundulla yellows (strong leaf chlorosis and slow decline) are being monitored. A sample was sent to Adelaide to test for phytoplasmas but results have yet to be received.

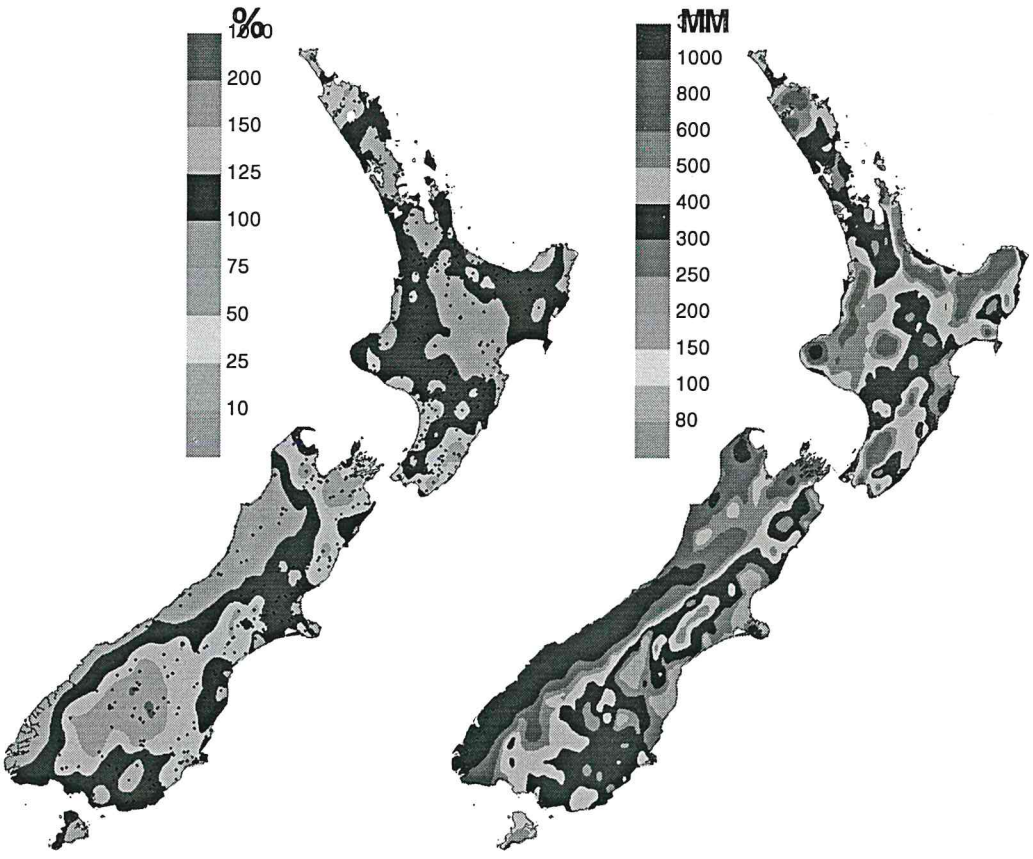
164. Symptoms of the Mundulla yellows syndrome have been observed in Western Australia for some six years, and a new monitoring program is being instituted. Symptoms are most common in jarrah (*Eucalyptus marginata*), but have also been noted in some other eucalypts, in *Allocasuarina* spp., *Xylomelum angustifolium* and possibly *Banksia* spp. The disease does not appear to be associated with the crown declines of wandoo (*Eucalyptus wandoo*) or tuart (*E. gomphocephala*). As in South Australia, Mundulla yellows is only seen in vegetation in disturbed sites or modified landscapes such as road verges and medians, and in parkland stands. It has not been recorded within bushland areas, whether logged or not, nor in plantations. It appears to be confined to alkaline sands of the Swan Coastal Plain, but is widespread through this region in both urban and rural locations.

NEW ZEALAND

165. Following two dry summers, this year's growing season was comparatively wet in most parts of the country.

NIWA
Taihoro Nukurangi

Rainfall pattern for: Summer (DJF), 1999/00



Percentage of average rainfall

Rainfall pattern for summer

Plantations:

***Pinus radiata*:**

***Pests*:**

Foliage

166. *Essigella californica* was first found in New Zealand in 1998, and is now distributed throughout the country, but there is little or no information on population trends. Anecdotal information indicates that in some regions, populations have reached high numbers, but there is so far no damage attributable to this aphid, and at present *E. californica* is not considered to be a problem.

Stems:

167. *Sirex noctilio* remained at very low levels throughout most of the plantation estate. However, a recent sawing study on pruned logs from a northern coastal forest found a high incidence of resinous blemishes resulting from unsuccessful oviposition attempts by *S. noctilio* between 1986 and 1991, which affected clearwood quality and therefore potential log value. The earliest evidence of attack was in 1982, the year in which the stand was high pruned and thinned to the final crop stocking. Records in the Forest Health Database confirm the regular sighting of *S. noctilio* in suppressed trees in the forest over this period.

***Diseases*:**

Foliage

168. Despite a total of 834 records of *Dothistroma pini* (synonym, *D. septosporum*) needle blight, the disease caused by this needle fungus had a lower impact this year. A smaller area (34, 000 ha) was sprayed aerially with copper fungicide for disease control than in the previous year, about two-thirds the original estimate. More than half the records of *Dothistroma* were from the central North Island (Bay of Plenty and Taupo Biological Regions, 57% of records). *Dothistroma* was occasionally reported as locally severe, and by May, 2000, appeared to be building up in some forests where spraying had been deferred the previous season because infection was at that time judged to be marginal. The spray area may be greater next season.

169. Records of *Cyclaneusma minus* needle cast totalled 868, and this disease was again significant through much of the country, particularly in the central North Island and Northland (Bay of Plenty, Taupo, and Northland Biological Regions, 53% of records).

170. The *Strasseria*-associated defoliation attributed to *Cyclaneusma* that caused considerable concern last year did not develop to the same extent this season.

171. The condition known as upper mid-crown yellowing, attributed to a magnesium and potassium nutrient imbalance, was again reported in parts of the country this year.

Stems, shoots:

172. Reports of Diplodia dieback (*Sphaeropsis sapinea*) totalled 236, with most records being from the central and eastern North Island, Northland, and Canterbury. A number of locally more severe occurrences were related to earlier dry conditions, pruning wounds, or in one case, possible hail damage (20 ha with 10-15% trees affected). In Canterbury, a survey of stands over 10-years-old found 5-55% of trees with malformation in the mid to upper stem leading to loss of the second log, attributable to stress from the previous very dry summers and subsequent infection by *S. sapinea*.

Roots:

173. There were 602 records of Armillaria root disease, this year (*Armillaria novae-zelandiae* and *A. limonea*). As previously, most were from the central North Island, Coromandel, and the northern and southern South Island. There was also a significant number of records from the eastern North Island, this year. Most records were of low-incidence mortality in young stands, since chronic infection is not readily identified during surveys. Serious ongoing mortality in first-rotation radiata pine stands on ex-*Nothofagus* sites in Fiordland is being addressed by planting with Douglas fir, which shows low mortality on such sites.

174. There was a report of a "G.B. fungus" root disease centre (*Dextrinocystidium sacratum*; synonym, *Peniophora sacrata*) at Tangoio in the eastern North Island. Ill health in Wanganui in the southern North Island was attributed to *Leptographium* and *Ophiostoma* associated with heavy soil texture.

Other:

175. Symptoms of ill health caused by nutrient imbalance and adverse soil pH appeared again this year, in addition to the upper mid-crown yellowing defoliation syndrome referred to above. Problems associated with boron deficiency were reported in the southern part of the North Island.

176. Ongoing mortality, now attributed to a high soil pH, continues in a small forest near the North Island East Cape. Increased areas of trees showing crown yellowing were reported this year. Mortality was first noted when the trees were four- to five-years old and approximately 500 trees have died in the last ten years, in a series of expanding mortality centres. Symptoms of yellowing foliage and shortened needles were associated with death of root systems and butts. Some trees showed seasonal cycles of chlorosis and recovery, and in some years no symptoms were recorded. Field, laboratory, and glasshouse work have ruled out a pathogen as the cause. The underlying rock is basaltic, and while the pH of the surface soil in affected patches is in the normal range for adjacent forest soils, the pH of the subsoil is comparatively high (6.5 or more). Under these conditions, the pH of ground water can also be expected to be high, and the availability of manganese will be low. Both of the major mortality patches are on old slip faces, indicating ground water pressure at these locations. Application of manganese fertiliser to correct the deficiency is not possible, because this mineral becomes unavailable when it contacts the high pH ground water.

177. The use of vulnerable planting stock resulted in some losses on exposed planting sites in Coromandel, this year. Damage from snow occurred again this year in Southland, and there was some salt burn on the exposed coast west of Auckland. Drooping of shoot tips in one central North Island forest in August was again attributed to frost.

178. Losses in a newly established stand in the central North Island were attributed to the incorrect application of ulexite, and fire damaged a small woodlot in Golden Bay at the northern end of the South Island. Unexplained symptoms of ill health were reported at several localised sites in the North Island. "Top yellowing" occurred in the east of the Island, and in the same region group mortality in five-year-old pines was ascribed to a physiological and nutrient cause, associated with *D. sacratum* and species of *Phytophthora*.

179. Possums have caused significant damage in some pine stands in the central and eastern North Island.

Douglas fir (*Pseudotsuga menziesii*):
Diseases

180. Records of Swiss needle cast disease (*Phaeocryptopus gaeumannii*) totalled 99, this year. A significant wood volume reduction following the appearance of *P. gaeumannii* in a number of forests in both the North and South Islands, was demonstrated by linking growth data to archival records of the distribution and spread of the pathogen. It is therefore apparent that the significant growth decline caused by this fungus in the central North Island is more general than appreciated through much of the country.

181. Effects of earlier dry conditions were still apparent in some mid and later rotation Douglas fir stands that had experienced drought conditions in previous years.

***Eucalyptus* species:**
Pests:

182. *Cardiaspina fiscella* (Psyllidae) is currently distributed in the northern half of the North Island and since its arrival in 1996, has been responsible for extensive die back and death of *Eucalyptus saligna* and *E. botryoides*. In November 1999, *C. fiscella* nymphs were found to be parasitised by *Psyllaephagous gemitus* (Hymenoptera: Encrytidae), and this parasite is now established throughout *C. fiscella's* area of distribution. Where parasitism occurs, severely attacked host trees appear to be recovering and there are indications that *C. fiscella* will be kept under control. *P. gemitus* was investigated as a possible biological control agent in 1997, but although permission to import it into containment was granted, this was not undertaken through lack of funds. It is not known how the parasitoid reached New Zealand, but where it is present the susceptible hosts are now showing a marked improvement in health.

183. *Glycaspis granulata* (Psyllidae), which was first recorded from New Zealand in 1986, has been found to be parasitised by *Psyllaephagus quadricyclus* (Encyrtidae). It not known how long this Australia species has been in New Zealand. It was found during surveys for *Cardiaspina fiscella* parasitoids.

184. It has been found that *Ophelimus eucalypti* (Eulophidae) is already parasitsed by at least two species of eulophid parasites, *Aprostrocetus* sp. and *Chrysonotomyia* sp., and that further expenditure on biological control cannot now be justified.

Diseases

185. As in previous years, a high number of leaf spot fungi were recorded on eucalypt species throughout the year. These included *Aulographina eucalypti* (23 records), *Fairmaniella leprosa*, *Mycosphaerella* species (particularly *M. cryptica*), *Phaeophleospora eucalypti* (synonyms, *Kirramyces eucalypti*, *Septoria pulcherrima*; 33 records), *Pseudocercospora eucalyptorum*, *Sonderhenia eucalypticola*, and *S. eucalyptorum*. In most cases these fungi had limited host impact, but *S. pulcherrima* continued to cause a severe leaf cast disease of *Eucalyptus nitens* in the coastal Bay of Plenty region. A number of new records on eucalypts are listed elsewhere (Paragraph 251).

186. The branch cankering condition in *Eucalyptus nitens* on the South Island West Coast associated with a *Sarcostroma* species (now formally described as *S. mahinapuense* Gadgil and Dick) was reported as having worsened, by September, 1999. This fungus, also known on other eucalypt species in the central North Island and Nelson regions, is consistently associated with the canker symptoms in *E. nitens*, and appears to be the cause of the problem.

Sarcostroma mahinapuensis

187. Widespread frost burn of *E. nitens* was reported in a central North Island plantation in winter, in September, 1999. Trees in the same forest displayed symptoms in the lower crown suggestive of nitrogen deficiency in October. Unexplained thinning in the crowns of trees of *E. regnans* was observed in another central North Island forest in March, 2000.

Acacias:

Pests

188. *Dicranosterna semipunctata* (Chrysomelidae) was first found in Auckland in 1996 on *Acacia melanoxylon.* It has now spread to the Orewa-Helensville area in the north, and south to north Waikato. Following a pest risk analysis, a field survey for biological control agents was carried out in New South Wales in November 1999. Both larval and egg parasitoids were found, the most promising agent being an egg parasitoid, *Enoggera polita* (Pteromalidae). If funding is available the possibility of introducing this species into New Zealand will be investigated.

189. *Acrocercops alysidota* (Gracillariidae), the Australian wattle leaf miner, has been found to have a wider host range and feeding habit than previously recognised. Besides mining in the phyllodes of *Acacia melanoxylon*, activity in the stems and branches of young blackwood has been implicated in shoot dieback and subsequent multi-leadering of trees, possibly leading to the failure of many *A. melanoxylon* plantations in New Zealand by affecting tree form and timber quality. Bi-pinnate *Acacia* species, particularly *A. dealbata*, have been found with splits in the stems, branches and petioles, and withered shoots, caused by stem boring second and third instar larvae. *Acrocercops alysidota* has now been recorded mining the phyllodes of *A. melanoxylon, A. longifolia, A. pycnantha, A. podalyriaefolia, A. cultriformis, A. saligna*, and *A. sophorae*, as a stem borer of *A. melanoxylon, A. dealbata, A. mearnsii, A. elata* and *A. suaveolens*, and as a pod miner of *A. melanoxylon* and *Paraserianthes lophantha*.

Diseases

190. *Uromycladium alpinum*, previously identified on *Acacia dealbata* at Gisborne in December 1998 during a routine port environs survey, was found this year infecting *A. mearnsii* and *A. dealbata* in Auckland, Wanganui and Northland. On these hosts the disease it causes is characterised by vast masses of spores produced in mucus which coats the pinnae, often webbing the pinnules

together, before they are cast. Newly developing spring flush of infected *A. mearnsii* becomes distorted and chlorotic. Current indications are that *A. dealbata* is less susceptible to the disease than *A. mearnsii.* In one nursery where some beds of *A. mearnsii* were infected and plants appeared somewhat stunted, the adjacent *A. dealbata* seedlings were barely affected. Both hosts are also susceptible to the gall-forming *U. notabile*.

Cypresses:

Diseases

191. This year a countrywide grower questionnaire survey was completed of the incidence of cypress canker disease caused by *Seiridium unicorne* and *S. cardinale*. With the proliferation of small cypress woodlots around the country, and expressions of concern about cypress canker disease, it was felt necessary to determine the impact of this disease on the changing resource. Completed questionnaires were received from 317 growers, with information on 734 stands. The disease survey confirmed that cypress canker is widespread, though variable in impact, throughout the country. There was significant variation, in both rural stands and larger forest plantations, for species, region, and pruning treatment. In decreasing order of severity, the cypress species or types ranked: *Cupressus macrocarpa* (most diseased), *Chamaecyparis lawsoniana*, ×*Cupressocyparis leylandii*, *Cupressus lusitanica*, ×*Cupressocyparis ovensii* (least diseased). For *Cupressus macrocarpa* there was a gradual increase in disease severity in this species from south to north through the whole country. More disease was reported in pruned stands than in unpruned stands.

192. New host records on cypress species are recorded in Paragraph 251. There was also a first record of one of the cypress canker fungi, *Seiridium unicorne*, on the non-cypress species, *Sequoia sempervirens*. This year there were four records of *Stigmina thujina*, one being a new host record (*Chamaecyparis obtusa*; *S. thujina* currently has significance only on *Ch. lawsoniana* on the South Island West Coast).

Nurseries:

Diseases

193. As previously there were few requests for nursery inspections, this year.

194. Terminal crook disease, caused by *Colletotrichum acutatum* f.sp. *pineum*, was found for the first time in the South Island in a Nelson nursery in February, 2000. This disease of mainly one-year-old seedlings was first recorded in New Zealand in 1963 near Auckland, and appeared in various central North Island nurseries during the 1960s and early 1970s. It did not reach the lower North Island until the 1980s. It is likely that the pathogen was transported to the South Island as a soil or plant debris contaminant. All plants found were destroyed, and no new diseased seedlings were seen in June, but it remains to be seen whether diseased plants will be found again next summer.

195. *Thielaviopsis basicola* was found causing black root rot in stunted, chlorotic seedlings of *Acacia mearnsii* in a Northland nursery.

Urban and rural:

Pests

196. *Stegommata sulfuratella* (Lyonetiidae) was found in Auckland in April 1999 leaf-mining in *Banksia integrifolia.* Since then it has been found in Northland, Waikato, Coromandel and Taranaki. Although quite widespread it is nowhere very abundant.

197. During the summer of 1999-2000 *Eucolaspis brunnea* (Chrysomelidae) caused noticeable damage to trees in Auckland parks and gardens. This native beetle is a generalist feeder and can cause significant defoliation by chewing the leaves of *Prunus* species, especially flowering cherries and fruit trees. It also feeds on eucalypts and has been responsible for creating extensive, and unevenly shaped, holes in the leaves of *Eucalyptus maculata*. In one area where it was common it showed a decided preference for *E maculata* over *E. saligna* and *E. pilularis.*

Diseases

198. Armillaria root disease continued to afflict the Christchurch Botanic Gardens, this year. Since a systematic search for the causal fungus began in 1991, around 60 tree species have been found infected. Although some trees are killed quickly, most undergo a gradual decline, with sections of the crown becoming progressively unthrifty. An area called the Pine Mound, which photographs indicate to have contained more than 40 healthy trees of *Pinus pinaster* in the 1940s, can today boast only 15, the most recent death, in 1987, being that of an 80-year-old tree heavily colonised by *Armillaria*. Numerous trees are currently infected throughout the Gardens, and on some, mycelial sheets extend up to a height exceeding 5 m. Normal cultural practices since the Gardens were established in 1863, particularly stump retention, have continued to foster the disease, and tree removals frequently disclose old decaying stumps and wood debris colonised by *Armillaria*. The Christchurch City Council has developed a management strategy that includes the promotion of cultural practices that minimise tree stress, such as fertilisation and good drainage, regular tree health monitoring and removal of the woody food base, where possible, and trials to test soil fumigation and biological control.

199. *Phyllosticta spinarum* has been consistently associated with dieback, particularly in the lower crown, of *Cryptomeria japonica*, *Cupressus macrocarpa*, and *Chamaecyparis lawsoniana*, from Auckland to Wellington. Although this disease has been observed during surveys since 1995 the frequency of collections increased this year.

Native vegetation:

Diseases

200. Records on native hosts, this year, included a leafspot on karaka (*Corynecarpus laevigatus*, Corynocarpaceae) caused by a species of *Phyllosticta*, and different species of *Phomopsis* isolated from dead and dying shoots of karaka and *Libocedrus plumosa* (Cupressaceae), respectively. Others, this year, comprised: *Cashiella sticheri* in living pinnules of the fern *Sticherus cunninghamii* (Gleicheniaceae) dying from unknown cause; *Acremoniella* sp. in living and dead leaves from dieback-affected *Pteris tremula* (Pteridaceae); and *Coleophoma cylindrospora* causing leaf lesions on *Pseudopanax crassifolius* (Araliaceae). Deformation of *Cyathea* foliage continued at a location in Southland (Cyatheaceae), and mortality of isolated *Nothofagus solandri* trees was associated with track modification disturbance and infection by *Armillaria*.

201. Shoot and twig dieback of totara (*Podocarpus totara*, Podocarpaceae) occurred in locations in the Bay of Plenty, Taranaki and Westland. Records of this disorder, which may be quite severe in some seasons, date back to the 1950s. A range of fungi are associated with the dieback, but these vary in pathogenicity, and no single organism has been identified as the dominant cause. Trees in locations in Northland and the central North Island which suffered from striking dieback symptoms in 1998 and early 1999, were comparatively disease free this year.

QUARANTINE AND BIOSECURITY

202. Quarantine deals with the exclusion of potentially damaging pests and diseases. This section reports on successful border interceptions and barrier breaches during the past year, including post-border interceptions and incursions into the tree and forest environment of exotic organisms whose eradication is still being attempted. Where eradication is not in progress, establishment is considered to have occurred, and the issue is no longer a quarantine one. Also in this section are current administration and policy issues relevant to biosecurity, including assessments of the risk of pest entry.

Australia:

Interceptions:

203. In May, 1999, the Formosan termite, *Coptotermes formosanus*, was intercepted in New South Wales, in an infested shipment of timber from Taiwan. In economic terms this is the world's most important termite pest, and the infestation was destroyed by fumigation.

204. In July, 2000, large numbers of live bark beetles were found in pine timber dunnage on a Brisbane wharf, associated with a shipment that originated from China. The beetles were tentatively identified as a species of either *Orthotomicus* or *Ips*. The dunnage was sprayed and destroyed, and pheromone traps baited with ipsenol were placed through the area. No more beetles have been found.

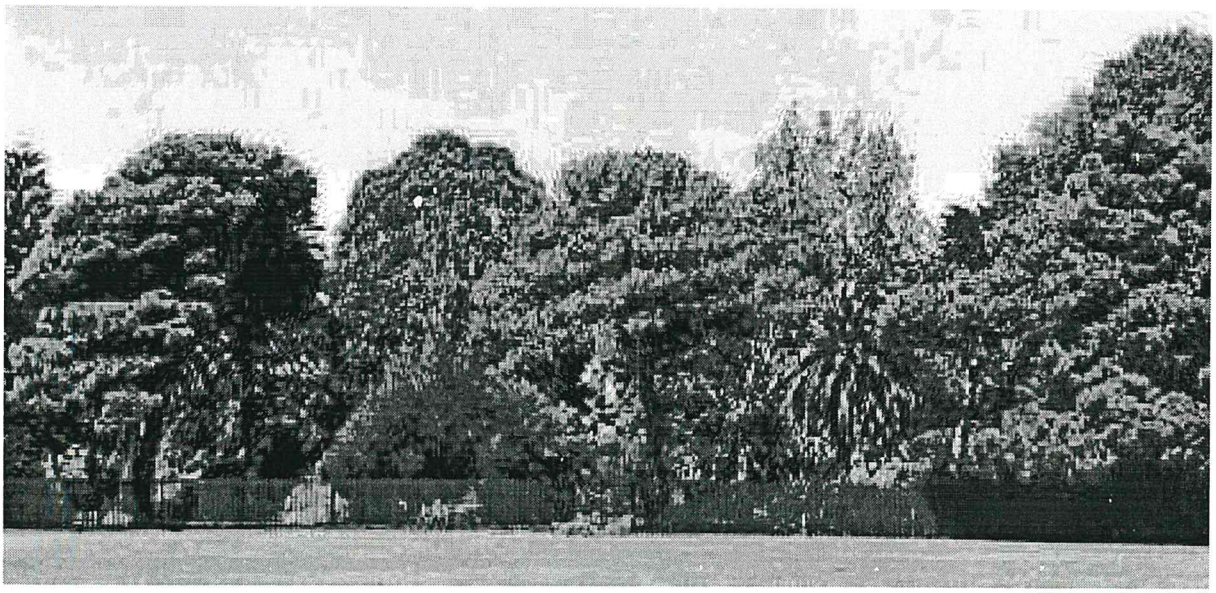
Post-border interceptions:

205. The most serious breaches for the period 1999-2000 included the western drywood termite, *Incisitermes minor*, from North America. This termite is potentially a serious, destructive pest and appears to move well through transport pathways in timber products, although it tends to be slow to establish. In November 1999, *I. minor* was detected in a crate in a warehouse in Cronulla, Sydney. No evidence of alates (reproductive winged termites) was found and surveys of the surrounding buildings did not reveal any evidence of infestation or spread. The termite was eradicated from the warehouse and it is considered that no further action is warranted. The infested case is being maintained in a quarantine insectary in order to obtain specimens for research purposes.

206. In January, 2000, western drywood termites were found in a yacht at Runaway Bay, Gold Coast, which had been imported about 4 years ago from the United States. Alates were noticed in the cabin of the yacht, but not on externally, at least a year prior to the discovery, but were believed to be only flying ants. The yacht was fumigated and no further action is deemed necessary.

207. A number of additional breaches recorded during 1999-2000 are tabled in Annex A.

Dead pine tree in the Melbourne suburb of Williamstown associated with the detection of *Bursaphelechus ?hunanensis*.



***Exotic Incursions*:**

208. An exotic *Bursaphelencus*, tentatively identified as *B. hunanensis*, was found in wood from a dying *Pinus halapensis* tree in Melbourne, the first detection of this genus in Victoria. The infested tree was removed and destroyed by burning. The genus *Bursaphelenchus* includes the pine wood nematode (*B. xylophilus*), not present in Australia or New Zealand, which causes rapid death of pine trees and other conifers in Asia, North America, and Portugal. *B. hunanensis* is known only from China, and testing is underway to ascertain its pathogenicity. However, the infested tree died rapidly, and symptoms were compatible with those attributed to *Bursaphelenchus* overseas. Surveys have now identified 21 infested trees throughout Melbourne, mainly mature *P. radiata*, possibly under stress. Three of these trees have so far been destroyed, with local council cooperation. Aerial surveys of plantations close to Melbourne (100 km radius) failed to locate trees showing related symptoms. The insect vector has not yet been identified. The known vector of this genus is not recorded in Australia, but it is thought that several native beetle species could transmit the nematode. Since detection, a Consultative Committee involving Forest Health Committee members has convened, and an eradication program is being organised. Further surveys are underway, and a national survey is planned. Payment of eradication costs is being worked through, and a communication strategy is being developed. Further diagnostic and pathogenicity work is required, and the need to seek the assistance of overseas expertise is recognised.

209. *B. hunanensis* was not detected during forest health surveys of *P. radiata* plantations in New South Wales, nor in additional surveys in the New South Wales southern pine growing regions. A non-pathogenic species of *Bursaphelenchus* is commonly associated with *Ips grandicollis* in this State. Nematodes were recovered from the roots of one, recently dead tree in a small patch of dead and dying trees in a ca. 20-year-old plantation in Tasmania. The nematodes have been forwarded to CSIRO for identification but results have yet to be received. Nematodes belonging to the genera *Bursaphelenchus* and *Aphelenchoides* were found associated with dead and dying pines in plantations in Western Australia. They differ from those recently found in Victorian samples.

210. In August 2000, beetle larvae of an *Arhopalus* species, since identified as *A. rusticus*, were found in one of the pine trees infested with the new *Bursaphelenchus* in Victoria. This species had previously been intercepted by quarantine authorities in both South Australia and Western Australia, but was not known to have established in Australia. This beetle is recorded as a nematode vector in the USA but mainly attacks dead or dying pines. It is not yet known if there is any association between this species of beetle and the Melbourne nematode. A number of similar species of beetle are present in Australia; for example, *A. syriacus* is naturalised in New South Wales and attacks commercial *Pinus radiata*. It is not considered that *A. rusticus* poses any greater threat to forests than these other species.

211. In September 1999, adults of the beetle species *Corticeus praetermissus* were found under the bark of living trees infested with *Ips grandicollis*, in a *Pinus radiata* plantation near Casterton in Victoria. This is the first record in Australia of a North American species thought to feed on the fungus associated with *Ips*, with which it may have been introduced. It is not considered to be a threat to pine plantations in this country. The appropriate authorities were informed.

212. In October 1999 a further detection of the powderpost beetle *Minthea reticulata* was made in tulip oak (*Argyrodendron trifoliatum*) timber flooring of a residential property at Timberlea, south of Cairns. This was the second detection of this species within timber flooring, with the previous detection made Oak Beach in April 1999. The response to the April detection included fumigation of the infested property, and the segregation and fumigation of timber susceptible to attack by this beetle at the timber yard that supplied the flooring. It is believed that the species was confined to a single consignment of timber, but at the time the locations of the remainder of the consignment were not identified by the timber supplier. The detection in October was made on timber of the same consignment as the original detection. The localities of the remainder of the consignment of flooring were subsequently identified and placed under surveillance. The house was fumigated and timber baits deployed around Cairns to determine the establishment status of the pest. No other *M. reticulata* has been found since that time. Treatment costs were shared between the Commonwealth and the States at risk from this pest. Since there are many similar species of beetles that are endemic to Australia, it was not expected that *M. reticulata* would have a significantly greater impact on forest or timber production if it were to become established than these other species.

213. *West Indian Dry Wood Termite*: Fourteen buildings in Brisbane, including the Industrial Pavilion and associated horse stables, Royal National Association (RNA), and five in Maryborough, were fumigated in 1999-2000 to eradicate infestations of the West Indian Drywood Termite, *Cryptotermes brevis*. A further 12 infested buildings were discovered in Brisbane during recent surveys, which also require fumigation. Twenty infested buildings have been found in the Maryborough Central Business District during the past few years. An adequate strategy has yet to be devised and implemented to meet the political, technical and resource challenges posed by the discovery of such new infestations.

214. An infestation of West Indian drywood termite was also found in furniture at Cronulla, Sydney, in New South Wales, which had been imported about 10 years previously. There was no evidence that the infestation had spread, and the furniture was fumigated.

***Pest Risk Assessment*:**

215. *Asian Gypsy Moth* (Lymantria dispar); potential impact in Australia and New Zealand: Asian gypsy moth is able to feed on native, commercial, and amenity tree species in both countries (e.g. *Eucalyptus*, *Acacia*, *Nothofagus*, *Pinus radiata*, apples, pears, and cherries, oaks

and poplars), but relative preferences were not known. A joint study was undertaken in France to determine insect growth rates and potential damage on different native hosts. Plants tested included 39 tree and shrub species from Australia, New Zealand and South America, as well as 44 eucalypt species. Larvae were able to complete development on 21 out of 44 species of eucalypts tested. On five species of eucalypts, larval performance was equivalent, if not better than, that observed on two species of deciduous oaks (the preferred natural hosts). Favourable eucalypt species occur over a wide altitude and geographic range in southeastern Australia, and a significant number derive from Tasmania. However, Asian gypsy moth larvae were not able to survive on *E. globulus*, one of the important species in commercial plantations. The predicted distribution range of Asian gypsy moth, based on climatic conditions, covers much of southeastern and southwestern Australia, including Tasmania and coastal areas of South Queensland. Also, the predicted larval period coincides with periods of eucalypt leaf flush. Therefore, if accidentally introduced, Asian gypsy moth is likely to be able to persist in forests and woodlands in Australasia and has the potential to become a serious forest pest.

216. The Australian surveillance program for Asian gypsy moth, *Lymantria dispar*, coordinated by the Office of the Chief Plant Protection Officer, continued over the period 1999-2000. Field monitoring is carried out by State and Territory agencies and the trapping program is centered in the first ports of call for the pest. Primary areas at risk are ships and shipping containers, so traps have been placed in 22 ports around the country, including Melbourne, Geelong and Westernport, in Victoria, and five ports and surrounds in Tasmania. To date, no Asian gypsy moth has been detected.

Policy and Administration:

217. *Surveillance of ports and surrounds in Queensland:* refer Paragraph 237.

218. *National stakeholder timber pest conference:* A national AQIS-run conference was held in April, 1999, to raise awareness of timber pest problems and look at current import arrangements for timber, timber packaging and timber products. The meeting involved stakeholders from a wide range of industry sectors, countries that exported timber to Australia, the research community, government and unions. Recommendations were developed for review by AQIS which were presented to the commonwealth minister for forestry and conservation.

219. *Fungal survey of imported timber:* Following stakeholder concerns about the possible introduction of harmful fungi, State Forests of New South Wales undertook a study for AQIS examining fungi on wood imported into Sydney. Fifty samples were examined of mainly imported Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*). Results showed that: bark is common on sawn timber imports; live colonies of two potential insect pests were detected, a termite *Zootermopsis* sp. and a scolytid beetle *Dendroctonus pseudotsugae*; Douglas-fir lumber showing potentially economic blue staining was colonised by species of Ophiostomataceae not known to occur in Australia; pockets of active decay were common in lumber, live fungi including *Heterobasidion annosum* and a *Phellinus* sp. in Douglas-fir and a *Phellinus* sp. and *Postia* sp. in western red cedar; the moisture content of 'green' lumber was consistently sufficient to ensure the survival of mycelia; kiln dry timber did not have living populations of stain or decay fungi.

220. *Import risk analyses of the importation of coniferous lumber from the USA, Canada and New Zealand, and wood packaging materials from Asia*: Import risk analyses (IRAs) will be conducted of coniferous sawn timber imported into Australia from the USA, Canada and New Zealand, and of wood packaging material from Asia. These IRAs will identify exotic arthropod pests and pathogens, estimate the probability of entry and establishment, and develop appropriate

risk-mitigation strategies. They will be non-routine, since the risks are considered potentially significant, have not previously been undertaken, and are likely to be large and complex. A Risk Analysis Panel (RAP) to oversee both analyses has been determined, and membership of the technical working groups (TWGs) will be decided in consultation with stakeholders.

221. *Mushroom Import Risk Analysis*: This IRA will assess the phytosanitary risks of mushroom importation, and consider risk management and import protocols. Initially 39 currently permitted species will be considered, but the analysis will be expanded to include dried wild and cultivated mushroom species.

222. *Importation of teak (*Tectona grandis *L.f.) stumps and tissue cultures*: Following submissions to import 6 million teak stumps and tissue cultures from Thailand and Indonesia to establish 6000 hectares of plantation in Northern Territory and West Kimberley Region of Western Australia, AQIS has stopped the importation of all teak nursery stock pending an assessment of insects and diseases in the source countries. Of particular concern are diseases such as bacterial wilt, *Pseudomonas solanacearum*, teak rust, *Olivea tectonae*, and possible viral disorders, as well as insects and nematodes, including the teak skeletoniser, *Eutectona machaeralis*, and teak leaf defoliator, *Hyblaea peura*. There is likely to be a high quarantine risk because teak stumps are grown on the ground in open shade houses in tropical conditions for about one year prior to export, and there are questions regarding effective inspection and treatment, the availability of space for disease screening at Government post-entry quarantine facilities, and the adequacy of resources. AQIS will retain the current conditions for teak "stumps", (two-year quarantine at a Government post-entry quarantine facility), pending a full import risk analysis (IRA). As clonal forestry increases using superior selections, breeds and hybrids, AQIS would encourage the importation of forest germplasm in the form of sterile tissue cultures (eg. teak, pines and eucalypts) in sealed, sterile containers. AQIS is prepared to consider less stringent conditions (eg. no post-entry quarantine for tissue cultures) if tissue cultures are produced under "high plant health conditions".

223. *Importation of pine (*Pinus *spp.) and Douglas-fir (*Pseudotsuga menziesii*) seeds for sowing*: New import conditions have been imposed for such seed, to address the risk of introduction of the seed-transmissable pitch canker fungus (*Fusarium circinatum*; teleomorph *Gibberella circinata*). It is now required that the importer possesses a valid Import Permit prior to arrival; that seed be accompanied by an official government Phytosanitary certificate from the country of origin, endorsing the absence of pitch canker in that country, that the seed was collected from disease-free trees, and that it has been treated by an approved method. Imports of pine and Douglas-fir seeds from New Zealand must be accompanied by an official New Zealand MAF Phytosanitary certificate endorsing that the seed originates from officially-verified disease free areas, are New Zealand grown, and have been immersed in 1 % sodium hypochlorite solution for 10 minutes. The importation of *Pinus* spp. and *Pseudotsuga* spp. seed from pitch canker infected countries is prohibited.

224. *Surveys for pine pitch canker in new South Wales*: Samples of dead tops, resinous stem and branch cankers, and dead natural regeneration from *Pinus radiata* plantations in all regions in New South Wales and A.C.T. were collected by the new South Wales Forest Health Survey Unit in 1998 and 1999. Isolations from this material yielded no *Fusarium circinatum*. The great majority of isolates were *Sphaeropsis sapinea* and *Sclerophoma pythiophila*.

225. *Breaking Bundle survey*: In order to test current inspection methods, AQIS officers examined 10 random bundles per vessel (152 bundles, total), of untreated green sawn Douglas-fir or western red cedar timber imported from Canada or the US over a period of six months in 1999, for the presence of any insects. The bundles were then broken and planks laid out to

expose the internal timber surfaces for inspection. External examination detected pests in 3% of bundles, whereas internal inspection found pests in 33% of bundles. Douglas-fir bundles had a 45% infestation rate of quarantine pest species, whereas western red cedar bundles had a 16% infestation rate. There were too few data to test for seasonal differences. The high rate of infestation suggests that the survey should be continued, and with a full year of data seasonal variation could be investigated.

226. *Surveys for Dutch Elm Disease*: Surveys were undertaken in the main gardens and boulevards around the City of Melbourne. Symptoms resembling Dutch Elm Disease were attributed to ringbarking of branches by possums and elm bark beetles. The fungus could not be isolated from wood. A draft contingency plan for the disease has been developed to enable a rapid response to the disease should it enter Australia. The plan was tested in Melbourne in June 2000 and is being modified to encompass experience learnt from the trial.

New Zealand:

Interceptions:

227. For the year ending 30 June 2000 some 253 quarantine samples containing 333 organisms were received from the Ministry of Agriculture and Forestry (MAF) quarantine inspectors. Of the organisms identified 281 were insects and 41 were fungi. The source of these organisms were: air cargo 5 (2%), dunnage 11 (3 %), free flying insects 12 (4%), plant debris in containers 16 (5%), plant debris on ships 2 (1%), sawn timber 44 (13%), vehicles 165 (50%), wood products 7 (2%), wood on ships 6 (2%), and wood packaging 65 (20%). The geographic area of origin of these samples were - Asia 208 (63%), Australasia 42 (13%), Pacific 13 (4%), North America 17 (5%), Europe 18 (5%), Africa 1 (0.3%), South America 7 (2%), and uncertain 21 (6%).

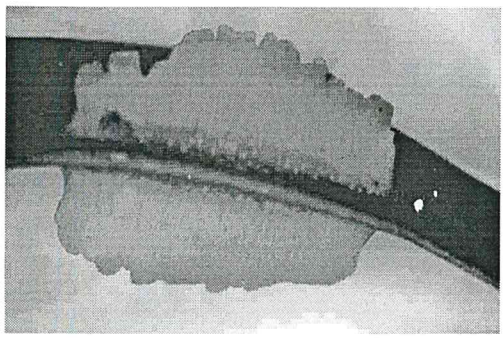
Exotic Incursions:

228. *Dutch elm disease:* The eradication campaign for Dutch elm disease in Auckland continues. In 1999-2000 three detection surveys were conducted, and an additional survey was undertaken to determine the incidence of *Ophiostoma novo-ulmi* in inner growth rings of elm trees. Only two trees were found with symptoms typical of the disease, but in both the infection was localised in the old wood. The last tree with infection confined to the current season's wood was discovered in the 1995-96 season. In the survey for infection in old wood, four branches were cut from each of 2,500 elm trees throughout greater Auckland. Isolations were attempted from 1308 growth rings in 370 trees that showed evidence of staining, but none yielded *O. novo-ulmi*. This work will continue for at least one more year. No pheromone trapping for *Scolytus multistriatus* was carried out during the summer of 1999-2000, but it is hoped to reinstate it this coming season.

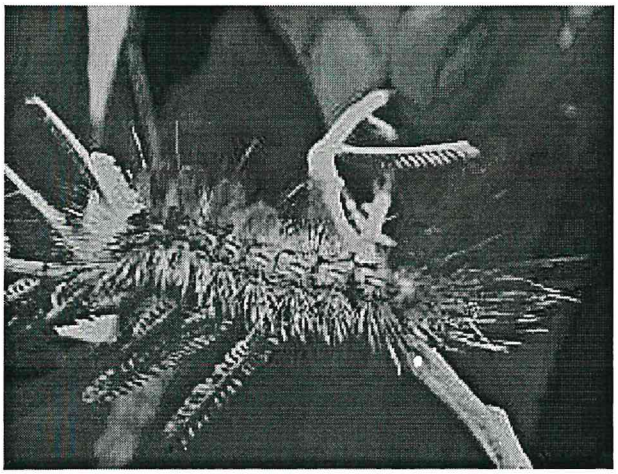
229. *Uraba lugens* (Nolidae), first found on eucalypts in New Zealand in 1997, has not been sighted at Mt Maunganui since late 1999. An intensive survey for it is planned for spring this year. Perhaps the eradication attempt has been successful?

230. *Acrocercops laciniella* (Gracillariidae), first recorded in New Zealand in January 1999, is still apparently confined to the Auckland area. Monthly monitoring of *Eucalyptus pilularis* trees in Auckland has demonstrated successful over-wintering, although abundance was much lower than during the warmer months. The first eggs were laid in flushing foliage in late October, with a second generation appearing in late December. Examination of leaf mines has not revealed any

natural enemies of *A. laciniella* larvae, but mine failure seems to be quite high, resulting in the death of the larvae or eggs. There appears to be no effect on tree growth as yet.



231. An undescribed species of *Nambouria* (Pteromalidae) has been identified as the cause of very unusual and distinctive looking galls found on *Eucalyptus nicholli* leaves in Auckland in October, 1999. The insect is apparently confined to a relatively small area (Mt Wellington) in Auckland and has also been found on *E. glaucescens* and *E. cinerea*. The galls are approximately 8 mm long and protrude in a wavy red line (not unlike a rooster's comb) through each side of the leaf. The developing larvae feed inside the gall within an oval gallery. Development takes approximately three months, and up to 25 galls have been found on a single leaf. Even on heavily infested trees there are no signs of ill health. The genus *Nambouria* contains one other smaller species that causes galls on *Eucalyptus camaldulensis* in Queensland.



232. *Teia anartoides* (Lymantriidae) was first discovered at Glendene in Auckland in May 1999. In September of the same year a separate infestation was found in Mt Wellington about 15 km away. Both sites are the subject of eradication attempts using ground-based sprays and selective host tree removal. The sites (ca. 1 km radius) are surveyed every 6-8 weeks. The insect is still present at Glendene but has not been seen at Mt Wellington since May 2000. *T. anartoides* is polyphagous but shows a distinct preference for *Acacia* spp. (s.l.). The native legume, kowhai (*Sophora tetraptera*), has also been highly favoured. Attempts have been made to identify the pheromone but so far with no success. The eradication attempt is continuing.

***Pest Risk Assessment*:**

233. *Lymantria monacha* (nun moth) on *Pinus radiata*: feeding trials were conducted over a ten-week period in mid 2000 in the US. In no-choice trials *L. monacha* successfully completed its development on *P. radiata* foliage alone, although it is known that neonate larvae prefer to feed on young male cones. Growth rates were better than on a known favoured host, *Picea glauca*.

234. *Gypsy Moth:* refer to the item on a joint Australia-New Zealand feeding preference study, Paragraph 215. A quarantine sample from Christchurch underlined the potential for gypsy moth, and other pests with similar habits, to appear almost anywhere in the country. An egg mass was found on a car during an Automobile Association inspection some six weeks after the vehicle had arrived in New Zealand. The car had presumably been sitting in a dealer's yard for most of that time, and if like most, it had simply been bought and driven away without a pre-purchase inspection, the eggs could have ended up anywhere in the country. On examination at *Forest Research* they were found to be viable and to contain well formed larvae. This once again emphasises the biosecurity risk created by the large, used car trade.

***Policy and Administration*:**

235. *Decline in Forestry Quarantine Samples:* For the year ending 30 June 1999 *Forest Research* received some 576 quarantine samples from the Ministry of Agriculture and Forestry quarantine inspectors. The total numbers of quarantine samples received in 1995-96 and 1996-97 were 1214 and 1554. The number of samples declined to 832 in 1997-98 and this was attributed to the winding down of the used car import survey in late 1997. However the number of samples continued to decline in 1998-99 and in October 1999 it was estimated that numbers would decline to around 440 samples. Samples numbers for 1999-2000 in fact dropped to 253. This could reflect an increase in vigilance on the part of the exporters but it is more likely that the restructuring of the MAF has disrupted continuity of collecting. In addition, the laboratory to which intercepted material may be sent is at the importer's discretion, and dead insects are no longer considered a quarantine matter, and are not being sent for identification. This will have serious repercussions on New Zealand's ability to monitor and predict pest and disease entry pathways. A MAF press release (21 October 1999) announced 29,346 quarantine seizures had been made over the last 6 months at Auckland Airport contrasting sharply with the 193 forest related quarantine specimens that arrived at *Forest Research* over that period.

236. *Molecular methods for rapid recognition of the pitch canker fungus (*Fusarium circinatum*):* The DNA from 86 New Zealand isolates of *Fusarium* species from Section Liseola has been examined. DNA from isolates of *F. circinatum* originating from South Africa, south-eastern United States and Mexico was acquired for evaluation along with that from living isolates of *F. circinatum* held in Rotorua. As a result of this work, molecular tools to aid in the rapid and confident identification of the pitch canker fungus are now available in New Zealand.

FOREST HEALTH SURVEILLANCE, MONITORING AND DIAGNOSIS

Australia:

237. *Port and Airport Environs Surveillance in Queensland:* a trial forest health surveillance program was undertaken over the period 1999-2000 in shipping and air ports, and surrounds, in Brisbane, Cairns, Gladstone, Townsville and Bundaberg. The area within a one-kilometre radius of each port was rated as a high-risk zone, and that beyond this to five kilometres as a medium-risk zone. In the high-risk zone, intensive surveys were conducted of all amenity trees, natural vegetation and parks. Within the medium-risk zone, areas of different land use or vegetation type were surveyed at an intensity dependent on the perceived hazard. Sites especially targeted included vegetation adjacent to container storage yards, rough land containing native woody vegetation, sawmills, timber yards holding imported timber, wharves, and mercury vapour lamps for night flying insects. Standard surveillance forms were used in recording data, and all information was entered on the QFRI Forest Health Database. A wide range of insects and fungi causing damage to trees and shrubs was collected, including drywood, dampwood and subterranean termites, psyllids, whiteflies, tussock moths, scales, gall formers, leaf pathogens and rust fungi. With one exception, all proved to be native species. On Tide Island in Gladstone Harbour, a nest of an exotic paper wasp (*Polistes* sp.) was discovered, which is very much larger than native wasp species and has the potential to damage native fauna. AQIS was notified.

238. This work was undertaken by staff of the Queensland Forestry Research Institute, under the auspices of Agriculture, Fisheries and Forestry - Australia (AFFA). It is the first serious attempt to systematically survey areas of highest-hazard with respect to forestry quarantine. Although no exotic pests of forestry significance were found, the project demonstrated a capability for the detection of such pests if present. The surveys also raised the awareness of AQIS and Port Authority staff of forestry quarantine issues, leading to requests for training, and have laid the

foundation for joint inspections. It is desirable that a survey program is continued in Queensland, and extended to other States.

239. In New South Wales, surveys of the majority of the eucalypt hardwood joint venture and land purchase plantations were conducted during summer and autumn. Forest Health staff met with Silvicultural Officers and Plantation Officers at the commencement of these surveys in order to prioritise the plantations to be surveyed. Forest health surveys identified important pests and diseases that may be limiting to the growth and establishment of eucalypt plantations, and that may need further research. They also pinpointed particular sites and areas that may have increased health problems. Forest Health Reports provided owners and managers with a summary of important pests and disease in their plantations, with recommendations on remedial or control action where appropriate. Aerial surveys were carried out of the majority of the larger plantations (those greater than 500 ha), and these proved useful in highlighting health problems and stratifying ground surveys. Overall, the levels of pests and diseases in the eucalypt plantations were lower than in previous years.

240. Forest health surveys of all New South Wales softwood plantations were completed during winter and spring, 1999. The extent of all areas where pests, diseases, vertebrates, nutrients and weeds were limiting growth or affecting the survival of pines was reported by the Forest Health Survey Unit. Recommendations on control or remedial actions for health problems were supplied to Softwood Plantations Division for consideration. Softwood Plantations Division use these data to predict impacts on wood volume in affected stands, adjust management regimes for "unhealthy" stands, apply fertilisers or weed control to improve establishment, growth and survival of young trees, and spray for *Dothistroma* control. Approaches have been made to private forestry companies, and ACT Forests, in regards to State Forests of NSW conducting forest health surveys in their *P. radiata* plantations next year.

241. To increase the efficiency of surveillance in new South Wales, a collaborative WAPIS (FWPRDC) project aims to develop a robust, reliable indicator of eucalypt canopy condition using remotely-sensed imagery that will be suitable for integration with other operational and strategic planning tasks. In late 1999, a very intensive foliar sampling program was undertaken as part of the 'ground-truthing' project associated CASI hyper-spectral imagery acquisition over the Olney forest health study site. An array of morphological and physiological assessments was made of foliage sampled from mature trees exhibiting a range of canopy decline symptoms. A similar study is planned for the *Pinus radiata* plantations in Hume Region.

242. Development of the New South Wales Forest Health database is now complete, and regular entry of data is being carried out.

243. In South Australia, monitoring for *Essigella* has been carried out on a monthly or fortnightly basis since September 1999 using the protocols developed in New South Wales, and results are being compared with those from monitoring in Victoria. Interaction is continuing with forest growers in the Green Triangle Region and elsewhere to discuss the impact of *Essigella* and to determine what action, if any, should be taken regarding research into control of this insect.

244. A Forest Health Monitoring Kit has been developed to assist ForestrySA staff in the identification of insect pests and diseases, sampling and monitoring of plantations, interpreting sampling results, and decision-making regarding control and management. The aim of the kit is to encourage people to monitor their plantations to assist in deciding when to spray.

245. In Tasmania, North Forest Product's program of surveillance was curtailed this year because of conflicting demands and only about 1400 ha were inspected.

246. Intensive health status surveys (plot-based ground survey) were done in about 4000 ha of 18-month-old and three-year-old *E. globulus* and *E. nitens* plantations and about 2000 ha of three-year-old *P. radiata* plantation during the past year in Tasmania. Helicopter detection surveys were done in the remainder of Forestry Tasmania's plantation estate. A backlog of pathology diagnoses of problems detect in Forestry Tasmania's health surveys has developed over the past 12 months. To relieve some of the pressure on pathology diagnosis one of the Forest Health Officers will assist the pathologist in the laboratory this year.

247. A considerable amount of effort in Tasmania was spent in integrating the health status survey of 18-month-old eucalypt plantations with silvicultural prescriptions. As a consequence the health status survey now includes an estimate of potential productivity as well as health and damage measures. The health status survey has become a key decision tool to identify and schedule appropriate silvicultural treatments as well as identifying areas needing remedial treatments such as secondary fertilising. A trial has also commenced to examine the effect of variability within eucalypt plantations on the reliability and accuracy of the results from health status surveys.

248. Forestry Tasmania has extended the appointment of it's two Forest Health Officers for a further 3-5 years.

249. In the period July 1999 to June 2000, CALM Forest Management Branch mapped the presence of *Phytopthora cinnamomi* disease symptoms and defined protectable areas on almost 33,000 ha of native forest in Western Australia. Approximately 9,500 ha of previously mapped forest was rechecked. Under contract to Alcoa of Australia and other agencies, CALM monitored the interpretation and mapping of a further 7,200 ha.

250. Between July 1999 and June 2000, a total of 1620 samples was processed for *Phytophthora* identification by CALM's Vegetation Health Service. *P.cinnamomi* was detected in 715 samples, *P.citricola* (55), *P.cryptogea* (10), *P.megasperma* (1), *P.drechleri* (1), and *Phytopthora*.spp.(5). There were 52 samples (sandalwood, pine, eucalypt and others) sent to the Vegetation Health Service for general diagnosis in this period.

New Zealand:

251. In the year from 1 July 1999 to 30 June 2000, records of disorders of forest trees on the Forest Health Database totalled 8, 792, slightly more than last year. Of these, 3,142 were fungal disorders. Pathology samples processed by the Forest Health Diagnostic Services over this period totalled 1,228 (including 23 quarantine samples; compared with 1,161, including 108 quarantine samples, in the previous year), and entomology samples totalled 1,028 (including 282 quarantine samples; compared with 1,261, including 469 quarantine samples, in the previous year). Among collections of fungi were one record new to New Zealand (*Cylindrotrichum* sp. on *Eucalyptus nitens*), and new host species records included, on pines, *Fusarium equiseti* (*Pinus radiata*) and *F. avenaceum* (*P. contorta*); on eucalypts, *Fairmaniella leprosa* (*E. obliqua*), *Phaeophleospora eucalypti* (*E. aggregata*, *E. macarthurii*), *Sonderhenia eucalypticola* (*E. fraxinoides*), *Stilbella cinnabarina* (*E. ficifolia*), *Vermisporium acutum* (*E. megacarpa*) and *Cephaleuros virescens* (*E, ficifolia*); on cypresses, *Coleophoma cylindrospora* (*Cupressus lusitanica*), *Phyllosticta spinarum* (*C. arizonica*), *Lepteutypa cupressi* (*Thujopsis dolobrata*), *Seiridium unicorne* (*Sequoia sempervirens*), and *Stigmina thujina* (*Chamaecyparis obtusa*), and on acacias, *Thielaviopsis basicola* (*Acacia mearnsii*). Additional records are listed in Annex A.

252. This year charges were further rationalised for the diagnosis of forest tree disorders provided by the Forest Health Reference Laboratory (*Forest Research*). Clients fall into three

groups, forest companies that pay an annual diagnostic fee based on forest area, non-commercial members of the public who are not charged, in the interests of biosecurity, and commercial entities (eg. forest tree nurseries, forest consultants, professional arborists), who are charged for each sample processed.

253. There have been dramatic changes in the administration of forest health surveillance in New Zealand. For the first time, surveillance was put out for tender by the Forest Owners' Association, and some regions are being surveyed by new surveillance providers who were successful in acquiring forests traditionally surveyed by the old government Forest Biology Survey (now a commercial subsidiary company of *Forest Research*). Competition for forest health surveillance is perceived as cost-efficient by industry clients. However, there are questions about the consistency and worth of the information that will emerge from different sources over successive years that impinge on "down stream" biosecurity, which depends upon the quality and regularity of the information gathered by field advisers. Formerly great value was placed on longer-term regional experience, the reliability of data, and the standardisation of survey methods. Advisers from throughout the country met routinely to compare notes and unify procedures. It is paradoxical that instability has been engendered at a time when biosecurity is being given a high profile at the national level. The importance of maintaining trained and dedicated forest health surveillance personnel is demonstrated by the fact that 82% of new records of forest insects and fungi received by the Forest Health Reference Laboratory over the last ten years were found by experienced surveillance staff.

254. Monitoring plots have been established in order to follow long-term trends in the health of *Pinus radiata* plantations. The initial work involves monthly assessments of ten health attributes on trees of three age-classes at two locations (twelve 25-tree plots), to determine seasonal influences on tree health ratings and test monitoring precision. Early results suggest that crown density, branch density, and degree of dieback will prove useful indicators of tree condition, and that data using trained assessors will be sufficiently robust to yield statistically valid results. It is intended that this work will link in with a related project to determine plantation sustainability over successive rotations.

TIMBER IN SERVICE

255. *Subterranean termites, Queensland:* Committee BD/74: Termite Management was reconstituted to re-draft the Standard to be a performance-based document and include a set of performance criteria for the assessment of novel products. The Termite Management trilogy of Standards: AS3660.1 (Part 1: New building work), AS3660.2 (Part 2: In and around existing buildings and structures) and AS3660.3 (Part 3: Assessment criteria for termite management systems) are progressing through the Postal Ballot phase.

RESEARCH AND DEVELOPMENT

256. The following catalogue summarises research studies or other activities itemised in the respective State and Organisation disease reports (Annex A). Because not all submissions have included such projects the list cannot be taken as representative of current forest pathology research in Australasia. However, it does provide a useful summary of activities being undertaken in some parts of the region. Presentation is by Country and State. This year Organisation responsibilities, affiliations, collaborations and funding sources are not included in the main text, but may be found in the respective individual reports in Annex A.

Australia

Pests

257. **General:**

- Biology of *Essigella californica*, and interaction with host plants (laboratory culture, relationship between temperature and development rate, field monitoring of phenology and biology). PhD scholarship funded by a consortium of major *P. radiata* growers.

258. **Queensland:**

- Resistance screening of families of *Toona ciliata* and *Chukrasia tabularis* for *Hypsipyla robusta*; includes complementary planting, underplanting, fertiliser and insecticide trials, and a related taxonomic project.

259. **New South Wales:**

- Assessment of selected eucalypt tree-improvement trials for pests and diseases.
- Impact of possums in Monaro Region.
- A study of the *Creiis* psyllid; study submitted.

260. **Victoria:**

- The effects of repeated fuel reduction burning on litter invertebrates in dry sclerophyll eucalypt forest in west-central Victoria; short-term (three year) and long-term (ten year) effects; substantially completed, and currently being published.
- Evaluation of the use of *Trichoderma* to control nursery diseases, and the influence of salt in predisposing seedlings to attack by *P. cinnamomi*: continuing.

261. **Tasmania:**

- Fungicide alternatives to synthetic pyrethroids for the control of chrysomelids (*Chrysophtharta bimaculata* and *C. agricola*) and autumn gum moth in eucalypt plantations.
- Artificial defoliation of *E. nitens* to determine the potential impact of *Chrysophtharta agricola* and *Mnesampela privata* on growth.

262. **Western Australia:**

- The insect fauna associated with blue gum plantations in Western Australia: the *Eucalyptus* weevil, *Gonipterus scutellatus*, was the most significant insect pest of *Eucalyptus globulus* plantations two years and older.
- Quantification of rates of egg parasitism of *Gonipterus scutellatus* by *Anaphes nitens*: inadequate biological control is considered the major reason for the elevated pest status of *G. scutellatus* in Western Australia; research seeks to quantify seasonal trends in parasitism rates and determine why *A. nitens* may occasionally be ineffective.
- A study of scarab defoliators such as 'spring beetle' and African black beetle.

- Impact of insecticides alpha-cypermthrin and dimethoate on beetle pests and their natural enemies in *Eucalyptus globulus* plantations, assessing both short and long term impacts.
- Insecticidal exclusion trials to assess the economic impact of feeding damage caused by *Gonipterus scutellatus*, chrysomelid beetles, *Chrysophtharta* spp. and *Cadmus excrementarius*, autumn gum moth, *Mnesampela privata*, and leafblister sawfly, *Phylacteophaga froggatti*, to *Eucalyptus globulus* plantations; long-term trials to determine economic thresholds for these pests.
- An exclusion trial to quantify the impact of defoliation by autumn gum moth on tree growth.
- The seasonal lifecycles of eucalyptus weevil, chrysomelid beetles, autumn gum moth and leafblister sawfly; to identify critical times for plantation surveillance, monitoring and control intervention.
- Study to see if increased tree and understorey diversity influences populations of autumn gum moth by limiting host abundance and/or affecting populations of hymenopteran parasitoids.
- A project to extract, identify and synthesise functional mimics of the sex pheromone of autumn gum moth, in order to produce a pheromone lure for industry to assist with the monitoring of field populations; extraction and partial identification of three chemical compounds that comprise the sex pheromone have been accomplished.
- The taxonomy and role of hymenopteran larval and pupal parasitoids of autumn gum moth in population regulation; PhD scholarship.
- Exclusion trials to assess the economic impact of leafblister sawfly (*Phylacteophaga froggatti*).
- Biological control of the *Eucalyptus* weevil, *Gonipterus scutellatus*: the parasitoid *Anaphes nitens* parasitised egg masses at very low rates (<5%) in early spring, with the parasitism rate rising to almost 100% by summer.
- Impact of jarrah leaf miner on jarrah coppice growth: 100% defoliation resulted in a significant decrease in growth increment.
- The outbreak and biology of the gum leaf skeletonizer, *Uraba lugens* in jarrah forest: papers are in preparation.
- The effects of timber harvesting on terrestrial invertebrates in medium rainfall jarrah forest: PhD thesis to be submitted shortly.
- The incidence and impact of *Phoracantha acanthocera* in karri: completed and published; dry sites in close proximity to jarrah-marri forest, and in small coupes, were more prone to borer attack; incipient rot was found to be correlated to borer presence.
- Enhanced attack by *Phoracantha impavida* in declining tuart (*Eucalyptus gomphocephala*) on nutrient depleted soils: trees appear stressed by competition with coastal peppermint (*Agonis flexuosa*) induced by fire exclusion, and by reduced nutrient uptake due to dry conditions in 1997 and 1998.
- Deterioration of flooded gum (*E. rudis*) in Perth associated with *Creis* psyllids and other leaf feeding arthropods.
- Crown decline and recovery in declining *Eucalyptus wandoo* in Talbot forest block: completed; leaf insect populations were not considered unduly high.
- The impact of fragmentation of *E. wandoo* woodlands in Western Australia, and yellow box woodlands in New South Wales, on canopy arthropod fauna and associated insectivorous birds: isolated trees in paddocks support a diverse and abundant arthropod fauna and can contribute to the conservation of invertebrate and bird diversity in agricultural landscapes.
- A survey of litter dwelling invertebrates following fire: over 16,000 forest floor invertebrates were collected; the majority of the 701 morphospecies captured were unique to a particular forest type (jarrah, karri or tingle) at a particular fire age; Jarrah forest unburnt for 30 years had the highest morphospecies richness, followed by jarrah forest burnt two months previously, with the tingle forests intermediate; to conserve the biodiversity of the forest

floor invertebrates a wide diversity of fire ages and forest compositions and structure should be maintained using the fire regimes prescribed by the current management plan.

- The bark arthropod fauna of jarrah, marri, wandoo and powderbark wandoo along a transect from Perth through to the wheatbelt: a year of sampling revealed in excess of 1,000 species of arthropods living on or visiting the bark of these trees. Abundance of some groups seems to increase towards the wheatbelt end of the transect, and this is reflected in a greater abundance of birds within the bark-feeding guild.
- The canopy fauna of native and introduced saplings in Kings Park, Perth, in both burnt and unburnt areas: canopy arthropods are more abundant on the post-fire regrowth than in the unburnt areas and this results in elevated levels of leaf feeding; it appears that this is a response to increased levels of foliar nutrients and the relationship with herbivores acts to counteract the vigour of post-fire regrowth following fire.
- Invertebrate conservation in an urbanized landscape; the native earthworm fauna of the metropolitan sector of the coastal plain and its representation in the conservation estate: completed and soon to be published.
- A survey of arachnids in the Western Australian wheatbelt, as part of the salinity action plan: collections made from 190 of 300 sites; 170 sites were sorted to 13,929 spider specimens composed of 329 species, at least 150 being new and undescribed.

Diseases

263. **General:**

- Project on potential impact of guava rust (*Puccinia psidii*) on eucalyptus: to commence in the second half of 2000 in collaboration with pathologists from Brazil and South Africa; includes screening for resistance to the rust of a range of eucalypts and other Australian Myrtaceae of commercial or conservation significance; bioclimatic mapping to predict Australian and world regions at risk; and development of methods, based on DNA analysis, for rapid identification and detection of the rust in host tissues.
- Management of disease impacts on eucalypts in South East Asia: primary concerns have continued to be with *Cylindrocladium quinqueseptatum* and *Cryptosporiopsis eucalypti*; to be completed at the end of 2000.
- Pine pitch canker screening project for radiata pine, cooperative between parties in Australia, Chile and New Zealand, stemming from the IMPACT Workshop on pine pitch canker (Monterey, California, 30 Nov-3 Dec 1998); screenings of elite lines from the collaborating countries, and bulk and individual-tree samples from five native populations, initially in glasshouse tests, will be undertaken in California by US researchers during the first 12-18 months.
- Diseases of Australian tree species in Sri Lanka; leaf blight associated with infection by *Cryptosporiopsis eucalypti* was a major cause of failure of *E. camaldulensis* in the north of the country; two-year-old red cedar (*Toona ciliata*) at one location in the mountainous central region were found to be infected by the wilt pathogen *Verticillium dahliae*.

264. **Queensland:**

- Investigation of variation in the indigenous acacia phyllode rust, *Atelocauda digitata*, on different acacia tree species in tropical north Queensland, and field trials for resistance selection and breeding.
- Root disease monitoring plots in southeastern and far north Queensland: results after two years in up to six-year-old second rotation plantations at Amamoor, Jimna & Yarraman indicate that losses attributable to fungal root rots range from 0 – 9 % (ca. 4.8 % mortality at Amamoor, 2.0 % at Yarraman, and 14.4 % at Jimna); most second rotation mortality was caused by Poria root disease (*Junghuhnia vincta*; synonyms, *Rigidoporus vinctus*, *Poria*

vincta), while most losses in first rotation stands were attributable to *Phellinus noxius*.

- Ectomycorrhizal infection of F1 hybrid *Pinus* cuttings (*P. caribaea* var. *hondurensis* × *P. elliottii* var. *elliottii*): studies showed that containerized cuttings at Beerburrum and Toolara nurseries become visible about two months after roots begin to form and just after new shoots begin to grow. All plants appear to be adequately ectomycorrhizal by the time they are large enough for outplanting. The main species are *Thelephora terrestris*, but others include *Rhizopogon* spp. and *Laccaria laccata*. In nursery conditions, the former fungus sporulates readily throughout the year at the base of infected plants and on the bottom of the air-pruned pots, thus providing a ready source of airborne spore inoculum as soon as the plants develop roots. Inoculations with spore cultures of *Rhizopogon* spp. were mostly ineffective in competition with the high level of natural inocula available. It was concluded that natural inoculum infects all the plants quickly and effectively, and that positive interventions with inocula of other ectomycorrhizal fungi are neither feasible nor warranted.

265. **Victoria :**

- A study has commenced on the possible toxic effect of eucalypt bark on eucalypt seedling regeneration in natural forests.
- Trials to evaluate pruning wounds on *E.globulus* and *E.grandis*: continuing.

266. **Tasmania:**

- Completion of a saw mill project on stem decay in regrowth eucalypt sawlogs and grade recovery of sawn boards: the results were applied to a sample of dissected trees measured for decay in an attempt to simulate the consequence of varying allowable log end-defect specifications on future sawlog yields; sensitivity analysis showed that a tightening of allowable end defect specifications by more than 60% of current standards (recommended for recovery of appearance products) resulted in a sharp reduction in future sawlog yields. Such a reduction would be concentrated mainly in the trees of the larger diameter classes.
- Alternative criteria to identify severely decayed trees for culling: preliminary results indicate that only a modest (10%) improvement was achieved with the modified selection criteria; the majority of the gains in reducing the proportion of severely decayed trees after thinning seem likely to be made by applying the existing criteria consistently.
- Site and stand factors associated with stem decay: pure *E. obliqua* forests growing in lowland areas had greater levels of decay than other forest types. Also, *E. obliqua* growing in mixed stands with *E. regnans* had significantly less decay that *E. obliqua* in pure stands. It was not possible to determine whether differences were related to site or to genotype, but the issue is important for plantation development on sites previously carrying pure *E. obliqua* forests.
- Stocking and decay: trees in areas with lower stocking had more decay columns than trees in better stocked areas. However, this result was confounded in that *E. obliqua* forests were over-represented in the lower stocking sample while *E. delegatensis* was over-represented in the well stocked sample. It was therefore not possible to conclude that the effect of stocking on the number of columns was due to stocking rather than species.
- Decay is high in *Eucalyptus nitens* and *E. globulus* pruned for high quality saw logs: a study to investigate the long-term effectiveness of reaction zones as barriers to decay in pruned trees, in order to adopt management strategies that will retard decay (site selection, fertilizer application, pruning severity and timing); factors include the role of water, levels of nitrogen and photosynthesis rates; early stage studies are using responses in one-year-old pot-grown *E. nitens* inoculated with the decay fungus *Ganoderma adspersum* at different times of the year; the reaction zone is blue purple in colour and occasionally associated with a white zone at the healthy sapwood interface; it is drier than healthy sapwood, with lower levels of

potassium, increased total phenols and a lower pH than both sapwood and decayed heartwood; hydrolysable tannins and other phenols are induced, some at least of which are antifungal; the zone is durable against decay (full details in Annex A).

- Molecular techniques to aid in the detection of fungal decay pathogens in living eucalypt plantation trees: present methods (reliance on erratic fruiting and identification of mycelial cultures from wood) are unsatisfactory; the diversity of wood decay fungi causing decay in eucalypt plantations in Tasmania is not known.
- Kino defects in fast growing eucalypts: anatomical and histochemical modelling of kino induction in *E. nitens*, *E. globulus* and *E. obliqua*; cambial damage, barrier zone formation, the chemical composition of kino; impact of kino defect to the solid wood plantation industry; silvicultural practices to reduce the incidence of this defect.
- The influence of forest floor woody debris type (log size) on the biodiversity of fungal and invertebrate assemblages; ecological sustainability of future prescriptions relating to the retention of regrowth logs.
- *Mycosphaerella* defoliation in native and regrowth eucalypts has been associated with wet and humid conditions, frequent in Tasmania; severe attack at two- or three-years would retard growth sufficiently to adversely delay and even exclude pruning in eucalypt plantations; 36 plantation and 5 natural stand sites of *E. globulus* and *E. nitens* were sampled in Tasmania; five *Mycosphaerella* species and three species from *Mycosphaerella* anamorph genera have been identified: *M. nubilosa*, *M. cryptica*, *M. tasmaniensis*, *M. grandis*, *M. nubilosa*, *Sonderhenia eucalyptorum* and *M. vespa*, *Coniothyrium ovatum* and *Sonderhenia eucalypticola*. The commonest, with the greatest impact, were *M. cryptica* and *M. nubilosa*. The internal transcribed spacer region of the ribosomal DNA has been sequenced for all the Tasmanian *Mycosphaerella* species; the results of molecular analysis support the morphological classification of species.
- Screening for resistance to *Mycosphaerella* has indicated a genetic basis to observed resistance. Studies in Tasmania indicate low levels of diversity within populations of *M. cryptica* on *E. globulus* Preliminary molecular and phenotypic data support the existence of only 2-3 fungal genotypes or races at a trial site of resistant and susceptible *E. globulus*. *M. cryptica* genotypes appear closely linked to plant resistant levels; a fast growing genotype is isolated more frequently from susceptible plants; the slow growing genotypes are isolated almost exclusively from resistant plants. There is a need for a reliable bioassay (a controlled artificial inoculation technique of young potted plants) to enable screening for resistance that does not rely on the natural infection of genetic trials or the use of inoculum collected from diseased leaves in the field. Mycelium has been used, because *M. cryptica* and *M. nubilosa* are reluctant to produce the infective spore (ascospore) in culture, but this is not ideal; current work in the UK may enable ascospore production in culture, which will facilitate artificial infection of leaves, and open the way to infection biology and controlled epidemiological studies.

267. **South Australia:**

- Work is continuing at the Waite in Adelaide to identify the phytoplasmid associated with the symptoms of Mundulla yellows.

268. **Western Australia:**

- *Mycosphaerella* leaf blights and other pathogens in *Eucalyptus globulus* plantations: interactions with tree nutrient status.
- Variation in *Armillaria luteobubalina.*
- Interaction between *Endothia gyrosa* and *Eucalyptus globulus* micronutrient status and canker disease development.

- *Mycosphaerella* leaf pathogens in *Eucalyptus globulus*. (PhD).
- Canker diseases in *Eucalyptus globulus*.
- Dieback-resistant jarrah: further field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have been established; work is continuing towards the establishment of production seed orchards.
- Will *Phytophthora cinnamomi* become resistant to the fungicide phosphite? Its implications: plant and fungal interactions at a genetic level.
- Ectomycorrhizal biodiversity in rehabilitated mines and adjacent indigenous forest sites: molecular tools for the characterisation of the different fungi on roots.
- The uptake and distribution of phosphite in *Eucalyptus marginata* and how this effects *Phytophthora cinnamomi*.
- Early disease development of *Phytophthora cinnamomi* in *Eucalyptus marginata* growing in rehabilitated bauxite mines as influenced by waterlogging and drought.
- Genetic and phenotypic variation in *P. cinnamomi* in the northern jarrah forest.
- Long term survival of *Phytophthora cinnamomi* in rehabilitated bauxite mines and adjacent *Eucalyptus marginata* forest: chlamydospore dormancy and saprophytic growth.
- Canker fungi associated with deaths of *Corymbia calophylla* (marri).
- A handspray trial carried out to compare different surfactants for phosphite application: results were equivocal, but BS 1000 (alchohol alkoxylate) showed enough potential improvement over Synertrol to replace that surfactant for this season's application program.
- The interaction of phosphate and phosphite on *Phytophthora cinnamomi* control in the plant.
- Sudden death in cutflower Proteaceae.
- The genetics of pathogenicity in *Phytophthora cinnamomi*, the cause of dieback in native plant communities.
- The effect of ectomycorrhizal fungi on induced resistance of specific native plant species to *Phytophthora cinnamomi*.
- The control of *Phytophthora cinnamomi* by the fungicide phosphite in native plant communities on the south coast of Western Australia.
- The effects of phosphite on pollen development, flowering, seed set and viability on native plant species.
- Taxonomy, genetic variation and pathogenicity of *Puccinia boroniae* (Boronia rust) in *Boronia megastigma, B. heterophylla, B. clavata* and hybrids.
- The role of *Acacia* species in rehabilitated mines on the suppression of *Phytophthora cinnamomi.*

New Zealand

269. **Pests**

- Monitoring of *Essigella californica* aphid population trends: a two year study in pine forests in the Bay of Plenty and Hawkes Bay, using the same methodology as that used in Australia, in an attempt to determine population trends and impact.
- A sawing study of pruned logs from a northern coastal forest attacked by *Sirex noctilio*: a high incidence of resinous blemishes resulting from unsuccessful oviposition attempts between 1986 and 1991, affected clearwood quality and therefore potential log value; the earliest evidence of attack was in 1982, the year in which the stand was high pruned and thinned to the final crop stocking; records in the Forest Health Database confirm the regular sighting of *S. noctilio* in suppressed trees in the forest over this period.
- Feeding trials with *Lymantria monacha* (nun moth) on *Pinus radiata* in a USDA Forest Service quarantine laboratory in the United States; in no-choice trials, *L. monacha* successfully completed its development on *P. radiata* foliage alone, although it is known that

neonate larvae prefer to feed on young male cones; growth rates were better than on a known favoured host, *Picea glauca*.

- *Ophelimus eucalypti*: the biology and gall development in susceptible host trees is now better understood, and resistant trees have been identified; the taxonomy of species in this genus remains unresolved, and the experimental use of allozyme electrophoresis to separate species has been initiated.
- *Dicranosterna semipunctata* on *Acacia melanoxylon*: as a result of a pest risk analysis, a field survey for biological control agents was carried out in New South Wales in November 1999; both larval and egg parasitoids were found, the most promising agent being an egg parasitoid, *Enoggera polita* (Pteromalidae); if funding is available the possibility of introducing this species into New Zealand will be investigated.

270. **Diseases**

- Septoria leaf blight of *Eucalyptus nitens* in the Bay of Plenty region (*Phaeophleospora eucalypti*; synonyms, *Kirramyces eucalypti*, *Septoria pulcherrima*): monthly field monitoring and placement of trap seedlings has determined basic disease aetiology and infection period; an *E. nitens* provenance trial established to screen families and provenances for resistance to *P. eucalypti* has been assessed; inoculation studies are continuing to determine environmental conditions favouring infection.
- Armillaria root disease in *Pinus radiata* (*A. novae-zelandiae*, *A. limonea*): chronic disease impact has been quantified on ex-native forest sites and in second rotation stands on non-native forest sites; studies are continuing to elucidate aetiology in second rotation stands (including spore trapping studies), and on potential disease management through host seedlot resistance, influence of silviculture (thinning, planting stock type – seedlings or cuttings), biological control (stump treatment).
- Cypress canker disease (*Seiridium unicorne*, *S. cardinale*): a survey of the disease has been completed (Paragraph 191); inoculation studies to screen for resistant material of susceptible species to commence this year.

EXTENSION LITERATURE

271. The following items were listed in various State and Country reports (Annex A).

272. *A Manual of Diseases of Tropical Acacias in Australia, South-East Asia and India* by K.M. Old, S.S. Lee, J.K. Sharma and Z.Q. Yuan, aimed primarily at field-based staff, has recently been produced for CIFOR with the support of ACIAR. The book is available from CIFOR, PO Box 6596, JKPWB, Jakarta 1006 Indonesia (Ken Old).

273. Proceedings of the IMPACT Workshop (Monterey, California, 30 Nov-3 Dec 1998) *Current and Potential Impacts of Pitch Canker in Radiata Pine* were published and circulated. Additional copies are available from Mike Devey, CSIRO Forestry and Forest Products, PO Box E4008, Kingston ACT 2604 (Mike Devey, Colin Matheson).

274. Queensland: Peters, B.C. and Fitzgerald, C.J. (1998): Developments in termite management: Life after cyclodienes. Paper presented at the 1998 AEPMA International Pest Management Conference and 10th FAOPMA Convention, Australia, 1-5 June is now on the web at: http://www.forests.qld.gov.au/resadv/qfri/qfpubs/termites.htm.

275. Queensland: Subterranean termites still continue as a newsworthy topic in the media. Extension literature aimed at increasing awareness and clarifying responsibilities among

builders, pest controllers and homeowners is being distributed. The need for government commitment to termite research and extension has yet to be fully realised.

276. Victoria : in November, 1999, a workshop was run on the aphid *Essigella californica*, with over 40 government and private representatives attending. Proceedings from the workshop were produced and distributed.

277. Victoria: A new updated eucalypt plantation note on the effects of defoliation on growth has been completed and is currently in the process of being placed on the Departmental website. A CD Rom listing major insect pests and diseases of Victoria including photos and detailed descriptive information is also under development.

278. Tasmania: Further refinements to the IPM system for leaf beetles has resulted in the release of a technical bulletin. 'Manual for managing leaf beetle defoliation in eucalypt plantations' and release of 'Farm Forestry Toolbox' containing economic analysis thresholds for leaf beetle control.

279. Western Australia: an information pamphlet on *Essigella californica* has been produced for plantation managers.

280. CSIRO: In February 2000 a symposium, funded by the CRC for Sustainable Production Forestry & CSIRO Entomology, was held in Canberra to discuss the role of entomological research in the improved management of eucalypt plantations. The meeting was intended to consider present research gaps and identify future issues needing address. The meeting was attended by 49 delegates, including four international delegates. Two publications have arisen from this meeting to-date:
Steinbauer MJ (Ed.) 2000: *Insect-Eucalypt Interactions*. Program and Abstracts of CRC-SPF Symposium, Canberra, 7-8 February. CRC for Sustainable Production Forestry & CSIRO Entomology, Canberra. viii + 42 pp.
Steinbauer MJ (Ed.) 2000: *Entomological research for Australian eucalypt plantations: conclusions, research priorities and outcomes arising from the Symposium on Insect-Eucalypt Interactions*. Technical Report No. 36. CRC for Sustainable Production Forestry, Hobart. v + 14 pp.
Fourteen manuscripts by authors who gave presentations at the symposium on insect-eucalypt interactions are under review for publication in a special issue of the journal *Austral Ecology*. This symposium issue is supported by the Ecological Society of Australia and it is hoped will be published in late 2001. This work is intended to be a primary reference source for colleagues studying insect-eucalypt interactions.

281. AQIS: *Forests and Timber: A Field Guide to Exotic Pests and Diseases.* A recent joint production by the Office of the Chief Plant Protection Officer, AQIS and SCF, providing information on 25 of the most serious potential exotic forest and timber pests and diseases. It includes photographs and details of origins, susceptible timbers, potential impact, and contacts. The target audience includes wharf workers, container depot staff, timber handlers, timber yard workers, forest workers, forest technical staff and private tree growers. It has been widely distributed, and is available on the AFFA web site at:
http://www.aqis.gov.au/docs/border/fieldguide.htm.

282. AQIS: "Quarantine disease threats to Australia forests and amenity trees from the importation of wood and wood products". Paper presented at the symposium entitled "Exports-Quarantine Impacts on Post-Harvest Agriculture and Lumbar Diseases in North America and Pacific Rim Countries", during the joint meeting of the Canadian Phytopathological Society and

the Pacific Division of the American Phytopathological Society in Victoria, British Columbia, Canada from 18-21 June 2000. This paper discussed the exclusion of many pests and diseases due to isolation and effective quarantine. However greater trade has increased the threat of introduction of forest pathogens such as *Heterobasidion annosum*, *Fusarium circinatum, Bursaphelenchus xylophilus*, *Puccinia psidii* and *Phellinus pini*. Effective quarantine policies and procedures are therefore necessary.

283. *New Zealand Forest Research* Forest Health Pest & Pathogen Leaflet Information on:

http://www.forestresearch.co.nz/largetext.cfm?page_id=1307&page_id=1307&CFID=545962&CFTOKEN=78831470

284. New Zealand Forest Health News is now also accessible on the Web at:

http://www.forestresearch.co.nz/largetext.cfm?page_id=1508&page_id=1508&CFID=545962&CFTOKEN=78831470

285. An annotated bibliography of over 400 references on the ecology, biology, health, and propagation of pohutukawa (*Metrosideros excelsa*, Myrtaceae) and tree rata (*M. robusta*). It includes many historical references and obscure publications. This document can be found on the Project Crimson web site (www.projectcrimson.org.nz).

CONCLUSION

286. This report is the Annual Pest, Disease and Quarantine Statement of the Forest Health Research Working Group 7 recording the 12-month state of forest health and quarantine situation in Australia and New Zealand.

RECOMMENDATIONS

287. The Annual Pest, Disease and Quarantine Statement be accepted and noted by the Standing Committee.

FOR INFORMATION

Forest Health Research Working Group
(I. Hood, N. Collett, Secretariat,
and RWG 7 members)
15 September, 2000

ANNEX A: Forest pest, disease situation and quarantine reports 1999-2000 by States and Country.

ANNEX A

FOREST PEST, DISEASE AND QUARANTINE SITUATION REPORTS 1999-2000 BY STATES AND COUNTRY

1 QUEENSLAND - PESTS

Ross Wylie and Brenton Peters

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Plantations

Pinus radiata (and other temperate pines)

Pests

Sirex Wood Wasp (*Sirex noctilio*)

Queensland remains free of sirex but the insect is known to be present at Inverell in New South Wales, 100 km from the Queensland border. Trap tree and ground surveillance has been increased in the border area and arrangements made for training of more DPI Forestry District staff on detection and management of this pest.

Monterey Pine Aphid (*Essigella californica*)

This aphid is present in all radiata pine areas in southern Queensland. It has sometimes been associated with needle chlorosis although no causal relationship has been proved. Many chlorotic trees have no aphids at all, and the symptoms may indicate nutritional changes. 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 and both aphids are often found on the same trees. Again, it is sometimes associated with chlorotic foliage but no serious damage has been evident.

Sub-tropical and tropical *Pinus* species

Pests

Five Spined Bark Beetle (*Ips grandicollis*)

Ips grandicollis remains south of the quarantine border established in 1994 at Marlborough in Central Queensland. *Ips* activity has generally been low this year, the only attack of any significance being on fire-damaged *P. caribaea hondurensis* at Beerburrum in southern Queensland.

Monterey Pine Aphid (*Essigella californica*)

This aphid is spreading rapidly and is in all pine plantations in southern Queensland north to the Maryborough-Bundaberg area. No damage has been observed.

Pine Aphid (*Eulachnus thunbergii*)

The distribution of this insect far exceeds that of the Monterey Pine Aphid, and it has been found in all coastal areas up to Kuranda in north Queensland (inland from Cairns). No damage has been observed.

Pink Wax Scale (*Ceroplastes rubens*)

Heavy infestations of this scale were present on *P. caribaea hondurensis* x *P. elliottii elliottii* hybrid in the Tuan State Forest near Maryborough. This insect has been an occasional problem on exotic pines, mostly loblolly pine *P. taeda* in southern Queensland.

Hoop pine (*Araucaria cunninghamii*)

Pests

Cat's Claw (*Macfadyena unguis-cati*)

While the hoop pine plantations throughout Queensland were generally free of any insect pest problems during this last year, areas of plantations at Imbil (southeast Queensland) are seriously affected by the exotic vine Cat's Claw. This rampant woody vine can climb to a height of 30m and the diameter of its stem can reach 15cm. It has distinctive small tendrils, each of which end in three sharp, hooked claws (hence the name). The vine can smother tree canopies causing crown death. It is difficult to kill and almost impossible to remove manually, which hinders milling of logs. Biocontrol options are being investigated.

***Eucalyptus* species**

Pests

Leaf beetles

Paropsis atomaria is the major defoliating species in young eucalypt plantations in the southern half of the State, and insecticide spraying has been necessary on several joint-venture plantings.

Sawflies

In north Queensland, species of *Perga* and *Pergagrapta* cause occasional severe defoliation in joint venture and trial plantings. These insects are most prevalent on the tablelands and in the drier areas of the coast.

Stem borers

Longicorn stem borers (*Phoracantha* sp., probably *P. solida*), are a common problem in the north, and in a joint-venture planting of *Eucalyptus pellita* near Julatten up to 50% of trees were attacked. This is of major concern given the likely timber degrade caused by this beetle. Plantations of *E. pellita* in the higher rainfall areas of the coast showed no signs of significant insect attack. It is apparent that this tree species is very susceptible to severe insect damage when planted off-site.

Other pest of eucalypt plantations

An unusual problem encountered in a joint-venture plantation at Somerset Dam in southern Queensland was erinose mite infestation on spotted gum (*Corymbia variegata*). An initial survey showed an incidence of approx. 75% of trees showing symptoms, although a much smaller proportion of these were severely affected.

Quarantine

Pests

Powder post beetle

Another infestation of the exotic powder post beetle *Minthea reticulata* was found in a house at Timberlea, south of Cairns in late 1999. It was in tulip oak flooring, and from the same batch that resulted in fumigation of a house at Oak Beach earlier that year. The house was fumigated and timber baits deployed around Cairns to determine the establishment status of the pest. No other *M. reticulata* has been found since that time.

Bark beetles

In July 2000, large numbers of live bark beetles were found in pine timber dunnage on a Brisbane wharf. The dunnage was associated with a shipment that originated from China. The beetles were tentatively identified as either a species of *Orthotomicus* or of *Ips*. The dunnage was sprayed and destroyed, and pheromone traps baited with ipsenol placed through the area. No more beetles have been found.

FOREST PRODUCTS

PESTS

West Indian Drywood Termite

Fourteen buildings in **Brisbane**, including the Industrial Pavilion and associated horse stables, Royal National Association (RNA), and 5 in **Maryborough** were fumigated in 1999/00 to eradicate infestations of the West Indian Drywood Termite *Cryptotermes brevis*. A further 12 buildings in **Brisbane** were discovered infested during recent surveys and require fumigation. Twenty buildings in the **Maryborough** Central Business District (CBD) have been found infested during the past several years resulting in certain political, technical and resource challenges. An adequate strategy has yet to be devised and implemented to meet these challenges.

Subterranean Termites

Committee BD/74 - Termite Management was reconstituted to re-draft the Standard to be a performance-based document and include a set of performance criteria for the assessment of novel products. The Termite Management trilogy of Standards: AS3660.1 (Part 1: New building work), AS3660.2 (Part 2: In and around existing buildings and structures) and AS3660.3 (Part 3: Assessment criteria for termite management systems) are progressing through the Postal Ballot phase.

The extension paper: Peters, B.C. and Fitzgerald, C.J. (1998). Developments in termite management: Life after cyclodienes. Paper presented at the 1998 AEPMA International Pest Management Conference and 10th FAOPMA Convention, Australia, 1 - 5 June.
is now on the web at: http://www.forests.qld.gov.au/resadv/qfri/qfpubs/termites.htm

Subterranean termites still continue as a newsworthy topic in the media. Extension literature aimed at increasing awareness and clarifying responsibilities among builders, pest controllers and homeowners is being distributed. The need for government commitment to termite research and extension has yet to be fully realised.

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2 QUEENSLAND – DISEASES

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1. Plantations

1.1 Diseases of *Pinus radiata.*

Dothistroma Needle Blight, caused by ***Eruptio* (syn. *Mycosphaerella*) *pini***, continues to defoliate ***Pinus radiata*** at Gambubal,

Diplodia Dieback, caused by the fungus ***Sphaeropsis sapinea* (syn. *Diplodia pinea*),** was relatively quiescent in plantations of ***P.radiata*** at Paschendaele during the year.

1.2 Diseases of Tropical Pines

Diplodia Dieback, caused by the fungus ***Sphaeropsis sapinea* (syn. *Diplodia pinea*),** was encountered occasionally on ***Pinus* spp**, causing insignificant damage.

Phytophthora Root Rot, caused by the fungus ***Phytophthora cinnamomi***, continues to give rise to scattered deaths in plantations of hybrid PCH x PEE in SE Queensland, especially on excessively wet sites. Overall damage is however, usually insignificant. "Phytoclean" has now replaced Formalin for ***Phytophthora*** control in foot/wheel baths at Toolara nursery.

Scattered mortality in young stands of **F1 Pinus** clones is associated with poor root configuration of the trees. This is possibly the result of stopping the use of Copper treatment to pots, but may also involve the small size of pots used and planting delays. **Nematodes**, of genera other than ***Bursaphelenchus***, are found in most affected trees together with ***Ips*** beetles and **blue-stain fungi**. However, all of these are considered to be secondary to root coiling and root compression.

1.3 Diseases of Hoop Pine.

Root Rot/Mortality, caused by the fungi ***Rigidoporus vinctus, Phellinus noxius & Rosellinia* spp,** continues to affect young 2R plantations in SE Queensland and Far North Queensland. Most of these deaths are caused by **Poria root disease,** which appears to be the main root rot disease encountered in 2R plantations, whereas ***P.noxius*** was the main pathogen in 1R plantations.
Dothiorella Dieback of branches and leading shoots, associated with ***Botryosphaeria ribis*** (anamorph ***Dothiorella* sp.**), continues to occur, but rarely causes significant crop damage. The teleomorph and anamorph states both occur at the base of young trees and on the branches of older trees in N.Q.

1.4 Diseases of Eucalypts

Ramularia Shoot Blight (RSB), caused by ***Sporothrix*** (syn. ***Ramularia*) *pitereka,*** was seen on ***Corymbia* spp**. throughout the year in several Joint Venture plantations, in research trials, and in other farm forestry areas in SE Queensland. RSB resistant trees are apparent in low numbers in most provenances, but are much more common in some provenances, such as those from Woondum and Coomingla in Queensland. As this "resistance" has held up over 3 years at widely-separated sites, it is now considered that the former provenance exhibits sufficient tolerance towards the disease for it to be recommended for inclusion in the planting programme. However, it is recognised that <10% of these "Ramularia resistant trees" will still require culling because of the effects of this disease.

Cylindrocladium Leaf Blight (CLB), caused by ***Calonectria quinqueseptata*** (anamorph ***Cylindrocladium quinqueseptatum)***, has been noted on ***Eucalyptus microcorys*** and many other ***Eucalyptus*** species and hybrids in Far North Queensland, mainly in the period February to June, with only ***E.pellita*** and ***E.deglupta*** showing acceptable resistance. CLB development appears to be very rapid on all trees within affected plantations, giving rise to the shedding of much of the foliage and the death of young shoots. The anamorph of the pathogen is readily seen on affected foliage from February to May but becomes virtually absent subsequently.

Leaf Crinkle, caused by ***Mycosphaerella cryptica,*** has been quite common and damaging in SE & Far North Queensland this year, affecting both immature and mature juvenile foliage of a number of ***Eucalyptus*** **spp.** and hybrids. ***E.globulus, E.grandis, E.tereticornis, E.camaldulensis,*** and various hybrids of the 2 latter species are particularly affected. It has also been noted affecting adult foliage of 3-year-old ***E.globulus*** at Binga. Provenance differences do occur within species, such as ***E.camaldulensis***, but these are generally quite small. However, differences between individual trees can be very large, especially in the hybrids between resistant and susceptible species.

Several other **Leaf Spot** fungi have also been observed this year on various Eucalypts associated with leaf necrosis on isolated trees, or at low levels on senescent foliage. These include the following:-

1. **Purple Leaf Spot,** caused by the fungus ***Mycosphaerella suttoniae*** (anamorph ***Phaeophloeospora epicoccoides***), particularly on juvenile foliage in the lower crown of ***E.pellita, E.cloeziana & E.resinifera*** in Far N.Q., and on ***E.camaldulensis, E.cloeziana, E.grandis & E.tereticornis*** in SE Q. Damage is insignificant on most trees affected.

2. **Leaf Blotch,** associated with ***Coniella fragariae*** **or** ***Cryptosporiopsis eucalypticola,*** on several eucalypt species, especially on leaves damaged by insect pests and on leaf tips. These diseases do not appear to be significant in Queensland despite reports to the contrary from other countries.

3. Various **Leaf Spots** have been encountered on several different Eucalypts, associated with various ***Mycosphaerella*** **spp.**, ***Hainesia lythri, Dichomera eucalypti*** , ***Coniothyrium*** **spp.** etc. However, these have not been associated with significant foliage damage.

Bacterial Wilt, caused by the bacterium ***Ralstonia solanacearum***, was again encountered on young ***E.pellita*** near Cardwell and Innisfail this year. Only a few scattered trees were affected.

Stem Cankers associated with copious flows of kino occur on young ***Corymbia variegata*** in varous parts of Queensland. These are of indeterminate cause, but are associated with a sooty mould, tentatively identified as ***Ophiocapnocoma phloiophila,*** and an unidentified ascomycete.

Phytophthora Root / Collar Rot has been reported in plantations of ***E.cloeziana & E.pilularis*** up to 2 years of age. Affected trees die suddenly with foliage still attached, and usually have decayed roots and root collar, with a defined live edge at, or just above, ground level.

1.5 Diseases of Red Cedar

Young trees, less than 1-year-old, were killed by **Poria Root Disease (*Rigidoporus vinctus*)** in research plantings during the year.

2. Managed Natural Forests

2.1 Diseases of Eucalypts

Nothing to report.

3. Nurseries.

3.1 Conifers

Mortality/Red Needle of Pinus Hybrid cuttings This has been particularly severe this year with many families affected at Beerburrum and Toolara Nurseries, despite the avoidance of families which performed poorly last year. The condition seems to be related strongly to the host provenance and batch, and does not appear to respond to applications of fungicides. Age of the hedge plants from which the cuttings are taken also appears to be important for some of the families involved. Unshaded cuttings do not appear to be susceptible to this condition.

Wollemi Pine were occasionally affected by **Dothiorella Shoot Blight** following pruning of large stems to provide cuttings. The same fungus was also commonly found on dead apices of cuttings under mist propagation. This fungus appears to be similar to that often found on young Hoop Pine.
Several other fungi have also been found on foliage and stems of this host species in the same nursery. Many plants were also severely affected by **Phytophthora Root Rot** following over-watering of heavily-pruned, pot-bound stock plants under glasshouse conditions.

3.2 Hardwoods

Shoot blight, caused by the fungus ***Calonectria scoparia*** (anamorph ***Cylindrocladium scoparium)***, gave rise to shoot blight and deaths in young ***E.cloeziana*** plants in Ingham nursery following a period of above average rainfall. Control was achieved by spraying with fungicides.

Leaf Spots, of indeterminate cause, commonly give rise to chlorosis and necrosis on the leaves of young ***E.cloeziana*** at all nurseries surveyed in both SE and Far North Queensland. Older plants appear to be unaffected by the disorder.

4. Native Plant Communities

Leaf Crinkle, caused by the fungus ***Mycosphaerella cryptica*** was detected on coppice shoots in native forest of ***E.tereticornis*** near Childers. This species, which is widespread in SE Qld is therefore regarded as a likely major source of inoculum for the outbreaks of the disease in research trials containing susceptible species.

Acacia Rust, caused by a new species of ***Atelocauda*** was collected during FHS surveys of native forests during the year. Gall rust affecting the pods of ***A.glaucocarpa*** has also been noted in seed orchard stock at Byfield recently.

5. Urban and Rural

Disease samples were received from other government bodies and private individuals from both urban and rural areas during the year. No unusual or significant reports were made.

9. Research and Development

9.1 Root Rot/Mortality, caused by the fungi ***Rigidoporus vinctus, Phellinus noxius & Rosellinia*** **spp,** continues to affect young 2R plantations in SE Queensland and Far North Queensland.
Results after 2 years from a series of observation plots (0-6 years of age at commencement of trial) established at Amamoor, Jimna & Yarraman show that mortalities attributable to fungal root rots range from 0 – 9 %. Summed data for these plots, up to the age of 8 years, suggest that root rot causes approximately 4.8 % mortality in Amamoor plantations, 2.0 % at Yarraman and 14.4 % at Jimna. Most of these deaths were caused by **Poria root disease,** which appears to be the main root rot disease encountered in young 2R plantations, whereas ***P.noxius*** was the main pathogen in 1R plantations.

9.2 Mycorrhiza (ECM) of F1 Pinus cuttings:- Studies carried out during the year have shown that containerized **F1** ***Pinus*** cuttings at Beerburrum and Toolara nurseries become visibly ectomycorrhizal about 2 months after roots begin to form and just after new shoots begin to grow. All plants appear to be adequately ectomycorrhizal by the time they are large enough for outplanting.
The ECM are mainly formed by ***Thelephora terrestris***, but also occasionally by other fungi such as ***Rhizopogon*** **spp.** and ***Laccaria laccata***.. In nursery conditions, the former fungus sporulates very readily virtually all year round at the base of infected plants and on bottom of the air-pruned pots, thus providing a ready source of airborne spore inoculum as soon as the plants develop roots.
Inoculations with spore cultures of ***Rhizopogon*** **spp.** were mostly ineffective in competition with the high level of natural inocula available.
It was concluded that natural inoculum infects all the plants quickly and effectively, and that positive interventions with inocula of other ectomycorrhizal fungi are neither feasible nor warranted.

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3 NEW SOUTH WALES – PESTS AND DISEASES

Angus Carnegie
State Forests of New South Wales

PINUS RADIATA (AND OTHER TEMPERATE PINES)

PESTS

Sirex **Wood Wasp (*Sirex noctilio*)**

Sirex damage was observed for the first time near Inverell in June 2000. This is the most northerly record from N.S.W. Very low levels of damage (<1% incidence) were observed in ~450 ha of *P. radiata* plantations at Mount Topper State Forest, approximately 20km south of Inverell. The incidence of naturally struck trees remains very low in all State Forests of NSW plantations. Most of the infested trees are suppressed and in stands overdue for thinning. However, levels of naturally struck trees are higher in several privately owned plantations around Walcha on the Northern Tablelands. Several owners have been approached in regards to implementing management through nematode releases. A *Sirex* workshop, run by State Forests of NSW, will be held at Tumut in October 2000. *Sirex* emergence numbers from trap tree billets remains low in Monaro, Hume and Macquarie Regions with the main concentration of effort for *Sirex* control in Northern Region.

Five Spined Bark Beetle (*Ips grandicollis*)

The numbers of adult *Ips grandicollis* collected during the flight season have increased from the 1998/1999 season. The main concentration of these beetles in N.S.W is in Hume region with numbers also on the increase in *Pinus* sp. forests managed by A.C.T. Forests. Forest management practices such as harvesting outside of the flight season and prompt log removal from log dumps to reduce attack sites have been employed where possible. Chopper rolling and rough stacking and burning utilising a spot cultivator has been employed to reduce adult beetle overwintering sites. The *Ips* monitoring programme is to be continued for the 2000/2001-flight season.

OTHER BARK BEETLE SPECIES

No evidence of damage to new plantings from *Hylastes ater* was observed.

Wingless Grasshopper (*Phaulacridium vittatum*)

There were no serious outbreaks of wingless grasshoppers in the pines this year. Monitoring of grasshopper numbers will continue in spring and summer in Tumbarumba in 2000 where *Phaulacridium vittatum* has previously been a problem.

Monterey Pine Aphid (*Essigella californica*)

Essigella californica has been found in northern New South Wales, in the Casino area in *Pinus elliottii* x *caribaea* F1 and F2 hybrids and in the northern tableland area around Walcha in *P. radiata*. Aphid numbers were low in both areas and there was no sign of foliage damage. Aphid monitoring was initiated at two Casino sites in March 2000 and was carried out over three consecutive months. An additional site was put in place in June 2000 at Crofts Knoll S.F. in the Walcha area.

Monitoring for *E. californica* has continued at six sites in central and southern NSW: three sites in Hume Region; one site in Monaro Region and two sites in Macquarie Region. Aphid populations at all sites which have been monitored for longer than a year showed in 2000 reduced numbers of affected trees and reduced numbers of aphids per tree. The two original sites at Carabost State Forest (Hume Region), which will have been monitored for two years in July 2000, also showed a shortening of the period of aphid activity. In 1998 aphids were still in reasonable numbers as late as the end of July, while in 1999 aphid numbers had significantly fallen by June; this latter trend appears to also be the case in 2000. The canopy scores for all monitored sites did not change during the 1999-2000 period.

Pine Aphid (*Eulachnus thunbergii*)

Surveys initiated to monitor the distribution of *Essigella californica* have also collected distribution data on *Eulachnus thunbergii*. The distribution of *E. thunbergii* has not changed in NSW in 1999-2000, with the southern most record in NSW still Oberon.

Painted apple moth (*Teia anartoides*)

Damage from this insect was observed in young *P. radiata* in Hume Region (Tumut/Tumbarumba) this year. Moderate levels of defoliation were observed (up to 15% need damage), but only on isolated trees.

DISEASES

Dothistroma septospora

Dothistroma was a significant problem (>50% defoliation or infection) in Northern Region, and also observed at higher than previous levels in Monaro and Hume Regions. Up to 1700 ha were affected in Northern Region (including Walcha and Casino plantations), while Monaro had 2250 ha and Hume approximately 800 ha. Spraying, thinning and pruning

operations are carried out in Northern Region to reduce *Dothistroma* levels, while thinning is the main form of control in other Regions.

Cyclaneusma minus

Cyclaneusma minus needlecast was observed at higher levels than previously in Monaro and Northern (Walcha) Region. In Northern Region, up to 1000 ha of *P. radiata* was damaged by *Cyclaneusma minus*. While widespread in other Regions, the levels were lower than previous years.

Sphaeropsis sapinea

Damage from *Sphaeropsis* was much less significant this year than in previous years. There was a significant reduction in deaths related to drought and *Sphaeropsis* in all Regions.

Armillaria

Armillaria was not a significant problem in the *P. radiata* plantations this year.

ENVIRONMENTAL

Frost

The incidence of damage to lower needles of young trees (<3-year-old) caused by frosts was higher than previous years in Hume and Macquarie Regions, but still less than 200 ha. Deaths as a result of frost damage were minimal.

Drought

High levels of needle chlorosis associated with drought and natural senescence were observed in the Casino plantations (mainly *P. taeda* and *P. elliottii*), similar to previous years.

SITE RELATED PROBLEMS IN *P. RADIATA* PLANTATIONS

Establishment

Establishment problems, such as poor site quality and waterlogging, resulted in infection from *Macrophomina phaseolina* and deaths of newly planted seedlings in localised areas mainly in Hume Region.

Weeds

Weed regeneration and competition (mainly *Acacia* spp. and grasses) was a problem in the younger age classes (up to 4-year-old) in Hume, Macquarie, Monaro and Northern (Casino) Regions.

VERTEBRATE PESTS

Possums

Extensive damage has been caused by possums in Bombala in recent years, and the damage has increased again this year, mainly in area (ha) of plantation affected, with possums moving into areas previously undamaged. Possum damage in other regions is less significant and restricted to localised areas surrounding native bush.

Wallabies

Browsing from wallabies was a problem in young stands adjacent native bush and retention strips in many regions in NSW. Often up to 90% of young trees are attacked, but less than 1% of trees are killed as a result of wallaby damage.

Rabbits
Browsing from rabbits had caused significant mortality in newly planted *P. radiata* in plantations east of Glen Innes.

Hoop pine (*Araucaria cunninghamii*)

There were no significant pests or diseases observed in the *Araucaria* plantations.

Eucalyptus species

PESTS

Psyllids
Creiis liturata has again caused significant damage to young plantings of *E. dunnii* around Casino and Kyogle. In one instance, approximately 100 ha were affected by a psyllid outbreak in April 2000, and recent observations indicate that up to 20 ha of this has not recovered (although frost may be a factor). Observations indicate that this insect can build up to high and damaging numbers in less than 4 weeks. *Creiis* was observed at more plantations this year than the previous year, and has also been observed damaging *E. grandis, E. grandis* x *E. camaldulensis* and *E. grandis* x *E. tereticornis.* This is now considered a potentially significant pest of young eucalypt plantations in northern NSW.

Autumn Gum Moth (*Mnesampela privata*)
This insect was not observed in the commercial plantations in NSW. Severe damage was observed on roadside plantings of *E. globulus* around Tumut in June 2000.

Leaf beetles / Chrysomelids
In most cases, damage from chrysomelids was much lower this year, however, several plantations of *E. dunnii* were severely defoliated. *Chrysophtharta cloelia* and *Paropsis atomaria* were amongst the most destructive pests in young eucalypt plantations in northern NSW. *Eucalyptus dunnii*, *E. grandis* and *E. pilularis* were the host species severely damaged.

Monolepta beetles (*Monolepta australis*)
Several damaging outbreaks of Monolepta beetles were observed in young *E. pilularis* plantations. These outbreaks were localised on tops of hills and ridges, and the largest area was less than 1 ha. In severe cases young seedlings and 1-year-old trees died. *Corymbia maculata*, growing adjacent to *E. pilularis*, was attacked at one plantation, a new host record for this pest.

Sawflies (*Perga* spp.)
Minor damage to eucalypt plantations was attributed to sawfly larvae.

Christmas Beetles (*Anoplognathus* spp.)
Christmas beetles (*Anoplognathus* spp.) caused defoliation in late spring and early summer in many young eucalypt plantations in northern NSW, with *E. grandis*, *E. dunnii* and *Corymbia maculata* being the most severely damaged.

Leaf Blister Sawfly (*Phylacteophaga froggatti*)
Minor damage to eucalypt plantations was attributed to leaf blister sawfly larvae.

Gum tree scale
In most cases, gum tree scale (*Eriococcus* spp.) was observed at very low levels in young plantations (<1 % incidence). Heavily infested trees were usually on waterlogged sites. The majority of hosts were *E. grandis.*

Stem borers
Stem borers are a major pest in young eucalypt plantations in NSW. Cossid moths and several species of cerambycids were observed causing damage to trees in 2–5 year old plantations. *Eucalyptus grandis* was by far the most damaged host, but *E. dunnii*, *E. pilularis, C. maculata*, and *C. variegata* on poor quality sites were also attacked.

Weevil larvae were observed at low levels (<1% incidence) tunnelling through the cambium of young *E. nitens* in several plantations in southern NSW. Decay/staining was observed with this damage.

DISEASES

Aulographina eucalypti
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 eucalypti* (= *Kirramyces eucalypti*)**
Minor damage from *Phaeophleospora eucalypti* was observed in *E. nitens* plantations in southern NSW (Bombala).

***Mycosphaerella* leaf spots**
Mycosphaerella cryptica was common in many plantations, but in most cases only at trace to low levels. *Eucalyptus saligna, E. nitens* and *E. pilularis* were the most susceptible hosts. However, in several plantations severe infection and defoliation (over 50% of the tree crown) was observed.

Coniella fragariae
Leaf spot caused by *C. fragariae* was common on lower foliage in many young *E. dunnii* plantations, similar to previous years. Trees growing in boggy or waterlogged areas had higher infection levels.

***Pestalotiopsis* sp.**
Damage to lower leaves, resulting in defoliation, of *E. dunnii* and *E. grandis* was observed at high levels in several plantations this year. The damage was similar to that caused by herbicide spray, but there was no evidence of this. The leaf fungus *Pestalotiopsis* sp. was consistently isolated from damaged leaves. This fungus, however, is not normally a significant problem.

Ramularia pitereka
Damage from *Ramularia* was not as severe in the young *Corymbia* plantations this year. Although recorded in many plantations, the severity of infection was very low. Evidence of previous years' infection was observed as tip dieback, often with little new flush.

***Endothia gyrosa* stem canker**
There was no new *Endothia* infections observed this year. Damage to 2–3 year old *E. dunnii* from the previous year's infection has now started to occlude.

Phytophthora

There was no repeat of the high levels of mortality from *Phytophthora* root rot as was observed the previous year. This season was not as wet as last year.

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 were reported this year.

EUCALYPTUS SPECIES

Botrytis cinerea remains the most important pathogen of eucalypt seedlings in forest nurseries. Improved management of watering regimes, keeping plants in full sun and application of fungicides ensures *B. cinerea* causes minimal damage.

NATIVE PLANT COMMUNITIES

No noteworthy pest or disease outbreak was recorded.

QUARANTINE

Pine Pitch Canker Fusarium circinatum

Samples of dead tops, resinous stem and branch cankers, and dead natural regeneration from *Pinus radiata* plantations in all Regions in N.S.W. and A.C.T. were collected by the Forest Health Survey Unit in 1998 and 1999. Isolations from this material yielded no *Fusarium circinatum*. The great majority of isolates were *Sphaeropsis sapinea* and *Sclerophoma pythiophila*.

Bursaphelenchus hunanensis

The pine nematode was not detected during forest health surveys of *P. radiata* plantations. SFNSW Forest Pathologist, Jack Simpson, has conducted further surveys for *Bursaphelenchus* in NSW southern pine growing Regions and elsewhere. A second non-plant pathogenic species of *Bursaphelenchus* is commonly associated with *Ips grandicollis* in N.S.W.

Discovery of Drywood Termite Infestations

AQIS inspectors discovered two drywood termite infestations in the Sydney region. West Indian drywood termite *Cryptotermes brevis* were found in furniture at Cronulla. The furniture had been imported around 10 years ago. FR & DD staff inspected the affected premises but found no sign that the infestation had spread. The furniture was fumigated by AQIS.

North American western drywood termite *Incisitermes minor* was found in a packing case in another house in Cronulla. FR & DD staff inspected this dwelling and again found no sign of spread. The infested case was taken back to Research Division and maintained in the insectary with the object of obtaining specimens to send to termite taxonomists at the CSIRO Division of Entomology for research purposes.

Interception of timber infested with Formosan termite, *Coptotermes formosanus*

In May 1999 AQIS inspectors intercepted a shipment of timber from Taiwan infested with termites. They were forwarded to FR & DD and identified as *Coptotermes formosanus*, which in economic terms is the world's most important termite pest. The infestation was destroyed by fumigation.

FOREST HEALTH SURVEILLANCE AND DIAGNOSIS

Surveys of the majority of the hardwood /eucalypt Joint Venture and Land Purchase plantations were conducted during summer and autumn. Forest Health staff met with Silvicultural Officers and Plantation Officers at the commencement of surveys to prioritise plantations to be surveyed. Forest health surveys identified important pests and diseases that may be limiting to growth and establishment of eucalypt plantations, and that may need further research, as well as certain sites/areas that may have increased health problems. Forest Health Reports provided owners/managers with a summary of important pests and disease in their plantations, with recommendations on remedial/control action where appropriate. Aerial surveys of the majority of the larger (>500 ha) plantations were carried out, and proved useful in highlighting health problems and stratifying ground surveys. Overall, the levels of pests and diseases in the eucalypt plantations were lower than in previous years.

Forest health surveys of all Softwood plantations were completed through winter and spring 1999. The extent of all areas where pests, diseases, vertebrates, nutrients and weeds were limiting growth or affecting survival of pines were reported by the Forest Health Survey Unit. Recommendations on control or remedial actions for health problems were supplied to Softwood Plantations Division for consideration. Softwood Plantations Division use these data to predict impacts on wood volume in affected stands, adjust management regimes for "unhealthy" stands, apply fertilisers or weed control to improve establishment, growth and survival of young trees; spray for *Dothistroma* control.

Private forestry companies and ACT Forests have been approached in regards to State Forests of NSW conducting forest health surveys in their *P. radiata* plantations next year.

A collaborative WAPIS (FWPRDC) project aims to develop a robust reliable indicator of eucalypt canopy condition using remotely-sensed imagery that will be suitable for integration with other operational and strategic planning tasks. In late 1999, a very intensive foliar sampling program was undertaken as part of the 'ground-truthing' project associated CASI hyper-spectral imagery acquisition over the Olney forest health study site. An array of morphological and physiological assessments was made of foliage sampled from mature trees exhibiting a range of canopy decline symptoms. A similar study is planned for the *Pinus radiata* plantations in Hume Region.

Development of the Forest Health database is complete, and regular entry of data is now being carried out.

RESEARCH AND DEVELOPMENT

Some eucalypt tree-improvement trials were assessed for pests and diseases this year.

Studies on the impact of possums in Monaro Region have been conducted in collaboration with Research Division and Softwood Plantations Division.

A SPIRT application to study the damaging *Creiis* psyllid has been submitted, in collaboration with Southern Cross University, Hardwood Plantations Division and Research Division.

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4 VICTORIA – PESTS

Nick Collett

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PESTS OF PINUS RADIATA PLANTATIONS

Sirex noctilio
Sirex has remained at very low levels throughout 1999/2000 in most pine areas of Victoria. However, due to the dry conditions experienced over the past two years, growers have been advised to ideally thin where possible, or increase trap tree plots and subsequent inoculation with nematodes in unthinned stands to ensure Sirex populations are kept at manageable levels.

Ips grandicollis
Apart from a minor infestation in the south west of the state where approximately 30 *P.radiata* trees age two were affected, no major Ips outbreaks have occurred.

Bark beetles
No outbreaks of either the Golden Haired Bark Beetle (*Hylurgus ligniperda*) or the Black Pine Bark Beetle (*Hylastes ater*) have been recorded.

Essigella californica
The Monterey Pine Aphid (*Essigella californica*) is now widely established throughout the pine growing areas of the state. Trees defoliated over the past two years have showed encouraging signs of refoliation as of summer 2000, especially in north-east Victoria, Latrobe Valley and Ballarat. Where the aphid has only arrived in the past year (south west Victoria), stands of *P. radiata* 15+ years-old are showing significant defoliation. In all areas where the aphid is present, ladybirds have been recorded in large numbers. In November 1999, Victoria assisted organising and hosting a workshop on the aphid, with over 40 government and private representatives attending. Proceedings from the workshop were produced and distributed.

Other pests
Some minor wingless grasshopper (*Phaulicridium vittatum*) damage was recorded in newly established Radiata Pine plantations in Gippsland.

Pests of eucalypt plantations

Psyllids

Low levels of psyllid damage (*Cardiaspin*a spp.) were recorded on *E. camaldulensis* plantations in the Shepparton irrigation region during summer 2000. Populations observed were not likely to warrant control measures being implemented, although subsequent activity levels have been monitored to ensure populations remain at low levels.

Mnesampela privata

Apart from isolated localised outbreaks causing low levels of defoliation, Autumn Gum Moth populations remain at predominantly trace to low levels across the eucalypt plantation estate in Victoria during 1999/2000. An outbreak in a trial planting of *E. globulus* in central Victoria required control spraying to be implemented to prevent significant damage occurring.

Chrysomelid leaf beetles

Low levels of damage by the leaf beetles *Chrysophtharta agricola* and *Paropsis* spp. were observed in *E. globulus* plantaions in East Gippsland and north-central Victoria. Damage however, was not widespread and tended to be confined to small sections of the plantation estate in the upper 50% of the tree crown. Control measures were not required to be implemented.

Perga spp.

Moderate levels of damage by the Steelblue sawfly (*Perga affinis affinis*) have been recorded in *E. globulus* plantations in the north central irrigation area. Damage tended to be confined to isolated and small groups of trees, with the upper 50% of the tree crown suffering the most defoliation. Control measures including spraying were implemented on some of these sites to prevent excessive defoliation and subsequent loss of growth occurring.

Phylacteophaga froggatti

Low levels of the leaf-blister sawfly (*Phylacteophaga froggatti)* were recorded on young juvenile foliage of *E. grandis* in northern Victoria. Most of the damage was restricted to the lower crown and therefore, no control measures were implemented.

Stem borers

Longicorn stem borers (*Phoracantha* spp.) were recorded in a small number of isolated *E. globulus* trees in south west Victoria

Uraba lugens

Minor Gumleaf Skeletoniser (*Uraba lugens*) damage was observed on *E. camaldulensis* in northern Victoria as well as in trees around Melbourne although no control measures were required to be implemented.

SCALE INSECTS

Low levels of Gumtree scale (*Eriococcus* spp.) were also observed on young *E. globulus* around Ballarat. No control measures were required.

Native Forest Research

Fire Effects Studies

Studies are being finalised into the effects of repeated fuel reduction burning on litter invertebrates in dry sclerophyll eucalypt forest in west-central Victoria. Work on the short-term effects over three years and the long-term effects over 10 years have been substantially completed. The results of this work are currently being published.

Cardiaspina bilobata

Observations of the population levels of the Mountain Ash Psyllid (*Cardiaspina biliobata*) are continuing with recently completed surveys showing the psyllid is currently at very low levels with only barely detectable levels of defoliation occurring.

Quarantine

Asian Gypsy Moth

Surveys have been conducted over summer 1999/2000 in the ports of Melbourne, Geelong and Westernport to detect Asian Gypsy Moth (*Lymantria dispar*), a major potential threat to the forest industry in Victoria. No moths were detected during the course of the survey work.

Bursaphelenchus

Extensive work has been conducted by Forest Pathologist Mr I.W.Smith (CFTT) surveying for the recently detected pest nematode *Bursaphelenchus hunanensis* in *Pinus* spp around Melbourne. A more detailed report of the works undertaken is contained within the Victorian state diseases situation report to SCF. As part of the nematode surveys, larvae of an *Arhopalus* species (possibly *rusticus*, ID courtesy John Bain NZ) were found in some dead pine also containing the nematode. This species may also be a new introduction to Australia. Overseas this beetle has been shown to carry *Bursaphelenchus*, however its habit of only attacking dead wood would suggest that it is not a main vector of the disease (John Bain, pers. comm.). Further investigations are continuing.

Extension Literature

A new updated eucalypt plantation note on the effects of defoliation on growth has been completed and is currently in the process of being placed on the Departmental website. A CD Rom listing major insect pests and diseases of Victoria including photos and detailed descriptive information is also under development.

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5 VICTORIA – DISEASES

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1. Plantations

1.1. *Pinus radiata and other species*

Bursaphelencus

An exotic *Bursaphelencus* was detected in wood samples taken from a dying *Pinus halapensis* in Williamstown, near the Melbourne docklands. The infested tree was removed and destroyed by burning. This was the first detection of this genus in Victoria. The *Bursaphelenchus* genus includes the Pine wood nematode (*B.xylophilus*) which causes rapid death of pine trees and other conifers in Japan, Southern China, Korea, Taiwan, United States, Canada and Portugal. *B. xylophilus* does not occur in Australia.

The species of nematode isolated from the tree was tentatively identified by CSIRO as *Bursaphelenchus hunanensis.* This species had previously only been recorded from China. It is not known whether this species is a primary or secondary pathogen of pines. Trials have commenced to ascertain pathogenicity of the nematode to pine species.

Symptoms first appeared with the needles turning yellow to brown in November and the tree died over a 4-6 week period. Symptoms in these trees were consistent with those described for *Bursaphelenchus* overseas including a rapid decline in tree health, little resin pressure in the tree and with the twigs becoming dry and brittle. Dead pines killed by the nematode tend to retain their needles for six to twelve months.

Ground and aerial surveys (followed by sampling and testing), have to date identified 21 trees (mainly *Pinus radiata*) to contain the nematode. So far the disease appears confined to mature pines, possibly under stress when infected (tops of ridges, earthworks, ring-barking, poison etc.). The distribution is widespread across Melbourne ranging from Werribee to the west, Wandin to the east, Mernda to the north and Arthurs Seat to the south. Three of the 21 trees have so far been destroyed with local council cooperation.

Bursaphelenchus species are normally transmitted from tree to tree by wood boring insects particularly Pine Sawyer Beetles. They are not known to occur in Australia. No evidence of longicorn beetle infestation was found in the dead pine at Williamstown, however some

minor bark beetle feeding was evident in branches at the top of the tree. Bark beetles have been shown to carry *Bursaphelenchus* species. The insects that are spreading this nematode in Australia are unknown at this stage. As part of the surveys, larvae of an *Arhopalus* species (possibly *rusticus*, ID courtesy John Bain NZ) was found in some dead pine also containing the nematode. This species may also be a new introduction to Australia. Overseas this beetle has been known to carry *Bursaphelenchus*, however its habit of only attacking dead wood would suggest that it is not a main vector of the disease (John Bain, pers. comm.).

Surveys are continuing to follow up reports of dying trees. An eradication program is being proposed by Forest Health Committee to Standing Committee of Forestry for consideration.

Dothistroma

Routine surveys undertaken in October 1999 for levels of *Dothistroma septospora* continued to show low levels of disease, and no spray programs were conducted in the State for 1999/2000.

Other

Southern Victoria and in particular the Western District, are still being affected by rainfall deficiencies. Diplodia in association with drought, is causing dead topping and death of trees in South-west Victoria.

1.4. Eucalypts

Due to the dry conditions through 1999/2000, very few foliage diseases were reported from eucalypt plantations in Victoria.

Trials evaluating pruning wounds on *E.globulus* and *E.grandis* are continuing.

Alcoholic flux first reported in March 1998 on the stems of 3/4 year-old *Eucalyptus nitens*, was again observed in April-June 2000 in plantations in north-east and south west Victoria. No further work to elucidate this 'disease' has been undertaken over this year.

2. Managed natural forests

2.1. *Eucalypts*

Few diseases were reported from native forest. A study has commenced on the possible toxic effect of eucalypt bark on eucalypt seedling regeneration.

3. Nurseries

3.1. Conifer

Monitoring of nurseries for *Phytophthora cinnamomi* remains a high priority so as to reduce the further spread of disease. Trials continued to evaluate the use of *Trichoderma* to control nursery diseases, and the influence of salt in predisposing seedlings to attack by *P. cinnamomi*. A scorching of the tops of cuttings/seedlings was investigated but no cause of damage could be ascertained. High levels of soil nematodes have also caused problems in one nursery and action was taken to alleviate these problems.

3.2. Eucalypt

Few problems were reported from nurseries.

4. Native Plant Communities

Studies into dieback within isolated stands of native forest have again shown no evidence of fungal pathogens as the primary cause of the symptoms. As in previous studies on this problem, Bell Miner/Psyllid interactions probably contributed to the dieback. *Armillaria*

luteobubalina continues to be a problem within Parks of the Dandenong Ranges creating hazardous trees to tourists and residents of the area.

Mundulla Yellows continue to be of concern in northwest Victoria and across the border into South Australia. Work is continuing at the Waite in Adelaide to identify the phytoplasmid associated with the symptoms.

5. Urban

Surveys for Dutch Elm Disease were undertaken in the main gardens and boulevards around the City of Melbourne. Symptoms resembling DED were attributed to ringbarking of branches by possums and elm bark beetles. The fungus could not be isolated from wood. A draft contingency plan for the disease has been developed to enable a rapid response to the disease should it enter Australia. The plan was tested in Melbourne in June 2000 and is being modified to encompass experience learnt from the trial.

Cypress canker was identified from dieback of Cypress shelterbelts from several locations in Victoria.

Endothiella and *Botryosphaeria* sp. were isolated from twig and trunk cankers respectively, from a drought affected historic *Eucalyptus ficifolia* in Western Victoria.

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6 TASMANIA – PESTS

Dick Bashford
Forestry Tasmania
16/08/2000

PLANTATIONS

Pinus radiata

Sirex Wood Wasp (*Sirex noctilio*)

In the past year *Sirex* has been located at two sites. One a private 5ha planting (1980) in the NE where approximately 10% of trees were either dead from previous years or current attack trees (2%). The other site at Beulah yielded three current attack trees. All trees were tested for *Deladenus* nematodes (negative- and now five years since nematodes were last recovered in Tasmania) and for other exotic nematodes (*Bursaphelenchus*). Surveys will not be conducted this winter except for monitoring of two 100-tree plots established at Tower Hill and Branchs Creek at the request of Rayonier who now manage the softwood joint venture. In the future there will be greater reliance on the forest health surveys to pick up *Sirex* attacked trees.

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

Other Bark Beetle Species
Some minor damage to newly planted seedlings detected in three NW plantations caused by *Hylastes ater* but replanting not necessary.

Monterey Pine Aphid (*Essigella californica*)

Sandra Hetherington (Fletcher Challenge) reported two sites in the southern Tasmanian planting's to be carrying high populations of an aphid in late summer. Specimens were forwarded to
Mary Carver (ANIC) who confirmed the identity of *Essigella californica*. One of the sites, a seed orchard, was sprayed with a synthetic pyrethroid and good control obtained. Damage levels of up to 50% needle loss was observed at both sites.
Attendance at the *Essigella* workshop provided valuable resource material for monitoring and recognition of symptoms.

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

Other Pests of *Pinus radiata*.
*Plague populations of the wingless grasshopper, *Phaulacridium vittatum*, caused severe defoliation to many shelterbelt and farm planting's of *P. radiata* throughout the central midlands during severe drought conditions in autumn. Shelterbelt pines up to 15m in height were totally defoliated but adjacent older trees suffered little damage. Blocks of planted trees suffered edge effect defoliation. This is the first time widespread defoliation of pines caused by grasshoppers has occurred in Tasmania and appears to be directly linked to severe drought conditions resulting in lack of pasture feed.

*Individual young trees (aged 2-4 years) of *Pinus radiata* at several sites were severely defoliated by larval feeding of the painted apple moth, *Teia anartoides*.

*The pine aphid, *Pineus laevis*, was observed affecting the shoots of drought stressed young trees, on the edges of several NE blocks, causing a stunted appearance.

*Adult weevils of *Scotasmus carnirostris* caused severe defoliation to a small number of young trees (1995) at a pasture site in the Plenty Valley.

Eucalyptus species.

Psyllids.
The blue gum psyllid, *Ctenarytaina eucalypti*, was present in most *E. globulus* and *E. nitens* planting's but caused little damage.

Autumn Gum Moth (*Mnesampela privata*)
There were no high population level recorded in any State plantation.
Several private planting's of *E. nitens*, in the NW, managed by Forest Enterprises, suffered severe defoliation where the outbreaks were not detected until late instar larvae were present. Other early detections were sprayed using synthetic pyrethroids resulting in good control and little damage.
The Camalco *E. globulus* planting's at Bell Bay had high defoliation levels in late winter last year. Despite moths emerging at those sites from mid November 1999 continuously until late February 2000 very few eggs were laid and no recordable defoliation occurred. There was no 'autumn' emergence.

Leaf beetles.
Routine monitoring of 109 coupes of *E. nitens* and *E. globulus* was conducted during the summer. Nine control operations against *Chrysophtharta bimaculata* were successfully

conducted. Research spray trials were conducted on populations of *C. bimaculata* and *C. agricola* to test alternatives to synthetic pyrethroids. Late season defoliation by adult beetles continues to be a problem.

Sawflies (*Perga* spp.)

Some woodlot planting's again suffered severe defoliation by *Perga affinis insularis* particularly throughout the Midlands. At some sites three seasons of severe defoliation pressure has resulted in the death of some trees and stunted crowns in many others. Most of these sites have larvae feeding now so an increase in mortality levels is expected.
Sawflies have not been a problem to date in State plantations.

Stem borers

A few trees, on the edges of plantations aged older than 10 years, have been found killed by the cerambycid *Phoracantha mastersi*. Both *E. nitens* and *E. globulus* are attacked. *P mastersi* is mainly a problem of farm woodlots and areas where trees may be drought stressed.

Frequently associated with cerambycid attack is horizontal cambial tunnelling by weevil larva of *Pelororhinus transversus*. Many species of smooth barked eucalypts carry the characteristic banding on trees of +15cm diameter. Cracking of the bark and emergence holes provides sites for subsequent *Phoracantha* oviposition.

Axil boring by the cossid *Culama australis* is common in 1-2year old *E. nitens* planting's but mortality of larvae seems very high and only a few develop to cause large tunnels.

Aenetus lignivorus is an occasional detection, which may have serious implications for later development of stem decay.

Other Pests of Eucalypt Plantations

*In the north of the State some trees in several young plantations of *E. nitens* with juvenile foliage had progressive leaf loss from the inner crown outwards associated with heavy infestation of the gum tree scale, *Eriococcus coriaceous*. Patches of up to 10 trees affected. Stems and branches densely encrusted with mature scale. The worst trees losing three-quarters of the crown. Appears to be associated with a local site condition.

*In some areas of the State damage by scarabs (*Heteronyx* complex) to eucalypt seedlings has been severe, as has adult browsing. This has not been a problem in any State plantation.

*The European wasp *Vespula germanica* continues to be continually reported by forestry workers as a nuisance and disrupting work. The English wasp, *Vespula vulgaris*, is now wide spread though the wet southern forests and causing the same problems.

MANAGED NATURAL FORESTS

Eucalyptus species

*Areas of the mature *E. delegatensis* forests in the central highlands suffered from attack by the psyllid *Cardiaspina* sp. causing premature leaf senescence. These occasional outbreaks usually decline in subsequent years as parasitoid populations develop.

* One of the criteria for selection of young native forest stands being reviewed for thinning is an assessment of stem damage due to insect borers. A guild of cerambycids and cossid moths are responsible of severe stem damage and early tree death in dense stands. Last year three coupes were deferred from commercial thinning due to high stem damage.

Nurseries

Routine monitoring of both *Pinus* and *Eucalyptus* growth areas did not reveal any problems.

Quarantine

Pests

Monitoring of five Tasmanian ports and surrounds was conducted for Asian Gypsy Moth between October and March. AGM was not trapped.

Research and Development

Pests

*The research program has largely been aimed at the development of alternate insecticides to synthetic pyrethroids for the control of chrysomelids and autumn gum moth in eucalypt plantations.

*Further refinements to the IPM system for leaf beetles has resulted in the release of a technical bulletin. 'Manual for managing leaf beetle defoliation in eucalypt plantations' and release of 'Farm Forestry Toolbox' containing economic analysis thresholds for leaf beetle control.

* Artificial defoliation trials of *E. nitens* to determine potential impact of *Chrysophtharta agricola* and *Mnesampela privata* on growth are planned for the coming summer.

7 TASMANIA – PESTS (CONTINUED)

Andrew Walsh

Forestry Tasmania

Plantations

Pinus radiata (and other temperate pines)

Other Pests of Pine

Stem stripping by wallabies affected approximately 230 ha of 3-year-old *P. radiata* in northern Tasmania. The problem was most prevalent in the steep, weedy compartments in Springfield Block where 57% of trees were affected. Most (98%) of the affected trees had only been partially stripped and the only sign of adverse effect was a slight yellowing of the foliage.

Top death following ringbarking by brushtail possums continues to be a problem in localised areas in high altitude plantations south of Burnie and plantations in the Tyenna Valley and middle reaches of the Derwent Valley.

Eucalyptus species

Other Pests of Eucalypt Plantations

Damage of young plantations by browsing mammals continues to be a major problem in Tasmania. Properly done, poisoning with 1080 gives sufficient protection to allow young

seedlings to escape the risk of severe browsing. However, appreciable areas do still suffer significant damage. Approximately 100 ha of eucalypt plantation established by Forestry Tasmania in 1998 had poor survival (<50% stocked) because of excessive browsing in combination with adverse site conditions (poor drainage and weed competition). In addition, a substantial proportion of about 140 ha of 1998 *E. globulus* on the West Coast was replanted because of excessive damage by browsing mammals.

8 TASMANIA – PESTS (CONCLUDED)

David de Little
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Autumn Gum Moth (*Mnesampela privata*) *E. globulus* plantations at Ridgley and Woolnorth had high populations of AMG causing considerable defoliation. In these areas AGM appeared much earlier in the season than normal. A combination of the earlier than normal season and poor weather conditions resulted in spraying being done too late and many of the 1st generation larvae had already pupated. A second spray operation was required around Easter to control the 2nd generation AGM population.

Leaf beetles *C. agricola* scattered throughout young *E. nitens* plantations in the northwest. Some areas required spraying.
Cadmus australis caused quite heavy defoliation of young *E. nitens* in the Surrey Hills area. Worst affected plantations required spraying in February.
Sawflies (*Perga* spp.)

Christmas Beetles *Anoplognathus* sp. was found attacking a young *E. nitens* plantation in the Buckland area (southeastern Tasmania). Although damage was not significant this represents the first time *Anoplognathus* has been found causing damage to plantation eucalypts in Tasmania.
Heteronyx continues to be a significant problem of young E. nitens plantations in the Surrey Hills area. At least three plantations failed because of heavy damage.

Uraba lugens caused severe defoliation of 7-9 year-old *E. nitens* plantations in the Birralee area (West Tamar). Up to 100 ha was heavily defoliated resulting in some moratality. Spraying is to be done in the near future as appreciable egg populations are currently present.

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9 TASMANIA – DISEASES

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Plantations

Pinus radiata (and other temperate pines)

Diseases

Foliage

Spring needle cast (SNC) remains the major foliar disease problem in Tasmania. Higher altitude plantations in the northeast that have suffered high levels of SNC are progressively being converted to *E. nitens* after harvesting.

Dothistroma septospora was again at very low levels during the year. Health status surveys of 3-year-old plantations assessed a total incidence of only 0.95%, three-quarters of which was trace infection.

No other major foliage disease problems were found this year. *Cladosporium* sp. and *Pestalotiopsis* sp. near *P. persea* were isolated from drooping needles (needle base infection) on the apical shoot from localised area in a compartment at Springfield (northeastern Tasmania). However, these fungi were considered to be secondary infections of stressed trees (poor drainage).

Shoots and stems (including Diplodia dieback)

A 10-year-old (approx.) plantation in the Plenty Valley area of southern Tasmania suffered extensive top death following *Sphaeropsis sapinea* infection. Approximately 10% of trees were affected, ranging in severity from the terminal metre killed through to death of the whole above-ground portion of the tree. The affected compartment has a history of boron deficiency and it is thought the combination of this with the record drought during the past 12 months triggered the outbreak. *S. sapinea* infection was very rare in 3-year-old plantations targetted for detailed health status survey and only two trees with top death due to the pathogen were found in the 3,000 ha (approx.) inspected.

The stem gall problem detected last year remains undiagnosed. No further affected plants were found during the year. Three affected plants were removed form the field and transferred to the glasshouse in an attempt to accelerate development of the gall. Unfortunately the trees failed to survive the transplant shock and all had died within 6 months.

Roots (including Armillaria root disease)

No dead or dying trees due to *Armillaria* were detected in health status surveys of 3-year-old plantations.

Environmental

Severe drought affected a diagonal strip from the central north-west coast to the south-east of the State. This was manifested as dead tops of trees growing on moderate slopes in several older plantations in drier areas east of Devonport. Generally affected trees were scattered at a low incidence (<1%). However, in the worst affected area (Branch's Creek Block) approximately 10-20% of trees in several patches of 1-2 ha had dead tops.

Scattered shoot blight of lateral branches affected patches of trees in older plantations in the Lisle – Springfield area. It is suspected that the problem is the result of hail damage (with subsequent *Sphaeropsis* infection). However, this diagnosis has yet to be confirmed. While a large area was affected, the severity of damage was low and negligible adverse impacts are expected.

Eucalyptus species

Site Related Eucalypt Plantation Problems

Poor form (forks and kinks) was a problem in young (18 month-old) *E. nitens* plantations established on very exposed sites at high altitude (>750-800 metres) in the northeast. Breakage or death of the apical shoot is has resulted in the poor form and it is thought

that wind damage (rather than possum damage or cold) is the likely cause. In the worst affected areas between 30-50% of trees had stem forks rendering the areas unsuitable to manage for sawlogs.

Marginal leaf reddening and scorch, suspected to be due to frost damage, affected a substantial number of trees at the margins of grassy plains in a 2-year-old *E. nitens* plantation near Deloraine. Although the worst affected trees suffered appreciable leaf loss (50% crown) negligible adverse impact is expected.

Diseases

Foliage (including *Cylindrocladium*, *Mycosphaerella*, and other leaf spot fungi)

Mycosphaerella (mainly *M. cryptica*) leaf infection affected 15% of the 3-year-old (1996 planting) *E. nitens* and 2% of the 18-month-old (1998 planting) *E. globulus* plantations. *Mycosphaerella* infection was very rare (<0.1%) in the 18-month-old *E. nitens* plantations. In more than 90% of affected trees the infection levels were very low (trace-<25% crown infection) and unlikely to have economic impacts. A 2-year-old *E. globulus* plantation in the Circular Head area suffered heavy bottom-up defoliation (50-70% crown infection) by *M. nubilosa* and *M. cryptica*. This outbreak occurred despite below average summer rainfall and was likely the result of a dense woody weed understorey in the compartment. A young *E. globulus* plantation in the West Tamar area suffered heavy infection by *M. cryptica*. No obvious reason for this outbreak could be identifed.

Defoliation of *E. nitens* in the Hampshire – Surrey Hills area associated with infection by *E. tasmaniensis,* was less severe this year in comparison with previous 2-3 years.

Kirramyces eucalypti leaf infection was only recorded from the Circular Head area during the past 12 months. Infection was much more prevalent in 3-year-old *E. nitens* (20% trees) than 18-month-old trees (<0.1% of trees) but severity was generally low (trace-25% crown infection).

Shoots (including Ramularia shoot blight)

Apical and lateral shoot blight, mainly due to infection by *Botrytis cinerea,* affected 0.7% and 0.4% of 18-month-old (1998 planting) *E. globulus* and *E. nitens* respectively. The problem was concentrated in *E. globulus* plantations in moist situations in the Circular Head and Tasman Peninsula areas.

Stems (including canker diseases and bacterial wilt)

Botryosphaera dothidea was associated with top death of previously vigorous 2-year-old *E. nitens*. Two plantations in the Deloraine – Cressy area were affected. At the Cressy site affected trees were scattered through the plantation at an incidence of about 5%, while at Deloraine the incidence was much lower (<0.1%). It is thought that drought conditions experience during the past year was a predisposing factor.

Roots

Mortality due to root and collar rot by *Phytophthora cinnamomi* occurred in two *E. nitens* plantations in the northeast this autumn. In one, a 2-year-old plantation near Pipers River, scattered mortality (totalling approx. 10%) occurred throughout an area of more than 40 ha. Mortality appeared to occur equally on both flat and moderately sloped areas of the plantation. The other, a 1-year-old plantation on a steep site north of Fingal had a low incidence of scattered mortality (1-5%) throughout. This outbreak was unexpected given the steep, seemingly well-drained site. Seasonal weather conditions of high

summer rainfall followed by an autumn drought may have contributed to these outbreaks.

The *Cryptosporiopsis* sp root rot disease detected in several *E. nitens* plantations 2 years ago has continued to develop at one site (Western Creek) with mortality increasing by a further 5%. Aerial inspection of the other two sites indicated the problem had stabilised with little new mortality over the past 12 months.

Armillaria (probably *A.luteobubalina*) caused significant mortality in a 3-year-old *E. nitens* plantation on a steep, well-drained site at Kamena (near Burnie). Mortality was occurring in patches and approximately 10% of the initial stocking had been killed.

Environmental

Despite record drought in the south-east damage was limited. The only report of mortality was in an *E. nitens* plantation at Clifton Vale (southern Midlands). Scattered trees in a 2-year-old *E. nitens* plantation near Geeveston suffered severe leaf scorch. Poor root development (limited and shallow) of affected trees combined with the drought was thought responsible.

Managed natural forests

Eucalyptus species

Diseases (including jarrah dieback, Armillaria root disease)

Extensive drought deaths of, mainly, *E. viminalis* occurred this autumn in a number of areas in the lower Derwent Valley. A small number of drought deaths of eucalypts also occurred in native forests east of Devonport.

Nurseries

Conifer species

Diseases

Phytophthora cinnamomi root rot caused localised losses of *P. radiata* seedlings in two nurseries. Treatment with Ridomil contained the outbreaks and extensive isolation attempts fail to detect the pathogen on symptomless seedlings in the near vicinity of affected plants.

Sphaeropsis sapinea caused scattered top deaths of *P. radiata* seedlings at Perth nursery. The crop was topped and affected plants tended to be below topping height suggesting that wounding during topping may have allowed infection.

Eucalyptus species

Diseases

Botrytis cinerea caused low-moderate damage in an early season batch of containerised *E. nitens* seedlings at Perth Nursery. Despite conditions for managing *B. cinerea* in the nursery being difficult this year, because of overcrowding, further losses were minor.

Urban and rural

Diseases (including Mundulla Yellows disorder)

Two *Eucalyptus sideroxylon* street trees in Hobart with symptoms resembling Mundulla Yellows (strong leaf chlorosis and slow decline) are being monitored. A sample was sent to Adelaide to test for phytoplasmas but results have yet to be received.

Quarantine

Diseases

Nematodes were recovered from the roots of one, recently dead tree (in a small patch of dead and dying trees in a ca. 20-year-old plantation). The nematodes have been forwarded to CSIRO for identification but results have yet to be received.

Forest health surveillance and diagnosis

North Forest Product's program of surveillance was curtailed this year because of conflicting demands and only about 1400 ha were inspected.

Intensive health status surveys (plot-based ground survey) were done in about 4000 ha of 18-month-old and 3-year-old *E. globulus* and *E. nitens* plantations and about 2000 ha of 3-year-old *P. radiata* plantation during the past year. Helicopter detection surveys were done in the remainder of Forestry Tasmania's plantation estate. A backlog of pathology diagnoses of problems detect in Forestry Tasmania's health surveys has developed over the past 12 months. To relieve some of the pressure on pathology diagnosis one of the Forest Health Officers will assist the pathologist in the laboratory this year.

A considerable amount of effort was spent during the year in integrating the health status survey of 18-month-old eucalypt plantations with silvicultural prescriptions. As a consequence the health status survey now includes an estimate of potential productivity as well as health and damage measures. The health status survey has become a key decision tool to identify and schedule appropriate silvicultural treatments as well as identifying areas needing remedial treatments such as secondary fertilising. A trial has also commenced to examine the effect of variability within eucalypt plantations on the reliability and accuracy of the results from health status surveys.

Forestry Tasmania extended the appointment of it's two Forest Health Officers (Karl Wotherspoon and Robyn Doyle) for a further 3-5 years.

Research and development

Diseases

The main focus has been in the analysis and writing-up of the stem decay research done over the past 7 years. A report of the effect of stem decay in regrowth eucalypt sawlogs on the grade recovery of sawn boards was completed. The results of this sawmill study were applied to a sample of dissected trees measured for decay in an attempt to simulate the consequence of varying allowable log end-defect specifications on future sawlog yields. Sensitivity analysis showed that a tightening of allowable end defect specifications by more than 60% of current standards resulted in a sharp reduction in future sawlog yields. The reduction in sawlog yields following a tightening of end defect specifications (recommended for recovery of appearance products) would be concentrated mainly in the trees of the larger diameter classes.

The project testing alternative criteria to identify severely decayed trees was completed during the year. Preliminary results indicate that only a modest (10%) improvement in the selective identification of severely decayed trees for culling was achieved with the modified selection criteria. The majority of the gains in reducing the proportion of severely decayed trees after thinning seem likely to be made by the consistent application of the existing selection criteria.

Analysis to find site and stand factors associated with stem decay identified that pure *E. obliqua* forests growing in lowland areas (<300 m) had a significantly levels of decay than other forest types. In addition, *E. obliqua* growing in mixed stands with *E. regnans* had significantly less decay that *E. obliqua* in pure stands. It was not possible to determine whether the higher levels of decay in pure *E. obliqua* forests were related to site or to genotype. This issue is of some consequence because plantation development on sites previously carrying pure *E. obliqua* forests may be prone to a greater decay risk if the higher decay risk is a site-related effect.

Stocking was shown to affect decay levels by affecting the number of decay columns establishing within trees: trees in areas with lower stocking (<1000 sph at age 30) had more decay columns than trees in better stocked areas (>1500 sph). However, this result was confounded by species such that *E. obliqua* forests were over-represented in the lower stocking sample while *E. delegatensis* was over-represented in the well stocked sample. As a result it was not possible to conclude that the effect of stocking on the number of columns was due to stocking rather than a species effect..

10 TASMANIA – DISEASES (CONCLUDED)

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Forest Health Group, Hobart: for 'Bark" June 2000

Eucalyptus nitens and *E. globulus* are species preferred for plantation in Tasmania and pruning is required to produce high quality sawlogs. However, the incidence of stem decay associated with pruned trees is high compared to unpruned trees. The ability of the tree to restrict stem decay will determine the extent of decay and consequential effect on wood quality at harvest. A full understanding of antimicrobial defence mechanisms in sapwood and environmental influences on defence expression is vital. A reaction zone is a 'line of defence' formed at the interface between healthy sapwood and decayed tissue in trees. The long-term effectiveness of a reaction zone as a barrier to decay in pruned eucalypts is unknown. Clear comparison and understanding of the characteristics of healthy sapwood, reaction zones and decayed tissue in *E. nitens* and *E. globulus* permit an experimental investigation of factors influencing the defence response. The role of water in initial and late stages of defence, levels of host nitrogen and photosynthesis are being investigated in collaboration with the Sustainable Management Program within the CRC for Sustainable Production Forestry. Management strategies (site selection, fertilizer application, pruning severity and timing) that avoid decay infection and retard development are the end-product of this goal.

Studies of very early stages of RZ development were conducted using a model of 1 year pot-grown *E. nitens* and the decay fungus *Ganoderma adspersum*. Changes in water and phenol content associated with a period of hours to days after wounding and fungal inoculation have been characterized. This early stage response is now being investigated in the field in artificial inoculations with fungi carried out at different times of the year. The morphology, anatomy, biochemistry and wood properties of the reaction zone (RZ) associated with decay from naturally infected pruning wounds in 4-6 year old *E. nitens* have been described. This zone is blue-purple in colour and occasionally associated with a white zone at the reaction zone/healthy sapwood interface. It has been characterized as markedly drier than healthy sapwood, with significantly lower levels of potassium, increased total phenols levels and a lower pH than both sapwood and decayed heartwood. A number of hydrolysable tannins are the major compounds induced in the RZ including pedunculagin, tellimagrandin I and tetra-galloyl-glucose. Other phenols of low molecular weight including ellagic acid, gallic acid and catechin have been identified. Bioassays indicate that compounds in the RZ are antifungal. A log incubation experiment over 9 months has shown that the reaction zone is durable against decay.

Molecular techniques to aid in the detection of fungal decay pathogens in living eucalypt plantation trees are being developed. Without recourse to more rapid molecular techniques, identification of wood-inhabiting fungi is totally dependent on erratic fruit body formation or the very tedious, lengthy and taxonomically difficult and subjective procedure of identifying mycelia isolated from wood. Fruitbody formation is unlikely in the plantation situation. Although research is investigating the initial defence response of eucalypt to fungal challenge - the identity or frequency of different wood decay fungi in eucalypt plantations in Tasmania is not known. The defence response of plantation eucalypts to fungi most common in the plantation situation must be tested. Questions important to developing management strategies must be answered. Are many different or a limited number of fungi responsible for decay? How does site influence fungal ecology and decay risk? Identity will give an indication of aggressiveness and the likely spread over time of decay infection initiated at pruning into clearwood.

The formation of kino veins and/or pockets are a characteristic defect associated with fast growing eucalypts. Kino veins are considered to be a macroscopic barrier zone produced by the cambium, however, kino defect can be a significant cause of degrade. Initial research has developed a model system for kino induction in *E. nitens*, *E. globulus* and *E. obliqua*. The anatomical and histochemical

properties of barrier zone formation induced by cambium damage in *E. nitens* and *E. globulus* are being described and the chemical composition of kino in *E. nitens* and *E. globulus* established. Current research will provide the basis for assessing the impact to the solid wood plantation industry of kino defect and determining silvicultural practices that could be employed to reduce the incidence of this defect.

Wood decaying fungi in living trees are an initial stage to the recycling of debris on forest floor. The influence of woody debris type (log size) on the biodiversity of fungal/invertebrate assemblages is under experimental investigation. Information will indicate the ecological sustainability of future prescriptions relating to the retention of regrowth logs.

The genus *Mycosphaerella* contains many pathogens capable of causing a severe impact on the growth of susceptible eucalypt species. *Mycosphaerella* defoliation events in native and regrowth eucalypts have been associated with wet and humid conditions frequent in Tasmania. Plantation eucalypts pruned and thinned for solid wood will be precariously vulnerable to any such defoliation. Severe attack at 2 or 3 years would retard growth sufficiently to adversely delay and even exclude pruning. A total of 36 plantation and 5 natural stand sites of *E. globulus* and *E. nitens* have been sampled. Five *Mycosphaerella* species and three species from *Mycosphaerella* anamorph genera have been isolated and identified from plantations in Tasmania; *M. nubilosa*, *M. cryptica*, *M. tasmaniensis*, *M. grandis*, *M. nubilosa*, *Sonderhenia eucalyptorum* and *M. vespa*, *Coniothyrium ovatum* and *Sonderhenia eucalypticola*. *M. cryptica* and *M. nubilosa* were the most frequently isolated species from plantations and found to have the highest frequency of severe infections. These two species are determined to have the greatest impact on juvenile eucalypt plantations in Tasmania. The internal transcribed spacer region of the ribosomal DNA has been sequenced for all the Tasmanian *Mycosphaerella* species. Additional isolates from geographically distinct populations have been obtained and sequenced for comparison with the Tasmanian populations. The results of the molecular analysis support the morphological classification of species. A disease assessment technique was developed for screening resistance in recent field epidemics. Analyses of field data within the Genetic Improvement Program indicate a clear genetic basis to observed resistance. Initial results in Tasmania with studies of populations of *M. cryptica* on *E. globulus* suggest a surprisingly low level of diversity within fungal populations. Most significantly, preliminary molecular and phenotypic data support the existence of only 2-3 fungal genotypes or races present at a trial site of resistant and susceptible *E. globulus*. *M. cryptica* genotypes appear closely linked to plant resistant levels. A fast growing genotype is isolated from both resistant and susceptible plants but with much greater frequency from susceptible plants. The slow growing genotypes almost exclusively isolated from resistant plants. One of the problems to the above approach is the need for a reliable bioassay (a controlled artificial inoculation technique of young potted plants) to enable screening for resistance that does not rely on the natural infection of genetic trials or the use of inoculum collected from diseased leaves in the field. Both *M. cryptica* and *M. nubilosa* are reluctant to produce the infective spore (ascospore) in culture. Young plants have been successfully inoculated with mycelium but this is not ideal and does not mimic natural infection. Colleagues at Wellesbourne in the UK have successfully cultured ascospores of *M. brassicicola*. These colleagues are currently applying their cultural technique to isolates of *M. cryptica*, *M. nubilosa* and *M. tasmaniensis* using eucalypt leaves from *E. nitens* grown in the UK. Ascospore formation in culture and the ability to artificially infect leaves with Mycosphaerella will also open the way to infection biology and controlled epidemiological studies.

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11 SOUTH AUSTRALIA – PESTS

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Plantations

Pinus radiata:

Sirex: Observation flights in the South East were carried out in late May 2000. Results showed *Sirex* to be relatively inactive. In areas where previously tree deaths had been high, no deaths were attributed to *Sirex*.

Nematode inoculations are continuing despite the low numbers of *Sirex*. 10 million nematodes have been ordered for this year for the South East Region and 25 million for the Central and Northern Regions. Live *Sirex* were found by contractors at Mt Burr in the South East but on dissection of these insects no nematodes were found. The situation in the South East is one where localised populations build up spasmodically as plantations become susceptible. As soon as these locations are identified, the ongoing inoculation program is focussed on them.

The trap tree program is continuing. Some *Megharyssa* have emerged and will be used in the breeding/release program.

Ips: There have been no reports of damage by *Ips*. However *Ips* have been present in *Sphaeropsis* affected trees.

Other Bark Beetles: In September 1999 several small beetles were found in a *Pinus radiata* plantation near Casterton in Victoria. Adult beetles were found under the bark of living trees infested with *Ips grandicollis*. The beetles were identified as *Corticeus praetermissus* (Fall) (Coleoptera: Tenebrionidae). This is the first record of these beetles in Australia (ANIC, CSIRO, Canberra). It is a North American species and is thought to feed on the fungus associated with *Ips*. It possibly originally came into Australia with *Ips*. AQIS, members of RWG 8 and other forest agencies were duly informed. It is not considered to be a threat to pine plantations.

Monterey Pine Aphid (*Essigella*): This aphid is now widespread throughout the pine growing areas of the state. Aphid numbers were high again this year but defoliation levels were low. Most of the northern plantations showed little sign of aphids even though aphid numbers were quite high. Numbers were higher in southern plantations but damage levels remained low.

Areas that were badly damaged last season have recovered and show little or no damage this season. Possibly the high levels of damage last season were not due solely to the aphid.

In all areas ladybirds have been present this year in huge numbers. Perhaps this is biological control at work!

Eucalypts:

Autumn Gum Moth: Autumn Gum Moth continues to be the major insect pest of eucalypts in this region – mainly in 2-3 year old trees. Numbers this season have been low so far but a few plantations have been sprayed.

Chrysomelid Beetles: These are present in most plantations but have caused little damage.

Sawflies: Sawflies are widespread but not always in large numbers. Spraying is occasionally necessary in some plantations.

Scale Insects: There have been some outbreaks of scale insects in the last year in several plantations. Control is difficult and in most cases trees were left untreated and the scale eventually disappeared though the associated sooty mould will remain for some time.

Nurseries

Pines:

An outbreak of *Essigella* in the nursery at Glencoe in stool beds was controlled by spraying.

Forest Health Surveillance and Diagnosis

Monitoring for Essigella has been carried out since September 1999 on a monthly basis (fortnightly when numbers were large) using the protocols developed by Debbie Kent in NSW. Results have been sent to Nick Collett for comparison with results from monitoring in Victoria.

Several meetings have been held with forest growers in the Green Triangle Region and others to discuss the impact of *Essigella* and to discuss what action, if any, needs to be taken regarding research into control of this insect. Discussions are continuing.

A Forest Health Monitoring Kit has been developed to assist ForestrySA staff in:

- Identification of insect pests and diseases
- Sampling / monitoring of plantations
- Interpreting results of sampling
- Making decisions regarding control

The aim of the kit is to encourage people to monitor their plantations before going ahead and spraying regardless of the numbers/stages etc of insects present. The kit consists of a series of fact sheets and sampling sheets for different insects.

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12 SOUTH AUSTRALIA – DISEASES

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Plantations

Pinus radiata:

Sphaeropsis pinea (*Diplodia pinea*). Although this disease is endemic to the area it is rarely seen. This year, probably due to the severe lack of rain over several years, an outbreak occurred in plantations at Mt Burr and Mt Gambier in the South East Region. The most severe outbreaks were in the Myora and Caroline plantations where large numbers of trees (21-37 years old) died. Symptoms were similar to Sirex attack but on further examination and sectioning of the trees extensive areas of bluestain were found. Samples sent to the CFTT in Melbourne identified the cause as *Sphaeropsis pinea*.

Eucalypts: *Mycosphaerella* is present in many plantations but is causing no problems.

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13 WESTERN AUSTRALIA – PESTS

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PLANTATIONS

Pinus radiata
Sirex: In 1999–2000 only two Sirex trapping sites had been installed. These sites were assessed and found free of Sirex. Due to the limited number of trap sites visual assessment of stands for Sirex evidence was undertaken whilst other work was done. No evidence of Sirex was found during these patrols. In November 2000 it is intended to establish a larger number of monitoring plots. These will be strategically placed near larger road transport routes such as the Great Eastern Highway, South West Highway and Old Coast Road taking a range of stand ages into account. (S. Ward)

***Ips grandicollis*:** Due to a dry autumn the incidence of attack increased in some plantations, particularly in 3-6 year old trees on second rotation sites in the Blackwood Valley. (M. Mitchell, JF)

Monterey Pine Aphid: The presence of *Essigella californica* in Western Australia was confirmed on 27 June 2000. A rapid survey of most pine plantations in the south west, confirmed the aphid was present throughout the pine growing regions with significant defoliation occurring in the Blackwood Valley, where the aphid was first found. The aphid has also been found on *Pinus pinaster*, however at present damage does not seem to be severe on this species. Some tip defoliation has been observed on *P. pinaster* but whether this is caused by *E. californica* has yet to be determined. An information pamphlet was produced outlining fundamental information on the aphid for plantation managers. A monitoring program for *E. californica* has been proposed and includes sampling for aphid predators. Monitoring is expected to start in spring this year. (JF)

***Bursaphelenchus hunanesis*:** Pine samples of dead and dying pines plus those where nematodes were observed were collected from WA pine plantations and forwarded to WA AQIS for extraction prior to species verification by CSIRO (Canberra). To date the nematodes observed in the WA pine samples were identified as a spear bearing nematode of the genera *Bursaphelenchus/Aphelenchoides* and are different from those found in the Victorian samples. (JF, M.Hodda).

Eucalyptus globulus (A. Loch, J. Matthiessen, CSIRO)
A CRC collaborative project, jointly funded through CSIRO, CALM and private industry is examining the insect fauna associated with blue gum plantations in Western Australia. Also CSIRO is funding a study into scarab defoliators such as 'spring beetle' and African black beetle. The Eucalyptus weevil, *Gonipterus scutellatus* emerged as the most significant insect pest of *Eucalyptus globulus* plantations two years and older. *Mnesampela privata* (AGM) has not been a significant pest during 2000. One 1999 planting is heavily infested with AGM near the Porongurup Ranges, and an exclusion trial has been established there to quantify the impact of defoliation on tree growth. Several 1-2 year old plantations in the Albany area have up to 50% damage to juvenile foliage as a result of leafblister sawfly (*Pylacteophaga froggatti*). Exclusion trials are in place to assess the economic impact of this species. Several species of paropsine

chrysomelids (mainly *Chrysophtharta* and *Paropsis* spp.) caused defoliation to plantations over the summer but were not as serious as eucalyptus weevil. The cryptocephaline *Cadmus excrementarius* caused extensive defoliation to trees even as young as 6 months during summer, but this species is concentrated mainly in the Rocky Gully and Mt Barker areas, and is only a minor problem in other areas. Leaf-tiers have caused some significant growth malformation to trees in their first year of growth. A gelechiid moth *Ardozyga stratifera* was identified although several species are likely to occur. African black beetle, *Heteronychus arator* is a significant problem in wetter areas.: Larvae of the 'spring beetle' *Heteronyx elongatus* caused severe damage to seedlings in some areas of the Great Southern. 'Spring beetle' adults (*Liparetrus* spp.) caused locally severe damage to seedlings.

MANAGED NATURAL FORESTS

Eucalyptus marginata

Jarrah leaf miner: Cutout boundary surveys continue and over the past year have shown that the JLM outbreak area in Collie has moved north, but the damage is only of moderate intensity. Thus at present the area of Jarrah affected by JLM has increased over the passed year. A project looking at the defoliation of Jarrah coppice has resulted in no new coppice death this year, however 100% defoliation has resulted in significant decrease in growth increment. There is now 10 years of data for this project. A project involving the selective retention of JLM resistant trees and ground coppice has been established in a demonstration forest plot. (T. Burbidge)

***Uraba lugens*:** Populations of gum leaf skeletonizer remain low in the southern Jarrah forest. Papers on the outbreak and biology of this insect in WA are in preparation and are planned to be published next year. (JF)

Effects of timber harvesting on terrestrial invertebrates in medium rainfall jarrah forest: An ongoing project, originally started as a PhD project with Murdoch University (K. Strehlow). Thesis due to be submitted this year. Pitfall collections are annually collected in November. 2000 samples will be sorted and data based by March 2001. Previous data is currently being analysed. (T. Burbidge)

Eucalyptus diversicolor

Bullseye Borer: Research into the incidence and impact of *Phoracantha acanthocera* in karri has now been completed and published. Dry sites in close proximity to jarrah/marri forest and in small coupes were more prone to borer attack. In addition, incipient rot was found to be correlated to borer presence. (JF)

NATIVE PLANT COMMUNITIES

Eucalyptus gomphocephala

High levels of *Phoracantha impavida* have been associated with tuart decline near Lake Clifton and Yalgorup NP. It is thought that the reduced incidence of fire has contributed to the population build and consequent decline of tuarts.

Tuart woodlands in and around Yalgorup National Park on limestone soils of marine origin exhibited a highly visible and extensive crown decline by late 1999. The decline was not related directly to drought as the woodlands are developed over a shallow aquifer. Tuart carried populations of the branch boring Cerambycid *Phoracantha impavida* which usually contribute to minor foliage loss via windfall branches and stem girdling. The effects of normal populations *of P. impavida* were enhanced by general loss of vigour of tuart leading to increased defoliation and acceleration of the decline. Field inspection of decline and opportunistic collection of Cerambycid branch borers including larvae of the Tuart borer *Phoracantha impavida*, and larvae

with affinities to *Bimia bicolor* had not been collected in larval stages in Western Australia since about 1920. Factors contributing to loss of vigour in tuart are hypothesised to be: A) Fire exclusion for several decades allowing the coastal peppermint *Agonis flexuosa* to develop as an increasingly important competitor for resources. B) Below average rainfall in 1997 and 1998 probably constrained nutrient availability from litter and upper soil horizons in these nutrient poor alkaline soils. Reverting to a fire regime of historical intervals of 2 or 3 years would not immediately restore the tuart woodlands due the heavy fuel loads and the complications of regenerating tuart in the presence of peppermint as a competitor. (A.Wills)

Eucalyptus rudis

A project by Curtin University of Technology in association with the University of South Australia is concerned with the dramatic deterioration of flooded gum that occurred in summer 1999 in the Perth metropolitan area. Canopy knockdowns revealed in excess of 13,000 Creis psyllids per small tree, although numbers of other herbivorous arthropods were also elevated. The areas of decline were mapped along the Swan River and attempts were made to correlate decline with adjacent landuse. No clear pattern was found. The outbreak of psyllids may be associated with nutrient enrichment of urban soils and the decline of vertebrate predators. (J. Majer)

Eucalyptus wandoo

Monitoring of crown decline and recovery using time series photography of *Eucalyptus wandoo* crowns suffering crown decline in Talbot forest block has been completed. Leaf insect populations were not considered unduely high. (A. Wills)

A major ARC-funded project (Curtin University of Technology) has investigated the impact of fragmentation of wandoo woodlands in WA and yellow box woodlands in NSW on canopy arthropod fauna and associated insectivorous birds. The study has indicated that isolated trees in paddocks support a diverse and abundant arthropod fauna and can contribute to the conservation of invertebrate and bird diversity in agricultural landscapes. (J. Majer)

Tingle Forest

A survey of litter dwelling inverteorates in response to fire has been conducted in WA Tingle forest at Walpole-Nornalup National Park. Over, 16,000 forest floor invertebrates were collected from spring 1996. Of the 701 morphospecies (including gondwanan relict taxa) captured, the majority were unique to a particular forest type (jarrah, karri or tingle) at a particular fire age. Jarrah forest unburnt for 30 years had the highest richness of unique morphospecies (dominated by wasps,bees and spiders), followed by jarrah forest burnt 2 months previously (dominated by beetles and spiders). The tingle forests were intermediate in unique richness (beta richness) and dominated by collembola morphospecies. Recently burnt and long unburnt karri forest had the lowest unique richness dominated by Gastropod morphospecies.
It was concluded that to conserve the biodiversity of the forest floor invertebrates a wide diversity of fire ages and forest compositions and structure should be maintained using the fire regimes prescribed by the current management plan. (P. VanHeurck)

Mixed Species

An ARC- funded project (Curtin University of Technology) is investigating the bark arthropod fauna of jarrah, marri, wandoo and powderbark wandoo along a transect from Perth through to the wheatbelt. A year of sampling has revealed in excess of 1000 species of arthropods living on, or visiting the bark of these trees. Abundance of some groups seems to increase towards the wheatbelt end of the transect, and this is reflected in a greater abundance of birds within the bark-feeding guild. (J. Majer)

The canopy fauna of native and introduced saplings in Kings Park, Perth has been sampled in both burnt and unburnt areas. Canopy arthropods are more abundant on the post-fire regrowth than in the unburnt areas and this results in elevated levels of leaf feeding. It appears that this is a response to increased levels of foliar nutrients and the relationship with herbivores acts to counteract the vigour of post-fire regrowth following fire. (J. Majer)

URBAN AND RURAL TREES

Cape Lilac: White Cedar or "Cape lilac" trees continue to be plagued by White Cedar Moth, *Leptocneria reducta*. The original outbreak area included Victoria Park/ South Perth (south of the Swan River) in 1998 - 99 and infestations have now been found in Nedlands (north of the Swan River). (T. Burbidge)

Invertebrate conservation in an urbanized landscape: This project studies the native earthworm fauna of the metropolitan sector of the coastal plain and its representation in the conservation estate. The project is complete and a paper is to be published soon. (T. Burbidge)

Biosurvey of Arachnids of the wheatbelt: As part of the salinity action plan a survey of Arachnids is being conducted in the WA wheatbelt. Three hundred trapping sites have been established in the wheatbelt from Kalbarri to Esperance. Sites collected to July 2000 are 190. In total, 170 sites were sorted to 13,929 spider specimens which are madeup of 329 species determined by the WA Museum. At least 150 of these are new and undescribed species. (P. Van Heurk)

PUBLICATIONS (CALM)

Abbott, I., Wills, A. and Burbidge, T. (1999) Reinfestation of *Eucalyptus marginata* ground coppice by jarrah leafminer after scorch by autumn or spring fires. Australian Forestry 62 (2): 160-165

Abbott, I., Wills, A. and Burbidge, T. (1999) The impact of canopy development on arthropod faunas in recently established *Eucalyptus globulus* plantations in Western Australia. Forest ecology and Management 121: 147-158

Abbott, I., Wills, A., Burbidge, T. and Van Heurck, P. (1999). Arthropod faunas of crowns of jarrah (Eucalyptus marginata) and marri (*Corymbia calophylla*) in mediterranean-climate forest: A preliminary regional-scale comparison. Australian Forestry 63(1): 21-26

Abbott, I., Wills, A. and Burbidge, T. (1999) Historical Incidence of *Perthida* leafminer species (Lepidoptera) in south-west Western Australia based on herbarium specimens. Australian Journal of Ecology 24: 144-150

Farr, J.D., Dick, S.G., Williams, M.R. and Wheeler, I.B. (2000). Incidence of bullseye borer (*Phoracantha canthocera* (Macleay), Cerambycidae) in 20-35 year old regrowth karri in the south west of Western Australia. Australian Forestry 63: 107-123.

Farr, J.D. (2000). Essigella californica (Monterey Pine Aphid)– A new pest of pines in Western Australia. Information Pamphlet July 2000, 7pp.

Wills, A., Tay, F., Stukely, M. and Burbidge, T. (2000). Crown decline in Wandoo 1999-2000. Department of Conservation and Land Management. Unpublished report, July 2000.

14 WESTERN AUSTRALIA – DISEASES

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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*)

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.

NATIVE PLANT COMMUNITIES

Diseases

No new problems reported. Management of *Phytopthora* root disease in susceptible plant communities continues (see Research and Development)

URBAN AND RURAL

Diseases

Symptoms of the Mundulla Yellows (MY) syndrome have been observed in WA for some six years (F.Podger). A new monitoring program is being instituted (M.Stukely-CALM). Symptoms are most common in jarrah (Eucalyptus marginata), but have also been noted in some other eucalypts, in *Allocasuarina* spp., *Xylomelum angustifolium* and possibly *Banksia* spp. MY does not appear to be involved in the crown declines of wandoo (*Eucalyptus wandoo*) or tuart (*E. gomphocephala*). As in South Australia, MY is only seen in vegetation in disturbed sites or modified landscapes such as road verges and medians, and in parkland stands. It has not been recorded within bushland areas (whether logged or not), nor in plantations. It appears to be confined to the Swan Coastal Plain (alkaline sands), but is widespread through this region in both urban and rural locations (M. Stukely-CALM).

Forest health surveillance and diagnosis

In the period July 1999 to June 2000, CALM Forest Management Branch mapped the presence of *Phytopthora cinnamomi* disease symptoms and defined protectable areas on almost 33,000 ha of native forest. Approximately 9,500 ha of previously mapped forest was rechecked. Under

contract to Alcoa of Australia and other agencies, CALM monitored the interpretation and mapping of a further 7,200 ha (M. Rayner-CALM)

Between July 1999 and June 2000, a total of 1620 samples was processed for *Phytophthora* identification by CALM's Vegetation Health Service VHS). *P.cinnamomi* was detected in 715 samples, *P.citricola* (55), *P.cryptogea* (10), *P.megasperma* (1), *P.drechleri* (1), and *Phytopthora*.spp.(5). There were 52 samples (sandalwood, pine, eucalypt and others) sent to the VHS for general diagnosis in this period (F.Tay-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: Interaction between *Endothia gyrosa* and *Eucalyptus globulus* micronutrient status and canker disease development. (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).

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

MANAGED NATURAL FORESTS
Jarrah forest (Eucalyptus marginata)
Diseases

Dieback-resistant jarrah: Further field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have been established (M.Stukely-CALM). Work is continuing towards the establishment of production seed orchards.

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).

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).

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).

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

NATIVE PLANT COMMUNITIES
Diseases
Twelve sites covering 171 hectares were aerially sprayed with phosphite during the 1999/2000 financial year in the Albany and South West Capes districts. Eight *Phytophthora*-susceptible DRF (decalred rare flora) species were treated in Albany district and 4 in South West Capes. Fourteen sites at Walpole and Narrogin, were sprayed with knapsack power mister or had trunk injection of phosphite (R. Smith-CALM).

A handspray trial was carried out by Albany district staff to compare different surfactants for phosphite application. The results were equivocal, but BS 1000 (alchohol alkoxylate) showed enough potential improvement over Synertrol to replace that surfactant for this season's application program (R. Smith-CALM).

Russell Smith (CALM) travelled to Kangarroo Island in November 1999 to assist the SA Department for Environment, Heritage and Aboriginal Affairs set up a phosphite application and monitoring trial in Flinders Chase NP, and to train local staff in the use of phosphite.

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).

The genetics of pathogenicity in *Phytophthora cinnamomi* the cause of dieback in native plant communities. (D. Huberli; Supervisors G.Hardy-MU, and I. Tommerup-CSIRO).

The effect of ectomycorrhizal fungi on induced resistance of specific native plant species to *Phytophthora cinnamomi*. (K.Howard; Supervisors G.Hardy and B.Dell-MU)

The control of *Phytophthora cinnamomi* by the fungicide phosphite in native plant communities on the south coast of Western Australia. (S. Barrett; Supervisors, G.Hardy-MU, and B. Shearer-CALM).

The effects of phosphite on pollen development, flowering, seed set and viability on native plant species. (M. Fairbanks; Supervisors J. McComb and G.Hardy-MU).

Honours Projects in progress at Murdoch University
Taxonomy, genetic variation and pathogenicity of *Puccinia boroniae* (Boronia rust) in *Boronia megastigma, B. heterophylla, B. clavata* and hybrids. Susanna Driessen (Supervisors: Giles Hardy and Phil O'Brien-MU)

The role of *Acacia* species in rehabilitated mines on the suppression of *Phytophthora cinnamomi.* Nola D'Souza (Supervisors: Giles Hardy-MU, Ian Colquhoun- Alcoa World Alumina and Bryan Shearer-CALM)

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15 CSIRO – PESTS

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CSIRO Entomology

1. **Insect – Eucalypt Interactions Symposium**
   In February 2000 a symposium, funded by the CRC for Sustainable Production Forestry & CSIRO Entomology, was held in Canberra to discuss the role of entomological research in the improved management of eucalypt plantations. The meeting was intended to consider present research gaps and identify future issues needing address. The meeting was attended by 49 delegates, including four international delegates. Two publications have arisen from this meeting to-date:

   Steinbauer MJ (Ed.) 2000. *Insect-Eucalypt Interactions*. Program and Abstracts of CRC-SPF Symposium, Canberra, 7-8 February. CRC for Sustainable Production Forestry & CSIRO Entomology, Canberra. viii + 42 pp.

   Steinbauer MJ (Ed.) 2000 *Entomological research for Australian eucalypt plantations: conclusions, research priorities and outcomes arising from the Symposium on Insect-Eucalypt Interactions*. Technical Report No. 36. CRC for Sustainable Production Forestry, Hobart. v + 14 pp.

   Presently, 14 manuscripts by authors who gave presentations at the symposium on insect-eucalypt interactions are under review for publication in a special issue of the journal *Austral Ecology*. This symposium issue is supported by the Ecological Society of Australia and it is hoped will be published in late 2001. This work is intended to be a primary reference source for colleagues studying insect-eucalypt interactions.

2. **Plant diversity and control of autumn gum moth**
   A large field trial comprising 9 individual plots (each separated from one another by 240m) and a total of 1008 trees was planted on the outskirts of Canberra in late 1999. This trial, funded by the CRC for Sustainable Production Forestry & CSIRO Entomology, aims to determine whether increased tree and understorey diversity can regulate populations of

autumn gum moth by means of limiting host abundance and/or elevated populations of hymenopteran parasitoids. This trial adds to the trial planted in late 1998 in which 500 trees of different species were planted together to investigate the same issue.

3. **Pheromones for monitoring autumn gum moth populations**
   A project to extract, identify and synthesise functional mimics of the sex pheromone of autumn gum moth was begun in early 2000. This project, funded by the CRC for Sustainable Production Forestry, ultimately aims to produce a pheromone lure for industry to assist with the monitoring of field populations of the moth. The project has successfully extracted and partially identified 3 chemical compounds that comprise the sex pheromone of this moth. Further work is on-going to determine which of these compound(s) are the biologically active constituent(s).

4. **Parasitoids of autumn gum moth**
   The CRC for Sustainable Production Forestry has recently funded a 3 year PhD scholarship to study the taxonomy and role of hymenopteran larval/pupal parasitoids of autumn gum moth in the population regulation of this moth. The role of natural enemies in the sustainable management of plantation defoliators was identified as an important research gap during the symposium on insect-eucalypt interactions.

5. **Assessment of the economic impact of the major insect defoliating pests of *Eucalyptus globulus globulus* in Western Australia**
   A series of insecticidal exclusion trials were established in 1999/2000 to assess the economic impact of feeding damage caused by the eucalyptus weevil, *Gonipterus scutellatus*, chrysomelid beetles, *Chrysophtharta* spp. and *Cadmus excrementarius*, autumn gum moth, *Mnesampela privata*, and leafblister sawfly, *Phylacteophaga froggatti* to *Eucalyptus globulus globulus* plantations. These long-term trials, which are supported by the Western Australian Blue Gum Industry Pest Management Group (IPMG), will aid in the determination of economic thresholds for these various pests.

6. **Seasonal phenology of the major defoliating pests of *Eucalyptus globulus globulus* in Western Australia**
   Research investigating the seasonal lifecycles of eucalyptus weevil, chrysomelid beetles, autumn gum moth and leafblister sawfly began in late 1999, with support from the IPMG. This research aims to identify critical times for plantation surveillance, monitoring and control intervention.

7 ***Impact of aerially applied insecticides on weevil and chrysomelid pests and their natural enemies***
   Surveys assessing the impact of insecticides (alpha-cypermthrin and dimethoate) on beetle pests and their natural enemies have been conducted since 1999 in Western Australian *Eucalyptus globulus globulus* plantations. The research funded by the IPMG aims to assess both short and long term impacts.

8. **Biological control of the eucalyptus weevil, *Gonipterus scutellatus*, by the egg parasitoid *Anaphes nitens*.**
   Also supported by the IPMG is research quantifying rates of egg parasitism of the serious eucalypt pest *Gonipterus scutellatus* by *Anaphes nitens* in Western Australia. Inadequate biological control is considered the major reason for the elevated pest status of *G. scutellatus* in WA, and research aims to quantify seasonal trends in parasitism rates and determine why *A. nitens* may be occasionally ineffective.

9. **Biology and ecology of *Essigella californica* (Hemiptera: Aphididae: Lachninae) on *Pinus radiata***

   A consortium of major *P. radiata* growers have funded a PhD scholarship to study the basic biology of *Essigella californica*, and aspects of the interactions of the aphid with its host plants. Ms Trudi Wharton started work in October 1999 and has started work on establishing a laboratory culture, defining the relationship between temperature and rate of development, and established a detailed field monitoring activity to document the phenology and biology of the aphid.

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

    CSIRO Entomology and the Queensland Forestry Research Institute (QFRI) are collaborating with forestry and scientific organisations in Thailand, the Philippines, Laos, Vietnam and Malaysia to screen over 100 families of *Toona ciliata* (collected by the SPRIG project) and 16 seedlots of *Chukrasia tabularis* (in association with CSIRO Forestry and Forest Products) for resistance to *H. robusta*. The project has also established a number of companion planting, underplanting, fertiliser and insecticide trials. The multi-partner project is funded by the Australian Centre for International Agricultural Research (ACIAR), the Rural Industries Research and Development Corporation (RIRDC) and the Natural Heritage Trust (NHT) and is jointly led by Dr Rob Floyd and Dr Ross Wylie, with assistance from Dr Saul Cunningham and Dr Manon Griffiths.

    A related project is seeking to clarify the taxonomy of *H. robusta* across its entire range. Dr Marianne Horak has discovered that what has been considered to be one species is at least four species.

Asian Gypsy Moth

Suitability of 85 species of native trees and shrubs of New Zealand, South America, and Australia to Asian gypsy moth has been examined. Asian gyspy moth larvae were able to complete development on some *Eucalyptus* spp. from Tasmania and SE mainland as well as two species deciduous oaks (preferred natural hosts). The study was conducted jointly by NZ Forest Research and CSIRO Entomology at CSIRO Entomology European Laboratory, Montpellier, France with funding from NZ Ministry of Agriculture and Forestry and Agriculture, Fisheries and Forestry – Australia. For further information re *Nothofagus* from NZ and SA, contact M. Kay (Nod.Kay@forestreaearch.co.nz), and re *Eucalyptus*, contact M. Matsuki (m.matsuki@ento.csiro.au).

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16 CSIRO– DISEASES

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

1. *A Manual of Diseases of Tropical Acacias in Australia, South-East Asia and India* by K.M. Old, S.S. Lee, J.K. Sharma and Z.Q. Yuan, aimed primarily at field-based staff, has recently been produced for CIFOR with the support of ACIAR. The book is available from CIFOR, PO Box 6596, JKPWB, Jakarta 1006 Indonesia (Ken Old).

2. A pre-emptive project on eucalyptus or guava rust (*Puccinia psidii*), sponsored by ACIAR, commences in the second half of 2000 in collaboration with pathologists from Brazil and South Africa. This three-year study includes a program of screening for resistance to the rust of a range of eucalypts and other Australian Myrtaceae of commercial or conservation significance; bioclimatic mapping to predict Australian and world regions at risk; and development of methods, based on DNA analysis, for rapid identification and detection of the rust in host tissues (Ken Old, Trevor Booth, Inez Tommerup).

3. Investigation of variation in the indigenous acacia phyllode rust, *Atelocauda digitata*, on different acacia tree species in tropical N. Queensland, and collaborative field trials with QFRI for resistance selection and breeding (Ken Old, Penny Butcher).

4. Termination at end of 2000 of collaborative ACIAR project with QFRI, Forest Science Institute of Vietnam and Royal Forest Department, Thailand on managing disease impacts on eucalypts in South East Asia. Primary concerns have continued to be with *Cylindrocladium quinqueseptatum* and *Cryptosporiopsis eucalypti* (Ken Old, Mark Dudzinski).

5. Proceedings of the IMPACT Workshop (Monterey, California, 30 Nov-3 Dec 1998) *Current and Potential Impacts of Pitch Canker in Radiata Pine* were published and circulated. Additional copies are available from Mike Devey, CSIRO Forestry and Forest Products, PO Box E4008, Kingston ACT 2604 (Mike Devey, Colin Matheson).

6. Following the IMPACT Workshop on pine pitch canker (Monterey, California, 30 Nov-3 Dec 1998) a research agreement for a pine pitch canker screening project has been signed by three co-operatives representing radiata pine interests in Australia, Chile and New Zealand. Screenings of elite lines from the collaborating countries, and bulk and individual-tree samples from five native populations, initially in glasshouse tests, will be undertaken in California by US researchers during the first 12-18 months (Mike Devey, Colin Matheson).

7. A range of collaborative research projects is undertaken in Tasmania with the University of Tasmania, Forestry Tasmania and the Cooperative Research Centre for Sustainable Production Forestry, for example stem defect and pruning in plantation eucalypts (Caroline Mohammed).

8. In Western Australia collaborative pathogen-related projects with CALM and Murdoch University include investigation of phosphite resistance in *Phytophthora cinnamomi* and its potential effects in disease control in native vegetation; genetic and phenotypic variation in *P. cinnamomi* in the northern jarrah forest; and variation in *Armillaria luteobubalina* (Inez Tommerup).

9. A CSIRO consultancy for AusAID on diseases of Australian tree species in Sri Lanka found leaf blight associated with infection by *Cryptosporiopsis eucalypti* to be a major cause of failure of *E. camaldulensis* in the north of the country. Two-year-old red cedar (*Toona ciliata*) at one location in the mountainous central region were found to be infected by the wilt pathogen *Verticillium dahliae* (Ken Old).

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17 AQIS– QUARANTINE

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The purpose of this report is to advise Forest Research Working Group members of the forest quarantine work program within the Department of Agriculture, Fisheries and Forestry - Australia (AFFA). Key quarantine activities relevant to the forest health were:

National Stakeholder Timber Pest Conference

In april 1999, the australian quarantine and inspection service (AQIS) organised a national stakeholder timber pest conference to raise awareness of timber pest problems and look at current import arrangements for timber, timber packaging and timber products. The meeting involved stakeholders from a wide range of industry sectors, countries that exported timber to Australia, the research community, government and unions. Stakeholders developed recommendations for consideration in the aqis review of arrangements for timber imports, and these were presented to the commonwealth minister for forestry and conservation.

Fungal survey of imported timber

Following concerns expressed by stakeholders including Forest Protection Groups, in relation to the possible introduction of exotic wood pathogens and staining fungi, AQIS contracted the State Forests of New South Wales for a study entitled "Fungi on wood imported into Sydney". The study looked at 50 samples of mainly imported Douglas-fir (*Pseudotsuga menzies*ii (Mirb.) Franco), western hemlock (*Tsuga heterophylla* (Raf.) Sarg) and western red *cedar (Thuja plicata* Donn ex D. Don). Results of the study showed that:

- bark is commonly present on sawn timber imports.
- living colonies of two potentially significant insect pests were detected in the course of gathering wood samples. These were a termite *Zootermopsis* sp., and a scolytid beetle *Dendroctonus pseudotsugae*.
- Douglas-fir lumber imports, showing blue stain symptoms, were infected with species of Ophiostomataceae not known to occur in Australia. Some species of *Ophiostoma* and *Ceratocystis* are economically important because they can cause stain in wood of a wide variety of conifers, thereby causing a significant reduction in the market value of timber.
- Douglas-fir and western red cedar lumber commonly included pockets of active decays. *Heterobasidion annosum* and a *Phellinus* sp. were isolated from Douglas-fir, and a *Phellinus* sp. and *Postia* sp. from western red cedar.
- The moisture content of 'green' imported lumber was consistently greater than the fibre saturation point of the wood and sufficient to ensure the survival of mycelia in the wood.
- Kiln dry timber did not have living populations of stain or decay fungi.

Import risk analysis of the importation of coniferous lumber from the USA, Canada and New Zealand, and wood packaging materials from Asia.

AFFA has identified the need to conduct an import risk analysis (IRA) of the importation into Australia of coniferous sawn timber from the USA, Canada and New Zealand, and wood packaging material from Asia. These IRAs will identify exotic arthropod pests and pathogens, estimate the probability of their entry and establishment in Australia, and develop appropriate management strategies to mitigate the identified risks.

The Executive Director of AQIS has confirmed a non-routine analysis for these IRAs. Non-routine is required where there are potentially significant quarantine risks to be evaluated that have not previously been canvassed by AQIS, and where the analysis is likely to be large and technically complex.

Risk Analysis Panel (RAP) for both IRAs has been determined. Stakeholders were advised of the final RAP membership in January 2000. The panel will act as a steering committee to oversee the IRA process. The RAP will hold stakeholder meeting in Sydney and Melbourne to discuss the scope of the two IRAs and membership of the technical working groups (TWGs).

Mushroom Import Risk Analysis

This import risk analysis will assess the phytosanitary risks associated with the importation of mushrooms, and will consider and evaluate procedures and conditions to manage the identified quarantine risks. The IRA will also review current protocols to determine their effectiveness in managing the quarantine risks identified in the IRA.

The IRA would primarily focus on 39 species. These species represent the currently permitted species and additional species in which importers have expressed the most interest. The Risk Analysis Panel (RAP) has also decided that the scope of the IRA will be broadened to include dried wild and cultivated mushroom species.

Importation of teak (*Tectona grandis* L.f.) stumps and tissue cultures

AQIS is currently considering four submissions seeking to import large consignments of teak stumps and tissue cultures from Thailand and Indonesia. The total consignment will be in the vicinity of 6 million stumps and tissue cultures to establish a large-scale plantation on around 6000 hectares of land in Northern Territory and West Kimberley Region of Western Australia. AQIS has stopped the importation of all teak nursery stock into Australia pending an assessment of the insect pest and disease situation in Thailand and Indonesia.

AQIS is concerned at the potential these proposals may have for introducing exotic pests and diseases into Australia. Diseases such as bacterial wilt (*Pseudomonas solanacearum* (E.F.Smith) E.F.Smith), teak rust (*Olivea tectonae* (T.S. & K. Ramakr.) Mulder). and disorders of suspected viral origin are of particular concern. Diseases of teak may even be less of a problem than insects and nematodes. The teak skeletoniser (*Eutectona machaeralis* Walker) and teak leaf defoliator *(Hyblaea peura* Cramer) can be quite devastating.

Teak stumps are a possible pathway for the entry of the above pests. Given the number and range of potential pests that could be introduced with the teak stumps, and that they are grown for 1 year or so on the ground in open shade houses in tropical conditions prior to export, the quarantine risk of the proposal could be high, and could put at risk the potential industry development in Australia. Furthermore, the importation of large quantities of teak stumps could increase the quarantine risk. Apart from the biological hazards, there are propagation and management factors that could impact on the overall risk. These include effective inspection and treatment, space availability at Government post-entry quarantine facilities for disease screening and availability of resources.

AQIS will retain the current conditions for teak "stumps', (2-year quarantine at a Government post-entry quarantine facility), pending a full import risk analysis (IRA) on this type of material.

AQIS is aware that the forestry sector is increasingly moving to clonal forestry using superior selections, breeds and hybrids. Much of this material is available as tissue cultures (eg. teak, pines and eucalypts). Importation of tissue cultures in sealed, sterile containers is considered by forest pathologists as the least risky means to import forest germplasm and planting stock. AQIS would encourage importation of forest germplasm in the form of sterile tissue cultures. Under current AQIS import conditions, teak tissue cultures must be deflasked and grown in Government post-entry quarantine facility for a minimum of 2 years. AQIS is prepared to consider less stringent conditions (eg. no post-entry quarantine for tissue cultures) if tissue cultures are produced under ' high plant health conditions'.

Importation of pine (*Pinus* spp.) and Douglas-fir (*Pseudotsuga menziesii*) seeds for sowing

In consultation with Australian forest pathologists AQIS has imposed new import conditions, for the importation of pine and Douglas-fir seed for sowing, to address the risk of introduction of the pitch canker fungus into Australia. A scientific paper published by Storer *et al*, 1998, confirmed that the pitch canker fungus could be disseminated with seed from pitch canker infected areas to disease free areas.

AQIS's new import conditions for seeds of pines and Douglas-fir for sowing require that:

- The importer must possess a valid Import Permit prior to the seed arriving in Australia;

- Seed must be accompanied by an official government Phytosanitary certificate from the country of origin where the seed was grown, and be endorsed with the following additional declarations:

    - pitch canker (*Fusarium circinatum* Nirenberg & O'Donnell; teleomorph *Gibberella circinata* Nirenberg & O'Donnell) is not known to occur in country of origin;

    - the seed originated from trees which were inspected at the time of seed collection and found free from Pitch canker (*Fusarium circinatum* Nirenberg & O'Donnell; teleomorph *Gibberella circinata* Nirenberg & O'Donnell); and

- the seed has been subjected to one of the AQIS approved treatments.

Imports of pine and Douglas-fir seeds from New Zealand must be accompanied by an official New Zealand MAF Phytosanitary certificate endorsed with the following declarations:

- the seed originates from areas that are, as verified by official pest surveillance, free from pitch canker (*Fusarium circinatum* Nirenberg & O'Donnell; teleomorph *Gibberella circinata* Nirenberg & O'Donnell);
- the seed is New Zealand grown; and
- the seed has been immersed in 1 % sodium hypochlorite solution for 10 minutes.

The importation of *Pinus spp.* and *Pseudotsuga spp.* seed from pitch canker infected country is prohibited.

Field guide to forest and timber pests and pathogens

The Australian Quarantine and Inspection Service (AQIS) and the National Office of Animal and Plant Health (NOAPH), both agencies within AFFA, and the Ministerial Council on Forestry, Fisheries and Aquaculture - Standing Committee on Forestry have published a booklet entitled "Forests and Timber - A Field Guide to Exotic Pests and Diseases".

The guide aims to provide basic information on some high-risk exotic pests and pathogens of forest and amenity trees and imported timber. The pests and pathogens featured in this quide are only a few - though very important examples of exotic forest pests and pathogens that could cause damage in the Australian environment. The guide also lists who to contact if an exotic insect, or signs and/or symptoms of an exotic disease, that might be of quarantine or forest health concern, is spotted. The target audience for the field guide will be wharf workers, container depot staff, timber handlers, timber yard workers, forest workers, forest technical staff and private tree growers.

Breaking Bundle survey

Australia imports untreated, green sawn Douglas-fir, western red cedar from Canada and the United States of America. The aim of the AQIS survey is to assess the efficacy of current inspection methods. The primary objective is to determine if further or increased inspection and/or treatment systems are needed for these imports. The data from the first six months of the survey have been analysed to determine the factors associated with insect infestation in these imports.

AQIS officers inspected 152 bundles of untreated green sawn, Douglas-fir or western red cedar timber imported from Canada or USA between May and October 1999. Ten randomly selected bundles per vessel were inspected to detect the presence of any insects contained within the bundles. After an external inspection of all exposed surfaces, the bundles were broken and planks laid out to expose the internal timber surfaces of each bundle to inspection. All insects detected were collected for

classification by AQIS entomologists to at least the level of genus. The insects were assessed by AQIS as to whether they were of quarantine concern in Australia.

The first six months of the 'breaking bundles' survey found high rates of infestation in the randomly sampled bundles of imported green sawn timber from Canada and USA. External inspection detected 5 incidences of pest infestation (3% of bundles), whereas breaking bundles and conducting an internal inspection detected 50 incidences of pest infestation (33% of bundles). That is, external inspection alone would have not detected 46 (30%) of bundles containing quarantine pest species. Douglas-fir bundles had a 45% infestation rate of quarantine pest species whereas western red cedar bundles had a 16% infestation rate. There were too few data to test for seasonal differences in the infestation rate. The high rate of infestation suggests that the survey should be continued, and with a full year of data seasonal variation could be investigated.

Participation in a Canadian Phytopathological Society symposium

AQIS participated in a symposium entitled "Exports-Quarantine Impacts on Post-Harvest Agriculture and Lumbar Diseases in North America and Pacific Rim Countries", during the joint meeting of the Canadian Phytopathological Society and the Pacific Division of the American Phytopathological Society in Victoria, Canada from 18-21 June 2000.

AQIS presented a paper at the symposium entitled "Quarantine disease threats to Australia forests and amenity trees from the importation of wood and wood products". The abstract of the manuscript presented at the meeting is provided below.

> "A combination of geographical isolation and effective quarantine practices has excluded many serious diseases of trees from Australia. The large amount of international trade in untreated wood and wood products, including dunnage has increased the threat of such diseases becoming established and deleteriously affecting the current relatively healthy status of our native and plantation forests, and amenity trees. Forest pathogens such as *Heterobasidion annosum* (Fr.:Fr.) Bret, *Fusarium circinatum* Nirenberg & O'Donnell, *Bursaphelenchus xylophilus* (Steiner &Buhrer) Nickle, *Puccinia psidii Winter* and *Phellinus pini* (Thore: Fr.) Ames are considered serious threats to plantation forests in Australia. The potential impact, if the more serious exotic diseases of forests were introduced, could be not just the loss of a few seasons' crop, but the loss of decades of effort and investment in plantations, and irreparable damage to the native flora and wood resources. Effective quarantine policies and procedures are necessary to prevent the entry of these pathogens into Australia".

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18 AFFA– QUARANTINE

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OFFICE OF THE CHIEF PLANT PROTECTION OFFICER

Forest Health 1999 - 2000: Report for RWG7

This report provides RWG7 members with an overview of the Asian gypsy moth host testing study, forest health surveillance programs, and the production of a forests and timber field guide. Also presented is a summary of exotic pest incursions and barrier breaches in Australia during 1999/2000.

ASIAN GYPSY MOTH STUDY

Examining host specificity of Asian gypsy moth (Lymantria dispar) on native tree species of New Zealand and Australia

Project Objectives

The general purpose of this study was to expand our knowledge of the potential damage that Asian gypsy moth (AGM) could cause to native vegetation and commercial forestry in Australia and New Zealand. It has been shown previously that AGM can feed on native tree species (e.g. *Eucalyptus* spp., *Acacia* spp., and *Nothofagus* spp.), commercially important species (e.g. *Pinus radiata*, apples, pears, and cherries), and amenity trees (e.g. oaks and poplars). However, the relative favourability of these species compared with AGM's preferred hosts was not known.

Specific objectives:
1. Determine growth rate of Asian gypsy moth on at least 14 species of Australian native trees that are distributed in temperate Australia and 6 species of native trees from New Zealand.
2. Compare the growth rate of AGM on native trees from Australia and New Zealand with that on the preferred host species.

Summary of Project Outcomes (based on a report by Mamoru Matsuki)

Along with 39 species of trees and shrubs from Australia, New Zealand and South America, the suitability of 44 species of eucalypts to AGM larvae was examined. Larvae were able to complete development on 21 out of 44 species of eucalypts tested. On 5 species of eucalypts, larval performance, measured in terms of pupal weight, larval duration and survivorship, was at least equivalent to, if not better than, that observed on 2 species of deciduous oaks (the preferred natural hosts of AGM).

Eucalypt species that supported larval development were found from sea level to tree lines, and from the coast to inland along rivers in south east Australia. A significant number of the eucalypt species that supported larval development were from Tasmania. However, AGM larvae were not able to survive on *Eucalyptus globulus*, one of the important species in commercial plantations.

The predicted distribution range of AGM, based on climatic conditions, covers much of south east and south west Australia, including Tasmania and coastal areas of South

Queensland. Also, the predicted larval period coincides with periods of eucalypt leaf flush. Therefore, if accidentally introduced, AGM is likely to be able to persist in forests and woodlands in Australia and has the potential to become a serious forest pest.

This project was a collaborative study between NZ Forest Research and CSIRO Entomology, and was carried out at the CSIRO Entomology European Laboratory in France. The project was jointly funded by NZ Ministry of Agriculture and the Department of Agriculture, Fisheries & Forestry - Australia. For further information on *Nothofagus* contact N. Kay (Nod.Kay@forestresearch.co.nz) and on eucalypts contact M. Matsuki (m.matsuki@ento.csiro.au).

FORESTS AND TIMBER FIELD GUIDE

Forests and Timber: A Field Guide to Exotic Pests and Diseases has recently been produced and distributed to relevant forestry protection agencies. It is a joint production by the Office of the Chief Plant Protection Officer, AQIS and the Standing Committee on Forestry.

This guide provides basic information on 25 of the most serious exotic pests and diseases which potentially threaten the forest and timber industries within Australia. The field guide includes photographs of the various pests and diseases and also of the types of damage they cause. It includes information on where they are from, what types of timber they attack and their potential impact. It also lists whom to contact if you see one of the featured pests or diseases.

The guide has been distributed to AQIS port staff, port workers, and state forestry agencies. This publication is available on the AFFA web site at http://www.aqis.gov.au/docs/border/fieldguide.htm.

FOREST HEALTH SURVEILLANCE

Port and Airport Environs Surveillance in Queensland

Over the period 1999/2000, Agriculture, Fisheries and Forestry - Australia (AFFA) funded a trial forest health surveillance program in Queensland. Contingent on the results of the trial, the aim would be to extend this program to other States, forming a national system of forest health surveillance around the country's major ports.

The work was carried out by staff of the Queensland Forestry Research Institute in the Forest Protection Program. Five ports were targeted *viz.* shipping and airport surrounds in Brisbane and Cairns, and shipping port surrounds in Gladstone, Townsville and Bundaberg. The area within a one-kilometre radius of each airport or port was rated as a high-risk zone, and the area between one and five kilometre radius as a medium-risk zone. In the high-risk zone, intensive surveys were conducted by foot, inspecting all amenity tree plantings, natural vegetation and trees in parks. Islands and other inaccessible areas of vegetation in the port vicinities were reached by boat. Wharves were inspected and insect surveys conducted under mercury vapour lamps at ports. Within the medium-risk zone, areas of different land use or vegetation type were surveyed according to the perceived hazard of the site, and the intensity of surveillance was varied accordingly. Surveys were conducted by foot and by vehicle. Sites

specially targeted included areas of vegetation adjacent to container storage yards, areas of rough land containing native woody vegetation, sawmills and timber yards dealing with imported timber. Standard QFRI surveillance forms were used in recording data on disorders observed and specimens collected for identification. All information was entered on the Forest Health Database.

A wide range of insect and fungal organisms causing a variety of damage to trees and shrubs was collected. These included species belonging to groups of quarantine significance (i.e. common 'tramp' groups) such as drywood, dampwood and subterranean termites, psyllids, whiteflies, tussock moths, scales, gall formers, leaf pathogens and rust fungi. With one exception, all proved to be native species. On Tide Island in Gladstone Harbour, a nest of an exotic paper wasp (*Polistes* sp.) was discovered. This species is very much larger than our native wasps and has the potential to damage native fauna. AQIS was notified of the find.

The surveys are considered highly successful for several reasons. They are the first serious attempt to systematically survey areas of highest-hazard with respect to forestry quarantine. Although no exotic pests of forestry significance were found, the surveys did demonstrate the capability to detect such pests if present. The surveys also greatly raised awareness of AQIS and Port Authority staff of forestry quarantine issues and have laid the foundation for joint inspections with these staff. Requests have been made by AQIS staff in several centres for training on forestry quarantine. The continuance of such a survey program in Queensland, and its extension to other States, is strongly recommended.

Asian Gypsy Moth Surveillance Program

The Australian surveillance program for Asian gypsy moth, coordinated by the Office of the Chief Plant Protection Officer, continued over the period 1999/2000. Field monitoring is carried out by State and Territory agencies and the trapping program is centred in the first ports of call for the pest. Primary areas at risk are ships and shipping containers, so traps have been placed in 22 ports around the country. To date, no AGM has been detected.

EXOTIC INCURSIONS

Three exotic pest incursions of interest to the forest industry (*Minthea reticulata*, *Bursaphelenchus sp.*, and *Arhopalus rusticus*) were reported during 1999/2000 (see Table 1). A summary of these incidents is presented below.

Table 1: Exotic Incursions 1999-2000

Pest	Detected by	Host (found in)	Pathway of entry	Response
Beetle *Minthea reticulata*	Public 9/10/99 Nth Queensland	Timber	Thought to have entered on timber products (e.g. floor boards).	Fumigation of house where pest was detected.
Nematode *Bursaphelenchus sp.*	NRE Vic 17/2/00 Williamstown, Vic	*Pinus* spp.	Unknown	Under investigation.
Beetle *Arhopalus rusticus*	NRE Vic 14/8/00 Melbourne, Vic	*Pinus* spp.	Unknown	No further action; first record for Australia.

Minthea reticulata

In October 1999 a further detection of the powderpost beetle *Minthea reticulata* Lesne was made in tulip oak timber flooring of a residential property in the Cairns district. This was the second detection of this species within timber flooring, with the previous detection made in April 1999. The response to the April detection included fumigation of the infested property, and the segregation and fumigation of timber susceptible to attack by this beetle at the timber yard that supplied the flooring. It is believed that the species was confined to a single consignment of timber, but at the time the locations of the remainder of the consignment were not identified by the timber supplier (FNT&T).

The detection in October was made on timber of the same consignment as the original detection. The localities of the remainder of the consignment of flooring were subsequently identified and placed under surveillance. On the basis of recommendations by the Forest Health Committee, the residential property was fumigated and treatment costs were shared between the Commonwealth and the states at risk of the pest.

Since there are many similar species of beetles that are endemic to Australia, it was not expected that *M. reticulata* would have a significantly greater impact on forest production or timber production if it were to become established than these other species.

Bursaphelenchus sp.

In February 2000 Victorian authorities advised the detection of a previously unrecorded nematode in two dying pine trees (*Pinus halapensis*) in the Williamstown Botanic Gardens. The nematode was tentatively identified as *Bursaphelenchus hunanensis*, a species originally described from China to which the death of many pines was attributed. Another species in this genus, *B. xylophilus*, is known to decimate natural and plantation pines in many countries in the world, hence the potential seriousness of the Victorian report.

At least nineteen dying or dead pines (*Pinus halapensis* or *radiata*) in the Melbourne metropolitan region were subsequently confirmed to be infested with the nematode. Survey teams reported that the nematode was associated with exposed older trees and others that had been stressed due to separate factors (e.g. root-disturbance, poison, ring-barking etc). Aerial surveys of plantations close to Melbourne (100 km radius) failed to locate trees showing related symptoms. Limited surveys in other States did not detect this nematode in similar situations, although a number of other nematode species were found. A direct causal link between the nematode and death of the trees has not yet been established.

The nematode is transmitted by a variety of beetles but the known vector of this genus is not recorded in Australia. However it is thought that several native beetle species could transmit this nematode.

Since detection, a Consultative Committee involving Forest Health Committee members has convened on a number of occasions to deal with the situation. The Consultative Committee met on 14 August 2000 and endorsed the preparation of a Standing Committee on Forestry (SCF) proposal to cover costs associated with a program to investigate the feasibility of eradication. It is anticipated that this program will involve:

- removal and destruction of the affected pines in Melbourne;
- a national survey to determine the distribution of the nematode;
- further diagnostic and pathogenicity work; and
- development of a communication strategy with government agencies and industry.

The Consultative Committee also endorsed the need to seek the assistance of overseas expertise to verify the identity of the specimens in hand. Surveying and sampling will continue in anticipation of a national eradication campaign should that be necessary.

Arhopalus rusticus

In August 2000, beetle larvae found in one of the pine trees infested with *Bursaphelenchus sp.* in Victoria were identified by John Bain of NZ Forest Research as *Arhopalus rusticus* (Coleoptera: Cerambycidae), a species exotic to Australia. *A. rusticus* had previously been intercepted by quarantine authorities in both SA and WA, but was not known to be established in Australia.

This beetle is recorded as a nematode vector in the USA but mainly attacks dead or dying pines. It is not yet known if there is any association between this species of beetle and the nematode detected in Melbourne earlier this year.

A number of similar species of beetle are present in Australia, for example, *A. syriacus* (Reitter) is naturalised in NSW and attacks commercial *Pinus radiata*. It is not considered that *A. rusticus* poses any greater threat to forests than these other species.

BARRIER BREACHES

The most serious breaches for the period 1999/2000 involved the western drywood termite *Incisitermes minor*. This termite is potentially a serious destructive pest and has

a track record of moving well through transport pathways in timber products, but tends to be slow to establish. In November 1999, *I. minor* was detected in a crate in a warehouse in Cronulla, Sydney. The incident was co-investigated by AQIS and NSW forestry. No evidence of alates (reproductive/winged termites) was found and surveys of the surrounding buildings did not reveal any evidence of infestation. The termite was eradicated from the warehouse and NSW forestry agreed that no further action was warranted.

In January 2000 a pest control company notified AQIS of western drywood termites in a 38' Catalina yacht at Runaway Bay, Gold Coast. The yacht was imported about 4 years ago from the USA and was purchased by the current owner about 2 years ago. Alates were noticed in the cabin of the yacht (but not on the outside) at least a year prior to the report but the pest control company that investigated at the time told the owners that they were only flying ants. Another company was called this year when frass was seen coming out of the plywood cupboards in the galley. The yacht was subsequently fumigated and no further action was deemed necessary.

A number of other barrier breaches were recorded during the period 1999/2000; these incidents are summarised at Attachment 1.

Attachment 1: Barrier Breaches 1999-2000

Pest	Detected by	Host (found in)	Pathway of entry	Response
Unknown	Public 3/8/00	Assorted wooden handicrafts	Ineffective treatment in Indonesia	Goods recalled and fumigated
Beetle *Lyctus brunneus*	Public 12/10/99	Doors	Ineffective fumigation treatment in South Africa	Not a quarantine concern - no further action
Beetle *Dinoderus bifoveolatus*	Public 8/11/99	Cane furniture	Ineffective treatment in Indonesia	Goods moved to importer's premises & fumigated
Termite *Incisitermes minor*	Pest control operator 17/11/99 Sydney, NSW	Packing crates	Wooden crates used for packing material	Eradicated from warehouse
Beetle *Minthea reticulata*	Public 29/11/99	Furniture in sea cargo	Ineffective treatment in Indonesia due to lacquering	Furniture was retreated and released
Beetle *Heterobostrychus aequalis*	Public 1/12/99	Wooden crates	Ineffective fumigation / certification	Crates were fumigated
Beetle *Dinoderus minutus*	Public 6/1/00	Kites	Unknown from China	No further action
Beetle *Plaeocallidium rufipenne*	AQIS 20/1/00 Sydney, NSW	Timber pallets	Ineffective treatment in Korea	Dunnage ordered for treatment with methyl bromide
Termite *Incisitermes minor*	Pest control company 27/1/00 Queensland	Yacht	Unknown, but entered Australia 3.5 years ago	Yacht was fumigated
Beetle *Stromatium sp.*	Public 27/1/00	Timber beds & furniture	Unknown from China	Recall & destruction of products
Beetle *Lyctus brunneus*	Public 28/1/00	Wooden pegs	Unknown from China	Not a quarantine concern - no further action
Beetle *Heterobostrychus aequalis*	Public 4/2/00	Ladies wooden heel shoes	Unknown from Malaysia	Recall of remaining stock for retreatment

Pest	Detected by	Host (found in)	Pathway of entry	Response
Beetle *Minthea obstita*	AQIS 4/2/00	Wooden giraffes	Unknown from Zimbabwe	Infested goods treated. Shop under surveillance.
Beetle *Dinoderus minutus*	Public 12/2/00	Bamboo cups	Passenger baggage from Sumatra, Indonesia	No further action
Beetle *Heterobostrychus aequalis*	Retail outlet 18/2/00	Cane wreath	Unknown from China	No further action
Beetle *Dinoderus bifoveolatus*	Retail outlet 23/2/00	Rattan furniture	Sea cargo covered by Indonesian fumigation certificate	Impervious surface treated with methyl bromide
Beetle *Dinoderus minutus*	Retail outlet 23/2/00	Toyworld bamboo kites	Sea cargo covered by Chinese treatment certificate	No further action
Beetle *Heterobostrychus brunneus*	Public 25/2/00	African artefacts	Cleared through airport from Zimbabwe	Goods retreated
Beetle *Lyctus africanus*	Public 1/3/00	Bamboo skewers in Woolworths	Sea cargo from China - ineffective fumigation	Internal recall & retreatment
Beetle *Lyctus brunneus*	Public 2/3/00	Wooden coathanger	Sea cargo covered by Chinese fumigation certificate	No further action
Beetle *Stromatium barbatum*	Public 3/3/00	Cricket bats	Sea cargo from Pakistan - cleared on documentation	Internal recall undertaken
Beetle *Lyctus brunneus*	Public 3/3/00	Wooden park benches	Sea cargo covered by Chinese fumigation certificate	Goods inspected further then released
Beetle *Heterobostrychus aequalis*	Public 9/3/00	Wooden doors in 33 apartments	Sea cargo covered by Indonesian fumigation certificate	Doors removed & treated by steritech
Beetle *Dinoderus brevis*	Retail outlet 23/3/00	Bamboo skewers	Imported from Taiwan 1-2 years ago	Internal recall. Goods treated & released.
Beetle *Dinoderus bifoveolatus*	24/3/00	Rattan & timber furniture	Sea cargo covered by Indonesian treatment certification	Goods ordered into quarantine for treatment

Pest	Detected by	Host (found in)	Pathway of entry	Response
Beetle *Heterobostrychus aequalis*	Custom broker 31/3/00	Plywood panels	Sea cargo covered by Thailand fumigation certificate	Infested consignment traced & retreated
Beetle *Lyctus brunneus*	Retail outlet 7/4/00	Bamboo pasta strainers	Unknown from China	No further action
Beetle *Heterobostrychus aequalis*	Public 12/4/00	Park bench	Ineffective fumigation treatment	Internal recall for Qld & NSW
Beetle *Minthea rugicollis*	Public 27/4/00	Furniture	Cleared on documents with offshore fumigation	No further action - pest established in Australia
Beetle *Lyctus brunneus*	Public 8/6/00	Wooden clothes pegs	From China; with offshore fumigation papers	No further action

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19 NEW ZEALAND – PESTS

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Plantations:
PINUS RADIATA:

Sirex noctilio (Siricidae) still remains at very low levels throughout most of the plantation estate. Recently a sawing study was undertaken on pruned logs obtained from a coastal forest north of Auckland. The sample had been selected to include batches of logs showing varying levels of external resin bleeding in an effort to establish links between these external signs and defects affecting clearwood quality, such as resin pockets. A disc was removed from the small end of each log and all but 6 of the 37 discs showed resinous blemishes that were the result of unsuccessful oviposition attempts by *S. noctilio*.

A total of 174 resinous blemishes were recorded with a significant number between 1986 and 1991. The blemishes followed a normal distribution peaking in 1988. It is interesting to note that the earliest evidence of attack was 1982 the year in which the stand was high pruned and thinned to a final crop stocking of 350 spha. Records in the Forest Health Database confirm the regular sighting of *S. noctilio* in suppressed trees in the forest over this period. However there was no correlation between the extent of external resin bleeding and internal resinous blemishes. In terms of clearwood quality these resinous blemishes associated with *S. noctilio* attack prevent the recovery of top clearwood grades and therefore have the potential to influence log value.

Essigella californica (Aphididae) first found in New Zealand in 1998 is now distributed throughout the country, however there is little or no information on population trends. At present *E. californica* is not considered to be a problem, but anecdotal information indicates that in some regions, populations have reached high numbers. If this is correct, then how is it that we are not finding damage to *P. radiata* that we can attribute to this aphid? In an attempt to answer this question, aphid population trends are to be monitored over the next two years, in pine forests in the Bay of Plenty and Hawkes Bay. The methodology to be used in the same that that used in Australia.

In mid 2000 Toni Withers spent nearly 10 weeks in a USDA Forest Service quarantine laboratory conducting feeding trials with *Lymantria monacha* (nun moth) on *Pinus radiata*. In no choice trials *L. monacha* successfully completed its on *P. radiata* foliage alone although it is known that neonate larvae prefer to feed on young male cones. Growth rates were better than on a known favoured host, *Picea glauca*.

Eucalyptus spp:

Cardiaspina fiscella (Psyllidae) is currently distributed in the northern half of the North Island and since its arrival in 1996, has been responsible for extensive die back and death of *Eucalyptus saligna* and *E. botryoides*. In November 1999, *C. fiscella* nymphs were found to be parasitised by *Psyllaephagous gemitus* (Hymenoptera: Encrytidae), this parasite is now established throughout *C. fiscella's* area of distribution. Where parasitism occurs, severely attacked host trees appear to be recovering and there are indications that *C. fiscella* will be kept under control. In 1997 *P. gemitus* was investigated as a possible biological control agent by entomologists funded by the New Zealand Farm Forestry Association. The project reached the stage of applying to the Environmental Risk Management Authority for permission to import *P. gemitus* into containment in Auckland. Permission was granted in May 1999 but lack of funds meant that it was not imported into containment. There are at least three possibilities as to how this parasitoid reached New Zealand.

- The original population of *C. fiscella* carried a low population of the parasitoid. This seem unlikely as surveys of for the lerp during periods of very high populations found no evidence of parasitism.
- There has been a second incursion of *C.fiscella* into New Zealand, this time including lerps parasitised by *P. gemitus*.
- *P. gemitus* has been deliberately and illegally introduced.

We will probably never know which of these three scenarios is correct but in the meantime the health of *Eucalyptus botryoides* and *E. saligna* is showing a very marked improvement in areas where the parasitoid is present.

Glycaspis granulata (Psyllidae), which was first recorded from New Zealand in 1986, has been found to be parasitised by *Psyllaephagus quadricyclus* (Encyrtidae). It not known how long this Australia species has been in New Zealand; it was found during surveys for *Cardiaspina fiscella* parasitoids.

Ophelimus eucalypti (Eulophidae). Research on the biology and pest status of *Ophelimus eucalypti* revealed the insect is already parasitsed in New Zealand by at least two species of eulophid parasites, *Aprostrocetus* sp. and *Chrysonotomyia* sp. Therefore further expenditure on biological control cannot be justified. The biology and gall development of *Ophelimus* in susceptible host trees is now better understood, and resistant trees have been identified. The taxonomy of species in this genus remains unresolved, and the experimental use of an alternative method, allozyme electrophoresis, to separate species has been initiated.

In October 1999 very unusual and distinctive looking galls were found on *Eucalyptus nicholli* leaves in Auckland. The galls are approximately 8 mm long and protrude in a wavy red line (not unlike a roosters comb) through each side of the leaf. The developing larva can be found feeding inside the gall within an oval gallery. Development takes approximately 3 months and up to 25 galls have been found on a single leaf. Even on heavily infested trees there are no signs of ill health. Adults reared from the galls have been identified (Landcare Research, CSIRO and British Museum) as an undescribed species of *Nambouria* (Pteromalidae). This genus contains one other smaller species that causes galls on *Eucalyptus camaldulensis* in Queensland. The insect is apparently confined to a relatively small area (Mt Wellington) in Auckland and has also been found on *E. glaucescens* and *E. cinerea*.

Uraba lugens (Nolidae), first found in New Zealand in 1997, has not been sighted at Mt Maunganui since late 1999. An intensive survey for it is planned for spring this year. Perhaps the eradication attempt has been successful?

Acrocercops laciniella (Gracillariidae), first recorded in New Zealand in January 1999, is still apparently confined to the Auckland area. Monthly monitoring of *Eucalyptus pilularis* trees in Auckland has shown that it successfully over-wintered although abundance was much lower than during the warmer months. The first eggs were laid in flushing foliage in late October, with a second generation appearing in late December. Examination of leaf mines have failed, so far, to find any natural enemies of *A. laciniella* larvae, however mine failure seems to be quite high. Often mines split open before the larva is fully developed, which may result in the death of the larva. In addition the leaf may "abort" the eggs which are laid just beneath the cuticle, by abscising the leaf tissue surrounding the egg. This causes the egg to dehydrate and fail to hatch. There appears to be no effect on tree growth as yet.

Acacia spp.

Teia anartoides (Lymantriidae) was first discovered at Glendene in Auckland in May 1999. In September of the same year a separate infestation was found in Mt Wellington about 15 km away. Both sites are the subject of eradication attempts using ground-based sprays and selective host tree removal. The sites (ca. 1 km radius) are surveyed every 6-8 weeks. The insect is still present at Glendene but has not been seen at Mt Wellington since May 2000. *T. anartoides* is polyphagous but shows a distinct preference for *Acacia* spp. (s.l.). Attempts have been made to identify the pheromone but so far with no success. The eradication attempt is continuing.

Dicranosterna semipunctata (Chrysomelidae) was first found in Auckland in 1996 on *Acacia melanoxylon.* It has now spread to Orewa/Helensville in the north and south to north Waikato. As a result of a pest risk analysis a field survey for biological control agents was carried out in New South Wales in November 1999. Both larval and egg parasitoids were found. The most promising agent is an egg parasitoid, *Enoggera polita* (Pteromalidae). If funding is available the possibility of introducing this species into New Zealand will be investigated.

Acrocercops alysidota (Gracillariidae), the Australian wattle leaf miner, has been found to have a wider host range and feeding habit than previously recognised. Generally *A. alysidota* has been well known in New Zealand for its mining habit in the phyllodes of *Acacia melanoxylon*. In addition, mining of the stems and branches of young blackwood has been implicated in shoot dieback and subsequent multi-leadering of trees. There is some evidence that this insect contributes to the failure of many *A. melanoxylon* plantations in New Zealand by affecting tree form and timber quality. Bi-pinnate *Acacia* species, particularly *A. dealbata*, have been found with splits in the stems, branches and petioles, and withered shoots. This has been caused by

stem boring second and third instar larvae of *A. alysidota*. To the best of our knowledge this behaviour has not recorded previously on bi-pinnate acacias. The first instar was observed to mine beneath the stem and branch cuticle, with the second instar tunnelling deeper into the stem or branch. It may also tunnel into the petiole for several centimetres. The final instar cuts a round exit hole and leaves the tunnel to pupate. *Acrocercops alysidota* has now been recorded mining the phyllodes of *A. melanoxylon*, *A. longifolia, A. pycnantha, A. podalyriaefolia, A. cultriformis, A. saligna*, and *A. sophorae*, as a stem borer of *A. melanoxylon, A. dealbata, A. mearnsii, A. elata* and *A. suaveolens*, and as a pod miner of *A. melanoxylon* and *Paraserianthes lophantha*.

Urban and Rural:

Stegommata sulfuratella (Lyonetiidae) was found in Auckland in April 1999 leaf-mining in *Banksia integrifolia.* Since then it has been found in Northland, Waikato, Coromandel and Taranaki. Although quite widespread it is nowhere very abundant.

During the summer of 1999/2000 *Eucolaspis brunnea* (Chrysomelidae) caused noticeable damage to trees in Auckland parks and gardens. This native beetle is a generalist feeder and can cause significant defoliation by chewing the leaves of *Prunus* species, especially flowering cherries and fruit trees. It also feeds on eucalypts and has been responsible for creating extensive, and unevenly shaped, holes in the leaves of *Eucalyptus maculata*.
In one area where it was common it showed a decided preference for *E maculata* over *E. saligna* nad *E. pilularis.*

The eradication campaign for Dutch elm disease in Auckland continues. During the summer of 1999/2000 no pheromone trapping for *Scolytus multistriatus* was carried out but it is hoped to reinstate it this coming season. No new diaseased trees were found. In early 2000 a survey to determine the incidence of asymptomatic infection by *Ophiostoma novo-ulmi* was carried out. Approximately 2500 trees were sampled and staining was found in the inner growth rings of nearly 15% of them but *O. novo-ulmi* was not isolated from any of the material. This work will continue for at least one more year.

Acknowledgement:

I thank my colleagues, particularly Clive Appleton and Toni Withers, for providing information for this report.

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20 NEW ZEALAND – DISEASES

Collated and summarised by I. Hood (*Forest Research*), assisted by M. Dick and others, from data and information from the *Forest Research* Forest Health Database (L. Bulman), Forest Health News (*Forest Research*; editor, G. Ridley), the *Forest Research* Forest Health Reference Laboratories - Diagnostic Services (M. Dick, K. Dobbie), and from *Forest Research* Forest Health Advisory Services - Vigil (R. Morgan and Forest Health Advisers).

Introduction:

In the year from 1 July 1999 to 30 June 2000, records of disorders of forest trees on the Forest Health Database totalled 8, 792, slightly more than last year. Of these, 3,142 were fungal disorders. Pathology samples processed by the Forest Health Diagnostic Services over this period totalled 1206 (compared with 1053 in the previous year).

New records of fungi and algae (*Forest Research* Forest Health Reference Laboratories):

New to New Zealand:

Cylindrotrichum sp. from *Eucalyptus nitens* (Buller Biogeographic Region)

New Host:

Fusarium equiseti from *Pinus radiata* with dieback (Gisborne Biogeographic Region)
F. avenaceum from a *Pinus contorta* tree with dieback (Westland Biogeographic Region)

Fairmaniella leprosa from leaf spots on *Eucalyptus obliqua* (Auckland Biogeographic Region)
Phaeophleospora eucalypti from leaf spots on *Eucalyptus aggregata* (Buller Biogeographic Region)
Phaeophleospora eucalypti from leaf spots on *Eucalyptus macarthurii* (Wanganui Biogeographic Region)
Sonderhenia eucalypticola from leaf spots of *Eucalyptus fraxinoides* (Taupo Biogeographic region)
Stilbella cinnabarina from sapstain and decay of *Eucalyptus ficifolia* with dieback (Wellington Biogeographic Region)
Vermisporium acutum from leaf spots on *Eucalyptus megacarpa* (Wanganui Biogeographic Region)
Cephaleuros virescens on leaves of *Eucalyptus ficifolia* (Taranaki Biogeographic region)

Coleophoma cylindrospora from *Cupressus lusitanica* (Buller Biogeographic region)
Phyllosticta spinarum from *Cupressus arizonica* suffering from needle cast (Taranaki Biogeographic region)
Lepteutypa cupressi on *Thujopsis dolobrata* (Wellington Biogeographic region)
Seiridium unicorne from stem and branch cankers on *Sequoia sempervirens* (Mid Canterbury Biogeographic Region)
Stigmina thujina causing needle cast of *Chamaecyparis obtusa* (Wellington Biogeographic Region)

Thielaviopsis basicola from black root rot of stunted, chlorotic seedlings of *Acacia mearnsii* (Northland Biogeographic region)

Cephaleuros virescens on leaves of *Acmena* sp. (Taranaki Biogeographic region)
Phycopeltis expansa on leaves of *Ilex* sp. (Auckland Biogeographic Region)

Botryosphaeria parva from a gummy lesion on *Pseudopanax laetum* (Araliaceae; Auckland Biogeographic Region)
Sclerotia-forming fungus (Agonomycetales) from white decay of roots and butts, *Dodonaea viscosa* (Bay of Plenty Biogeographic)

There were also records of fungi found beyond their previously known distribution ranges (refer pages in Forest Health News (see Extension, below).

Administration and Policy:

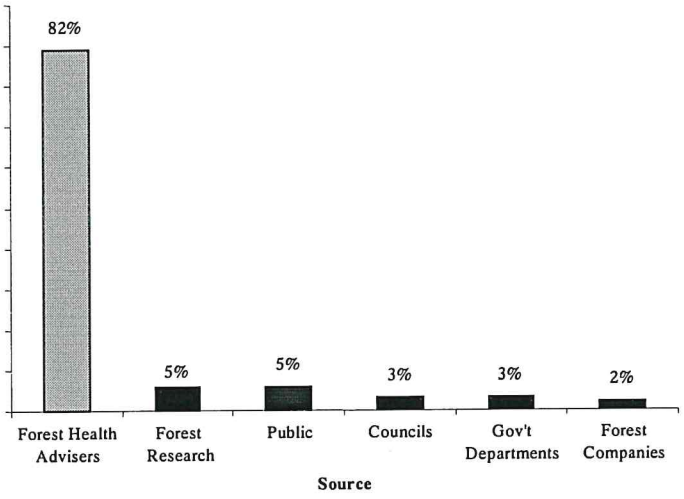
This year charges were further rationalised for the diagnosis of forest tree disorders provided by the Forest Health Reference Laboratory (*Forest Research*). Clients fall into three groups:

- Organisations that pay an annual diagnostic fee based on the area of the forests for which the services are sought. These are mainly forest companies belonging to the Forest Owners' Association. Forests are routinely surveyed by professional forest health advisers, who supply most of the samples.

- Individual members of the public. The cost of the service to the public and of other specific services of benefit to the country as a whole rather than to identifiable commercial sectors is deemed to be in the 'public interest' and is borne by the Government. The aim is to encourage the submission of unusual material to help in the early detection of incursions of overseas pests and diseases.
- Commercial entities, such as forest tree nurseries, forest consultants and professional arborists, who do not pay an annual fee. These groups are charged for each sample processed.

There have been dramatic changes in the administration of forest health surveillance in New Zealand. For the first time, surveillance was put out for tender by the Forest Owners' Association, and some regions are being surveyed this year by new surveillance providers who were successful in acquiring forests traditionally surveyed by the old government Forest Biology Survey (now evolved into a commercial subsidiary company of *Forest Research*). Competition for forest health surveillance is perceived as cost-efficient by industry clients. However, there are questions about the consistency and worth of the information that will emerge from different sources over successive years that impinge on "down stream" biosecurity, which depends upon the quality of the information gathered by field advisers. Formerly great value was placed on longer-term regional experience, the reliability of data, and the standardisation of survey methods. Advisers from throughout the country met routinely to compare notes and unify procedures. It is paradoxical that instability has been engendered at a time when biosecurity is being given a particularly high profile at the national level. The importance of maintaining trained and dedicated forest health surveillance personnel is clearly demonstrated in the graph below, which shows that 82% of the new records of insects and fungi pertaining to forestry, received by the Forest Health Reference Laboratory over the last ten years, were found by experienced surveillance staff.

Percentage distribution of 110 new records of insects and fungi found on trees and woody shrubs from 1 January, 1990 to 31 December, 1999, by collecting entity.



Changing policy developments in the diagnosis of quarantine samples are discussed in the Quarantine section.

Monitoring plots have been established in order to follow long-term trends in the health of *Pinus radiata* plantations. The initial work involves monthly assessments of ten health attributes on trees of three age-classes at two locations (twelve 25-tree plots), to determine seasonal influences on tree health ratings and test monitoring precision. Early results suggest that crown density, branch density, and degree of dieback will prove useful indicators of tree condition, and that data

using trained assessors will be sufficiently robust to yield statistically valid results. It is intended that this work will link in with a related project to determine plantation sustainability over successive rotations (*Lindsay Bulman*).

Extension:

Forest Research Forest Health Pest & Pathogen Leaflet Information is being placed on the Web, and may be sought on:

http://www.forestresearch.co.nz/largetext.cfm?page_id=1307&page_id=1307&CFID=545962&CFTOKEN=78831470

Forest Health News is now also accessible on the Web at:

http://www.forestresearch.co.nz/largetext.cfm?page_id=1508&page_id=1508&CFID=545962&CFTOKEN=78831470

Health of the Forest Estate

Following two dry summers, this year's growing season was comparatively wet in most parts of the country.

Plantations:

***Pinus radiata*:**

***Diseases*:**

Foliage

Despite a total of 834 records of *Dothistroma pini* needle blight, this disease had a lower impact this year. A smaller area (34, 000 ha) was sprayed aerially with copper fungicide for disease control than in the previous year, about two-thirds the original estimate. The later appearance of *Cyclaneusma* caused some confusion in the minds of a few forest owners, until reassured. More than half the records of *Dothistroma* were from the central North Island (Bay of Plenty and Taupo Biological Regions, 57% of records). *Dothistroma* was occasionally reported as locally severe, and by May, 2000, appeared to be building up in some forests where spraying had been deferred the previous season because infection was at that time judged to be marginal. The spray area may be greater next season.

Records of *Cyclaneusma minus* needle cast totalled 868, and this disease was again significant through much of the country, particularly in the central North Island and Northland (Bay of Plenty, Taupo, and Northland Biological Regions, 53% of records).

The *Strasseria*-associated defoliation attributed to *Cyclaneusma* that caused considerable concern last year did not develop to the same extent this season.

The condition known as upper mid-crown yellowing, attributed to a magnesium and potassium nutrient imbalance, was again reported in parts of the country this year

Stems, shoots:

Reports of Diplodia dieback (*Sphaeropsis sapinea*) totalled 236, with most records being from the central and eastern North Island, Northland, and Canterbury. A number of locally more severe occurrences were related to earlier dry conditions, pruning wounds, or in one case,

possible hail damage (20 ha with 10-15% trees affected). In Canterbury, a survey (P. Bradbury, Forest Health Adviser) of stands over 10-years-old found 5-55% of trees with malformation in the mid to upper stem leading to loss of the second log, attributable to stress from the previous very dry summers and subsequent infection by *S. sapinea*.

Roots:

There were 602 records of Armillaria root disease (*Armillaria novae-zelandiae* and *A. limonea*), this year. As previously, most were from the central North Island, Coromandel, and the northern and southern South Island. There was also a significant number of records from the eastern North Island, this year. Most records were of low-incidence mortality in young stands, since chronic infection is not readily identified during surveys. Serious ongoing mortality in first-rotation radiata pine stands on ex-*Nothofagus* sites in Fiordland is being addressed by planting with Douglas fir, which shows low mortality on such sites. There was a report of a "G.B. fungus" root disease centre (*Dextrinocystidium sacratum*; synonym, *Peniophora sacrata*) at Tangoio in the eastern North Island. Ill health in Wanganui in the southern North Island was attributed to *Leptographium* and *Ophiostoma* associated with heavy soil texture.

Other:

Symptoms of ill health caused by nutrient imbalance and adverse soil pH appeared again this year, in addition to the upper mid-crown yellowing defoliation syndrome referred to above. Problems associated with boron deficiency were reported in the southern part of the North Island.

Ongoing mortality, now attributed to a high soil pH (Peter Beets, Margaret Dick), continues in a small forest on the North Island East Coast. Increased areas of trees showing crown yellowing were reported this year. Mortality was first noted when the trees were four- to five-years old and approximately 500 trees have died in the last ten years, in a series of expanding mortality centres. Symptoms of yellowing foliage and shortened needles were associated with death of root systems and butts. Some trees showed seasonal cycles of chlorosis and recovery, and in some years no symptoms were recorded. Field examination, root excavation, isolating from roots and soil, and pathogenicity testing, have ruled out root-infecting fungi as the cause of death. The underlying rock is basaltic, and while the pH of the surface soil in affected patches is in the normal range for adjacent forest soils, the pH of the subsoil is comparatively high (6.5 or more). Under these conditions, the pH of ground water can also be expected to be high, and the availability of manganese will be low. Both of the major mortality patches are on old slip faces, indicating ground water pressure at these locations. Application of manganese fertiliser to correct the deficiency is not possible, because this mineral becomes unavailable when it contacts the high pH ground water.

The use of vulnerable planting stock resulted in some losses on exposed planting sites in Coromandel, this year. Damage from snow occurred again this year in Southland, and there was some salt burn on the exposed coast west of Auckland. Drooping of shoot tips in one central North Island forest in August was again attributed to frost.

Losses in a newly established stand in the central North Island were attributed to the incorrect application of ulexite, and fire damaged a small woodlot in Golden Bay at the northern end of the South Island. Unexplained symptoms of ill health were reported at several localised sites in the North Island. "Top yellowing" occurred in the east of the Island, and in the same region group mortality in five-year-old pines was ascribed to a physiological and nutrient cause, associated with *D. sacratum* and species of *Phytophthora*.

Possums have caused significant damage in some pine stands in the central and eastern North Island.

Douglas fir (*Pseudotsuga menziesii*):

Diseases

Records of Swiss needle cast disease (*Phaeocryptopus gaeumannii*) totalled 99, this year. A significant wood volume reduction following the appearance of *P. gaeumannii* in a number of forests in both the North and South Islands, was demonstrated (K.H. Lee, M. Kimberley, L. Knowles, *Forest Research*) using growth data, and distribution records supplied by Forest Health, based on the laboratory examination of foliage samples collected over a long period by forest health advisers. It is therefore apparent that the significant growth decline caused by this fungus in the central North Island is more general through much of the country.

Effects of earlier dry conditions were still apparent in some mid and later rotation Douglas fir stands that had experienced drought conditions in previous years.

Eucalyptus species:

Diseases

As in previous years, a high number of leaf spot fungi were recorded on eucalypt species throughout the year. These included *Aulographina eucalypti* (23 records), *Fairmaniella leprosa*, *Mycosphaerella* species (particularly *M. cryptica*), *Phaeophleospora eucalypti* (synonyms, *Kirramyces eucalypti*, *Septoria pulcherrima*; 33 records), *Pseudocercospora eucalyptorum*, *Sonderhenia eucalypticola*, and *S. eucalyptorum*. In most cases these fungi had limited host impact, but *S. pulcherrima* continued to cause a severe leaf cast disease of *Eucalyptus nitens* in the coastal Bay of Plenty region. A number of new records on eucalypts are listed above.

The branch cankering condition in *Eucalyptus nitens* on the South Island West Coast associated with a *Sarcostroma* species (now formally described as *S. mahinapuense* Gadgil and Dick) was reported as having worsened, by September, 1999. This fungus, also known on other eucalypt species in the central North Island and Nelson regions, is consistently associated with the canker symptoms in *E. nitens*, and appears to be the cause of the problem.

Widespread frost burn of *E. nitens* was reported in a central North Island plantation in winter, in September, 1999. Trees in the same forest displayed symptoms in the lower crown suggestive of nitrogen deficiency in October. Unexplained thinning in the crowns of trees of *E. regnans* was observed in another central North Island forest in March, 2000.

Acacias:

Uromycladium alpinum, previously identified on *Acacia dealbata* at Gisborne in December 1998 during a routine port environs survey (Colin Barr, Forest Health Adviser), was found this year infecting *A. mearnsii* and *A. dealbata* in Auckland, Wanganui and Northland. On these hosts the disease it causes is characterised by vast masses of spores produced in a mucus which coats the pinnae, often webbing the pinnules together, before they are cast. Newly developing spring flush of infected *A. mearnsii* becomes distorted and chlorotic. Current indications are that *A. dealbata* is less susceptible to the disease than *A. mearnsii.* In one nursery where some beds of *A. mearnsii* were infected and plants appeared somewhat stunted, the adjacent *A. dealbata* seedlings were

barely affected. Both hosts are also susceptible to the gall-forming *U. notabile* (M. Dick, C. Barr).

Cypresses:
Diseases

This year a countrywide survey was completed by *Forest Research* assessing the incidence of cypress canker disease caused by *Seiridium unicorne* and *S. cardinale* in different regions, host species, stand types and under different silviculture treatments. With the proliferation of small cypress woodlots around the country, and expressions of concern about cypress canker disease, it was felt necessary to determine the impact of this disease on the changing resource. As part of the survey, a questionnaire accompanied by a leaflet describing and illustrating the disease was distributed to growers with the assistance of the New Zealand Farm Forestry Association Cypress Development Group, and by means of an insert in *Tree Grower* magazine. The form was structured using a "user-friendly" format, and return postage was by freepost, to encourage response. Completed questionnaires were received from 317 growers, with information on 734 stands. The disease survey confirmed that cypress canker is widespread, though variable in impact, throughout the country. There was significant variation in both rural stands and larger forest plantations for species, region, and pruning treatment. In decreasing order of severity, the cypress species or types ranked: *Cupressus macrocarpa* (most diseased), *Chamaecyparis lawsoniana*, ×*Cupressocyparis leylandii*, *Cupressus lusitanica*, ×*Cupressocyparis ovensii* (least diseased). For *Cupressus macrocarpa* there was a gradual increase in disease severity in this species from south to north through the whole country. More disease was reported in pruned stands than in unpruned stands. Information obtained is being prepared on a result sheet that will be sent to all who replied (I. Hood, J. Gardner).

New host records on cypress species are recorded above. There was also a first record of one of the cypress canker fungi, *Seiridium unicorne*, on the non-cypress species, *Sequoia sempervirens*. This year there were four records of *Stigmina thujina*, one being a new host record (*Chamaecyparis obtusa*; *S. thujina* currently has significance only on *Ch. lawsoniana* on the South Island West Coast).

Nurseries:
Diseases

As previously there were few requests for nursery inspections, this year.

Radiata pine seedlings symptomatic of terminal crook disease were found in a Nelson nursery in February, 2000, and the presence of the causal fungus, *Colletotrichum acutatum* f.sp. *pineum*, subsequently confirmed at the Forest Health Reference Laboratory. This nursery disease of mainly one-year-old seedlings was first recorded in New Zealand in 1963 at Woodhill, with further records north of Auckland were being followed by its appearance in Kawerau in 1966, Tokoroa in 1968, Gisborne and Kaingaroa in 1970, and Rotorua in 1971, all in the central North island. The disease did not reach the lower part of the North Island until the 1980s, and not until now has it reached the South Island. It is likely that the pathogen was transported as a contaminant of soil or plant debris, possibly left in planting boxes. All plants found were destroyed, and no new diseased seedlings were seen in June, but it remains to be seen whether diseased plants will be found again next summer.

Thielaviopsis basicola was found causing black root rot in stunted, chlorotic seedlings of *Acacia mearnsii* in a Northland nursery (see new records, above).

Urban:

Diseases

Armillaria root disease continued to afflict the Christchurch Botanic Gardens, this year. Since a systematic search for the causal fungus began in 1991, around 60 tree species have been found infected. Although some trees are killed quickly, most undergo a gradual decline, with sections of the crown becoming progressively unthrifty. An area called the Pine Mound, which photographs indicate to have contained more than 40 healthy trees of *Pinus pinaster* in the 1940s, can today boast only 15, the most recent death, in 1987, being that of an 80-year-old tree heavily colonised by *Armillaria*. Numerous trees are currently infected throughout the Gardens, and on some, mycelial sheets extend up to a height exceeding 5 m. Normal cultural practices since the Gardens were established in 1863, particularly stump retention, have continued to foster the disease, and tree removals frequently disclose old decaying stumps and wood debris colonised by *Armillaria*. The Christchurch City Council has developed a management strategy that includes the promotion of cultural practices that minimise tree stress, such as fertilisation and good drainage, regular tree health monitoring and removal of the woody food base, where possible, and trials to test soil fumigation and biological control (D. Steinegg, P. Bradbury).

Phyllosticta spinarum has been consistently associated with dieback, particularly in the lower crown, of *Cryptomeria japonica*, *Cupressus macrocarpa*, and *Chamaecyparis lawsoniana*, from Auckland to Wellington. Although this disease has been observed during surveys since 1995 the frequency of collections increased this year (*M. Dick*).

Native vegetation:

A publication of an annotated bibliography of over 400 references, by Project Crimson, marked the culmination of an initiative arising from *Forest Research* Forest Health Group's national assessment of pohutukawa health in 1989 (*Metrosideros excelsa*, Myrtaceae). Stephanie Smith, who undertook the project, worked closely with the Forest Health Group and *Forest Research* library staff. The resulting document, which includes both published and unpublished references, covers all aspects of pohutukawa and tree rata (*M. robusta*) ecology, biology, health, and propagation. It includes many historical references and obscure publications, and will be a source document for anyone looking for information on New Zealand's *Metrosideros.* The document can be found on the Project Crimson web site (www.projectcrimson.org.nz) (G. Hosking)

Sampling of designated risk sites led to a number of interesting records on native hosts, which were identified by the *Forest Research* Forest Health Reference Laboratories Diagnostic Services. These included a leafspot on karaka (*Corynecarpus laevigatus*, Corynocarpaceae) caused by a species of *Phyllosticta* (Auckland, Bay of Plenty Biogeographic Regions; it is not clear if this is the same species as *Strasseria corynocarpi* reported from karaka in Portugal in 1949); and different species of *Phomopsis* isolated from dead and dying shoots of karaka (Auckland Biological Region) and *Libocedrus plumosa* (Cupressaceae; Wellington Biological region), respectively. Other records, this year, included (B. Rogan): *Cashiella sticheri* in living pinnules of the fern *Sticherus cunninghamii* (Gleicheniaceae) dying from unknown cause (Wellington Biogeographic Region); *Acremoniella* sp. in living and dead leaves from dieback-affected *Pteris tremula* (Pteridaceae; Wellington Biogeographic Region); *Coleophoma cylindrospora* causing leaf lesions on *Pseudopanax crassifolius* (Araliaceae; Wellington Biogeographic Region; also found on exotic conifer hosts elsewhere in New Zealand). Deformation of *Cyathea* foliage continued at a location in Southland (Cyatheaceae; R. Thum),

and mortality of isolated *Nothofagus solandri* trees was associated with track modification disturbance and infection by *Armillaria*.

Shoot and twig dieback of totara (*Podocarpus totara*, Podocarpaceae) occurred in locations in the Bay of Plenty, Taranaki and Westland Biogeographic Regions. Records of this disorder, which may be quite severe in some seasons, date back to the 1950s. A range of fungi are associated with the dieback, but these vary in pathogenicity, and no single organism has been identified as the dominant cause. Trees in locations in Northland and the central North Island which suffered from striking dieback symptoms in 1998 and early 1999, were comparatively disease free this year (M. Dick).

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21 NEW ZEALAND – BIOSECURITY AND QUARANTINE

Report compiled by Geoff Ridley, Lindsay Bulman, Margaret Dick, Roger Crabtree, New Zealand Forest Research Institute Ltd

Interceptions: For the year ending 30 June 2000 some 253 quarantine samples containing 333 organisms were received from the Ministry of Agriculture and Forestry (MAF) quarantine inspectors. Of the organisms identified 281 were insects and 41 were fungi. The source of these organisms were – air cargo 5 (1.5%), dunnage 11 (3.3%), free flying insects 12 (3.6%), plant debris in containers 16 (4.8%), plant debris on ships 2 (0.6%), sawn timber 44 (13.2%), vehicles 165 (49.5%), wood products 7 (2.1%), wood on ships 6 (1.8%), and wood packaging 65 (19.5%). The geographic area of origin of these samples were - Asia 208 (62.5%), Australasia 42 (12.6%), Pacific 13 (3.9%), North America 17 (5.1%), Europe 18 (5.4%), Africa 1 (0.3%), South America 7 (2.1%), and uncertain 21 (6.3%).

Forestry Quarantine Samples: For the year ending 30 June 1999 some 576 quarantine samples were received from the Ministry of Agriculture and Forestry quarantine inspectors. The total number of quarantine samples received in 1995/96 and 96/97 were 1214 and 1554. The number of samples declined to 832 in 1997/98 and this was attributed to the winding down of the used car import survey in late 1997. However the number of samples continued to decline in 1998/99 and in October 1999 it was estimated that numbers would decline to around 440 samples. Samples numbers for 1999/2000 in fact dropped to 253. This could reflect an increase in vigilance on the part of the exporters but it is more likely that the restructuring of the MAF has disrupted continuity of collecting. Also dead insects are no longer considered a quarantine matter and are not being sent for identification. This will have serious repercussions on New Zealand's ability to monitor and predict pest and disease entry pathways. A MAF press release (21 October 1999) announced 29,346 quarantine seizures had been made over the last 6 months at Auckland Airport contrasting sharply with the 193 forest related quarantine specimens that arrived at *Forest Research* over that period.

Gypsy Moth: A quarantine sample from Christchurch underlined the potential for gypsy moth, and other pests with similar habits, to appear almost anywhere in the country. An egg mass was found on a car during an Automobile Association inspection some six weeks after the vehicle had arrived in New Zealand. The car had presumably been sitting in a dealers yard for most of that time, and if like most, it had simply been bought and driven away without a pre-purchase inspection, the eggs could have ended up anywhere in the country. On examination at *Forest Research* they were found to be viable and to contain well formed larvae. This once again emphasises the biosecurity risk created by the large used car trade.

Biosecurity - Pine pitch canker fungus (*Fusarium circinatum*): The DNA from 86 New Zealand isolates of *Fusarium* species from the Section Liseola has been examined. DNA from isolates of the pitch canker fungus (*F. circinatum*) originating from South Africa, south-eastern United States and Mexico was acquired for evaluation along with that from living isolates of *F. circinatum*held at FR. Molecular tools to aid in the rapid identification of the pitch canker fungus can now be used with confidence in this country (*M. Dick*).