Ministerial Council for Forestry, Fisheries and Aquaculture

STANDING COMMITTEE ON FORESTRY
RESEARCH PRIORITIES AND COORDINATION COMMITTEE

Meeting Number
Location
Date
Agenda Number

ANNUAL DISEASE STATUS REPORT FOR AUSTRALIA AND NEW ZEALAND

1994/95

INTRODUCTION

1.This report presents the year's annual statement of forest disease conditions throughout Australia and New Zealand. It follows from Outcome 5 of the 1994 Operating Plan of Research Working Group 7 Forest Pathology, and is summarised from the individual state and country reports submitted (Annex A).

PURPOSE

2.To communicate the annual statement of forest disease conditions in Australia and New Zealand to the Standing Committee on Forestry for its information, consideration and any action deemed necessary.

CONSIDERATION

AUSTRALIA

***Pinus radiata*:**

Plantations:

3. Drier conditions this year resulted in a lower incidence of Dothistroma needle blight (*Dothistroma septosporum* or *D. pini*) in New South Wales, Victoria, and Tasmania, but levels were high in a small plantation in the Dividing Range in Queensland. Recovery from heavy defoliation due to this disease in 1993/94 has been slow in Victoria. *Dothistroma* was found for the first time in southern Tasmania. However, Spring Needle Cast has been a more significant foliage disease than *Dothistroma* in this state. Losses in young *P. radiata* caused by *Phytophthora cinnamomi* root infection in association with adverse environmental factors were reported from Queensland and Victoria. Drought stress was responsible for some mortality in several plantations in Western Australia, and frost damage occurred in stands up to 7 years old in New South Wales.

Nurseries:

4. Poorly growing *P. radiata* seedlings infected by *Phytophthora* species (*P. cinnamomi* and *P. nicotianae*) were quarantined in one nursery in New South Wales. Terminal crook disease, caused by *Colletotrichum acutatum* was found to have spread to another nursery in the same state.

Other *Pinus* species:

Plantations:

5. Bluestain fungi caused degrade in *P. elliottii* trees in a forest in Queensland during salvage operations following severe fires towards the end of 1994 (the worst recorded in plantations in the state). Nearly all bluestain was associated with attack by the introduced bark beetle *Ips grandicollis*, and stain first became significant in standing trees 10-14 weeks after fire damage. Limited losses have occurred in newly planted *P. elliottii* X *P. caribaea* stock in Queensland associated with dry conditions, and damage from excessive soil salinity also occurred. *Fusarium subglutinans* has been found in seedlings of *P. elliottii* and *P. taeda* in New South Wales but isolates appear unable to cause disease in exotic pines, suggesting that the strains present in eastern Australia are a of a different pathotype to those that cause pitch canker disease in North America.

Nurseries:

6. Low viability of *P. elliottii* X *P. caribaea* seed sown in a Queensland container nursery was associated with infection by *Lasiodiplodia theobromae*, which is believed to occur when seed is collected prematurely. Post-emergence losses in another, open-rooted Queensland nursery appear to have been caused by heat stress and wind exposure.

Araucaria cunninghamii:

Plantations:

7. Losses from root rots continued in Queensland hoop pine plantations on former rainforest sites. The principal agents were *Phellinus (Fomes) noxius* and *Junghuhnia* (*Poria*) *vincta.* Limited establishment losses resulted from soil drought, frost and herbicide damage.

***Eucalyptus* species:**

Plantations and regrowth stands:

8. Foliage diseases were reported at comparatively low levels this year due to the prevailing dry conditions. However, significant damage with some mortality to *E. regnans* was caused by *Aulographina eucalypti* infection in association with psyllid damage in the Central Highlands of Victoria. Low incidences of *A. eucalypti* and *Mycosphaerella cryptica* were observed in plantations in Western Australia.

9. Stem cankering in *E. nitens* associated with infection by *Endothia gyrosa* was observed in northern parts of Tasmania. Although incidence was low, the problem is causing concern.

10. A high incidence of stem decay caused by white rot fungi was found in *E. grandis* and *E. saligna* in parts of New South Wales associated with attack by cerambycid beetles. Stem decay originating mainly from pruning wounds was also common in *E. nitens* in Tasmania. In Western Australia, incidence of decay as measured in sawlog samples was found to be greater in regrowth than in virgin *E. diversicolor* stands (karri). In regrowth stands decay fungi had entered through branches, borer galleries and fire scars, and incipient decay was more common at ground level in dominant and co-dominant trees. Axial movement of two decay fungi was related to width of sapwood and time since entry.

11. Root disease caused by *Phytophthora cinnamomi* infection associated with root coiling from poor planting was present in 2-year old *E. nitens* plantations in parts of eastern Victoria.

12. Mortality of *E. globulus* associated with drought conditions occurred in some plantations in Western Australia.

Nurseries:

13. Losses occurred in seedlings of *E. cloeziana* and *E. pilularis* from infection by *Cylindrocladium parasiticum* in a nursery in northern Queensland. This fungus causes a disease of peanuts but has not previously been recorded on eucalypts in the area. Infected batches were destroyed. Significant leaf necrosis was inflicted on seedlings of *E. cloeziana* and *E. pilularis* in some New South Wales nurseries by *Botrytis cinerea*, *Hainesia lythri* and *Cylindrocladium clavatum*.

Native plant communities:

14. Outbreaks of root disease caused by *Phytophthora cinnamomi* infection were reported in understory species in eucalypt forests in parts of Victoria. The disease occurred in areas under residential development as well as in flora reserves. In Tasmania *P. cinnamomi* is threatening a number of rare indigenous plant species. Mortality was observed in other indigenous plant communities in this state associated with an unidentified *Phytophthora* species with a low temperature optimum. This undetermined species has previously been detected in parts of North and South America, and may have pose a threat to these communities in Tasmania.

Urban:

15. Unhealthy ornamental trees infected by *Ganoderma* sp. *aff. lucidum* were commonly reported

in Queensland. This fungus has now been shown capable of attacking living roots. Other diseased ornamental trees were infected by *Phellinus noxius* in Queensland and *Armillaria luteobubalina* in Tasmania.

NEW ZEALAND

16. Routine health surveillance of all forest plantations in New Zealand makes possible a comprehensive systematic annual evaluation of plantation health throughout the country (Annex A). Diseases were rated on severity and incidence for each biological region. Exotic plantations were generally healthy, but four diseases or disorders were important in *P. radiata* plantations. The diseases are controlled through chemical or silvicultural means.

Pinus radiata:

Plantations:

17. Cyclaneusma needle-cast (*Cyclaneusma minus*) was moderately severe in the northern half of the North Island due to favourable weather conditions. North of Auckland symptoms appeared earlier and foliage browning was more extensive than normal. The disease was locally important in the southern North Island and of low to moderate incidence in the South Island. Weather conditions also favoured Dothistroma needle-blight (*Dothistroma pini*) south of Auckland in the North Island, and in the western, southern, and parts of the northern and central South Island. Incidence of disease was only locally important in inland forests north of Auckland and was low in the eastern North Island. Infection was promoted in young stands oversown with lotus.

18. Armillaria root-disease (*Armillaria* species) was common in the central North Island, mainly in the form of chronic, non-lethal infection. In the South Island disease was common in Westland, Southland, Otago, and in parts of Nelson and Marlborough in the north. The disease has not been a problem north of Auckland and in the eastern North and South Islands. In Westland incidence of stump colonisation was higher in burnt than in unburnt cutover *P. radiata* areas.

19. Upper mid-crown yellowing was common in the northern half of the North Island, and caused problems locally in the southern North Island. In the South Island, the disorder was reported only in the south, where incidence and severity had increased.

20. Diplodia dieback (*Sphaeropsis sapinea*) was significant in the eastern North Island in association with wind damage, and in the northern and eastern South Island following dry conditions. Toppling problems have been encountered on fertile sites due to excessive top growth of high GF selected stock, and in Canterbury in the South Island poor lignification and loss of rigidity has been partly attributed to cold injury. Losses from lightning strikes occurred in the northern South Island.

Other species:

Plantations:

21. Swiss needle-cast (*Phaeocryptopus gaeumannii*) was present in *Pseudotsuga menziesii* (Douglas fir) throughout the country. *Mycosphaerella* showed a scattered incidence on susceptible *Eucalyptus* species in parts of both islands, and *Aulographina* was widespread on certain eucalypt hosts in the central North Island. Other species infecting eucalypt leaves showed scattered regional occurrences (Annex A).

RESEARCH

22. The following outline gleaned from the respective state and organisation reports (Annex A) is not by any means complete or representative of current forest pathology research in Australasia. It merely collates the described research topics into a convenient summary of some of the work being undertaken and reported on. Presentation is by state or organisation.

23. **Queensland:**

- Effects of silviculture and host genotype on Dothistroma needle blight in *Pinus radiata*.
- Documentation of diseases of tropical *Acacia* species (joint study, CSIRO).

24. **New South Wales:**

- Identification of fungi causing stem decay in plantation-grown *Eucalyptus saligna* and *E. grandis*.

25. **Victoria:**

- Quaternary ammonium compounds for nursery and equipment hygiene.
- Control of a nursery disease complex using soil sterilisation and application of urea.
- Artificial defoliation to determine impact on growth of eucalypts.

26. **Tasmania:**

- Identification of decay fungi isolated from eucalypts.
- Pathogenicity testing of a new, unidentified *Phytophthora* species in indigenous plant communities.
- Surveys to find populations of endangered indigenous plant species in locations distant from known occurrence of *P. cinnamomi.*

27. **Western Australia:**

- Glasshouse screening and field trials of clones of *E. marginata* (jarrah) resistant to *P. cinnamomi*.
- Determination of genetic markers for resistance to *P. cinnamomi* in *E. marginata*.
- Variation in pathogenicity of *P. cinnamomi* isolates in resistant and susceptible *E. marginata* clones.
- Effects of low oxygen levels and temporary inundation on the resistance of *E. marginata* to *P.cinnamomi*.
- The ability of *P. cinnamomi* to invade undamaged, suberised stems of *Eucalyptus marginata*.
- Long term ecological changes in *P. cinnamomi* dieback sites in *E. marginata* forests.

•The role of *Phytophthora citricola* in *E. marginata* forest and heathlands (results presented).
• Control of *P. cinnamomi* in *Banksia* spp. using phosphonate, including aerial application (results presented).
• Sensitivity of *P. megasperma* isolates from coastal heathlands to phosphonate (results presented).
• Identification of subgroups of *P. citricola* and *P. megasperma*, and their distribution in native plant communities, using isozyme analysis (results presented).
• Development of a model for integrated management of *P. cinnamomi* in native plant communities.
• Biocontrol of *P. cinnamomi* in conservation areas.
• Use of isozymes for rapid *Phytophthora* identification to aid in the routine processing of diagnostic samples.
• Surveys of stem decays, in association with insect attack, in regrowth *E. diversicolor* (karri).
• Control and extent of *Armillaria* in regrowth *E. diversicolor*.
• Biological pulping and bleaching of eucalypt wood.

28. **CSIRO Division of Forestry, Forest Pathology collaborative research:**
• Stem defect in regrowth stands.
• Biocontrol of *Phytophthora cinnamomi*.
• Marker-aided selection for resistance to *P. cinnamomi*.
• Diseases of plantation-grown acacias, eucalypts, and casuarinas in SE Asia and northern Australia.

CONCLUSION

29. This report is the annual disease statement of Research Working Group 7 recording the 12-month state of forest health in Australia and New Zealand.

RECOMMENDATIONS

30. The annual disease statement be accepted and noted by the Standing Committee.

FOR INFORMATION

Research Working Group 7
INDOOROOPILLY (Secretary)
14 August 1995

ANNEX A: Forest disease situation reports 1994/95 by states and country.

ANNEX A

FOREST DISEASE SITUATION REPORTS 1994/95 BY STATES AND COUNTRY

QUEENSLAND

Ian A. Hood, Queensland Forest Research Institute, Queensland Department of Primary Industries, Indooroopilly.

1. *Pinus* plantations

Intermittent rainfall eased drought stress to some extent in unthinned lowland coastal pine plantations in southeastern Queensland, but conditions are still very dry. Establishment failures were significant among *Pinus elliottii* var. *elliottii* x *P. caribaea* var. *hondurensis* hybrid stock as a result of the dry soil conditions. Excessive soil salinity caused chlorosis and defoliation with some terminal dieback on many trees in 3-year old F1 hybrid pine in two adjacent compartments at Toolara Forest during August.

Bluestain fungi were a significant factor during a major salvage operation following uncontrolled fires in September and November, 1994, at Beerburrum, 50 km north of Brisbane. The fires burnt through 9,000 ha of mainly slash pine (*P. elliottii* var. *elliottii*). Approximately 600,000 m^3 wood volume was salvaged from state forest land of which something like 1/6 had lost value through sapstain prior to salvage. Almost all bluestain was associated with attack by the introduced bark beetle *Ips grandicollis* which vectors the bluestain fungus *Ophiostoma ips*. Joint Pathology-Entomology plots were established using trees of three age classes and three levels of crown damage to monitor the progress of degrade organisms and advise management accordingly. Bluestain first became significant in standing trees in some plots 10-14 weeks after fire damage, ca. 4-5 weeks after initial attack by *Ips*. Bluestain developed more slowly in trees still retaining green crowns. Overall mean moisture content fell to below 100% (dry weight basis) in the outer sapwood 14-18 weeks after the fire (variation between trees was considerable). Tests were set up to investigate rewetting of dry logs during storage under sprinklers. Salvage of the small remaining areas of standing dead trees was terminated 8 months after the second fire following microscopic evidence of decay, including soft rot.

Dothistroma needle blight caused by *Dothistroma pini* (*D. septosporum*) was severe in young *P. radiata* at Gambubal Forest in the Dividing Range in 1994, with crowns on some trees more than 50% diseased. Plots have been established to monitor the effects of pruning and thinning on disease levels, and to compare stock selected for resistance in Victoria and New Zealand with local material. *Phytophthora cinnamomi* in association with poor soil conditions is causing a low incidence of mortality in young *P. radiata* over a wide area of Paschendaele Forest near Stanthorpe.

2. Hoop pine (*Araucaria cunninghamii*) plantations

Root disases continued to cause losses in hoop pine plantations. An evaluation of data from long term monitoring plots indicated that *Phellinus noxius* infection centres appear to become quiescent in some stands or may remain active for more than 20 years throughout a rotation in others. *Junghuhnia (Poria) vincta* was responsible for a low incidence of mortality over several compartments in young second rotation hoop pine stands on former rainforest sites at Jimna, north of Kilcoy and also at Amamoor. Isolated mortality due to attack by *Rosellinia* sp. was also observed at Imbil in 1994. Establishment failures in newly planted hoop pine at Imbil were attributed to insufficient soil moisture following planting. There were also minor losses in newly established hoop pine from frost and herbicide damage.

3. Nurseries

Emergence of open-sown *Pinus elliottii* var. *elliottii* x *P. caribaea* var. *hondurensis* F2 hybrid seedlings was satisfactory this year at Toolara Nursery, but some post-emergence losses were noted that may have been caused by heat stress and wind exposure. Low viability among F1 hybrid seedlots sown in containers at Beerburrum Nursery was associated with infection of seed by *Lasiodiplodia theobromae* that appears to occur when cones are collected prematurely.

Infection by *Cylindrocladium parasiticum* caused losses among *Eucalyptus cloeziana* and *E. pilularis* seedlings at Ingham Nursery in June 1995. This fungus is responsible for an important disease of peanuts in North Queensland. The infected batches were destroyed and measures were recommended for keeping plants destined for rural plantings free of disease (Community Rainforest Reafforestation Programme). It was advised that these species should not be distributed from Ingham Nursery beyond the range of known disease occurrence.

4. Hardwoods

Samples collected in North Queensland as part of a joint CSIRO-coordinated, CIFOR-funded project are being studied in order to record diseases and infections of natural and planted tropical *Acacia* species.

5. Urban

A considerable number of queries have been received involving infection of unhealthy ornamental hardwood tree species by *Ganoderma* sp. *aff. lucidum*. Glasshouse inoculation studies have shown

that this fungus is capable of penetrating below the cambium of healthy seedlings and destroying roots. *Phellinus noxius* was also the cause of some urban tree mortality in Brisbane.

NEW SOUTH WALES

Jack Simpson, Research Division, State Forests of New South Wales, Beecroft.

Until the late break in autumn most of the forests in New South Wales were under drought conditions. Consequently diseases caused by fungi with splash dispersal conidia, such as *Dothistroma septosporum* (Dorog.) Morelet on *Pinus radiata* D.Don, were generally of only minor significance in field plantings. Noteworthy disease outbreaks included:

1. *Botrytis cinerea* Pers., *Hainesia lythri* (Desmz.) Höhn., and *Cylindrocladium clavatum* C.S. Hodges & L.C. May caused significant leaf necrosis of foliage of seedlings of *Eucalyptus pilularis* Sm. and *E. cloeziana* F. Muell. in some nurseries. In some instances there was carryover into field plantings. The outbreaks could be controlled effectively by spraying at 14 day intervals with chlorothalonil.

2. Terminal crook disease, caused by *Colletotrichum acutatum* J.H. Simmonds, was found for the first time on P. radiata seedlings in Canobolas Nursery, Orange. Incidence was low and the outbreak was controlled with fungicides.

3. *Phytophthora cinnamomi* Rands and *P. nicotianae* Breda de Haan were isolated from unthrifty *P. radiata* plants in Bondo Nursery, Tumut. Infected beds were placed under quarantine.

4. Severe frosts at the beginning of April 1995 caused needle and/or top dieback of 1988 age class or younger *P.radiata* in Tumut and Tumbarumba Districts. Dying needles had a high incidence of infection by *Strasseria geniculata* (Berk. & Broome) Höhn., *Cladosporium* spp. and *Epicoccum nigrum* Link.

5. A felling study of plantations of *E. grandis* W. Hill ex Maiden and *E. saligna* Smith in Central and Northern Regions showed a high incidence of attack by cerambycid beetles and associated white rots caused by basidiomycetes. Identification of the fungi is in progress.

6. Pitch canker, caused by *Fusarium subglutinans* (Wollenweb. & Reinking) P.E. Nelson, T.A. Toussoun & Marasas is causing significant losses of trees of *P. radiata* in roadside plantings and plantations in California. The fungus is widespread in eastern Australia but not associated with pitch canker. We have isolated *F. subglutinans* from seedlings of *P. elliottii* Engelm. and *P. taeda* L. and from seed of the former species. However, when inoculated onto pines in the glasshouse the fungus did not cause disease symptoms. It seems the pitch canker strains are a different pathotype. Imports of grain and timber from USA may be an inadvertent means of introducing these pathotypes to Australia.

VICTORIA

Ian Smith, Centre for Forest Tree Technology, Department of Conservation and Natural Resources, Kew.

1. *Pinus radiata*

1.1 *Dothistroma septosporum*

The dry spring/summer of 1994/95 has resulted in a large reduction in the level of disease in Radiata Pine plantations throughout the state. Plots established in high hazard areas to monitor disease development have shown levels of infection of green needles of less than 5%. Recovery from the defoliation of 1993/94 however has been slow in areas where >75% of needles were lost, with some areas still only exhibiting 30% of effective crown. The pathogen has now been recorded on one site in the Strzlecki Ranges in the south-east of the state. The disease has not as yet been found in plantations in the far south-west.

1.2 *Phytophthora cinnamomi*

The pathogen has caused planting losses in north-east Victoria. This was associated with a number of stress factors including high chloride levels in the foliage, drought and possibly the application of velpar during dry conditions.

The use of quaternary ammonium compounds (quats) for nursery hygiene and vehicle and machinery washdown was evaluated. All quats are not as effective as each other and appear dependant on the type and composition of alkyl groups used in their formulations.

1.3 Nursery diseases

A complex disease situation involving both fungi, nematodes and nutrition has been investigated in an open rooted *P. radiata* nursery. Sterilisation of the soil using Basamid and the use of high rates of urea have given excellent control of the disease.

2. *Eucalyptus*

2.1 Foliage and branch pathogens

The level of disease of plantation grown eucalypts was very low due to the below average rainfall over the spring/summer of 94/95. Trials have been established using artificial defoliation techniques, to determine the impact of different levels of defoliation on growth of eucalyptus in plantations.

Despite the relatively dry conditions in Victoria, *Aulographina eucalypti* is still causing damage to *Eucalyptus regnans* regrowth in the Central Highlands in an association with psyllid damage caused by *Cardiospina bilobata.* Significant areas of 1939 *E. regnans* have been affected with significant tree deaths in some areas. The cause of deaths following defoliation is still to be determined however mortality appears confined to wetter gully sites and is associated with wood rot and decay fungi.

2.2 *Phytophthora cinnamomi*

The disease is still causing significant damage to understorey species particularly in areas set aside as flora reserves. New outbreaks of disease have been reported from Central Victoria, particularly in areas under residential development. Disease was also recorded from two year old

Eucalyptus nitens in plantations in north-east and south-east Victoria. Disease appears to have been aggravated by poor planting techniques resulting in root coiling.

TASMANIA

Tim Wardlaw, Division of Silvicultural Research Development, Forestry Tasmania, Hobart.

1. *Pinus radiata*

Dothistroma septosporum was found for the first time in southern Tasmania on two trees in a plantation near Maydena. The level of *Dothistroma* infection in this stand and elsewhere was uniformly low. Spring Needle Cast remains the most significant disease problem of *P. radiata* in Tasmania.

2. *Eucalyptus*

Stem canker of *Eucalyptus nitens* associated with *Endothia gyrosa* stem infection is still viewed with concern in Tasmania. The disease is still at low levels in most *E. nitens* plantations with annual cankers found in stands at Camden (northeastern Tasmania) and Hampshire (northwestern Tasmania). The sever canker outbreak in a 16-year-old stand at Tewkesbury (northwestern Tasmania) appears to be in remission with some evidence of healthy callus tissue growing around the margins of many perennial cankers.

Surveys of the incidence and extent of stem decay in young eucalypts continue to find large variation, between sites, in the incidence of "final crop" trees with high levels of decay. Branch shedding still constitutes the origin of most decay columns. Recent surveys in pruned stands of *E. nitens* have found that in four of the five stands examined about 15% of all branches in the pruned stem sections are the source of spreading columns of decay. Live branch pruning appears to constitute the greatest threat for the establishment of decay. Over 400 cultures of putative decay fungi have been isolated from columns of stem decay, but progress is slow in identifying isolates. A mixture of species from the Hymenochaetaceae constitute the dominant group isolated while a species of *Dichostereum* (syn. *Vararia*) is also quite common. An isolate of what appears to be *Hyphoderma rude* has been obtained representing the first record for this species in Australia.

3. Native plant communities - *Phytophthora*

During the year a disease causing the rapid death of a number of tree and shrub species appeared in several pencil pine stands in the vicinity of Pine Lake on the Central Highlands. A variety of tree and shrub species have been affected including *Athrotaxis cupressoides, Orites revoluta, O. acicularis, Richea scoparia, Baeckea gunniana* and *Boronia citriodora*. An undescribed *Phytophthora* species, with a low temperature optimum, has been isolated from dying *Richea scoparia* within one affected stand.
Cultures isolated have proved to be identical with a *Phytophthora* which has been isolated from *Malus* in New York State, *Prunus* in Michigan, *Pseudotsuga* in British Columbia, *Abies* in Oregon

and raspberry in Chile. Pathogenicity tests are currently being conducted to help determine the threat this *Phytophthora* poses to alpine, rainforest and wet eucalypt forest communities.

Phytophthora cinnamomi remains the most significant disease threat for plant conservation in Tasmania. During the year the fungus was isolated for the first time from a dying specimen of the very rare endemic *Tetratheca gunnii* in the Beaconsfield area. The fungus is also threatening populations of several other rare or threatened Tasmanian plant species including *Epacris limbata, E. barbata, Pultenaea hibbertioides* and *P. paleacea*. Extension surveys are currently being conducted in an attempt to find populations of these species in locations secure from *P. cinnamomi*.

4. Urban - *Armillaria*

The Royal Tasmanian Botanical Gardens have, during the past year, experienced dieback and mortality in mature trees associated with several foci of *Armillaria luteobubalina*. Among the trees which have been severely affected during the outbreak in the gardens are
Carpinus sp., *Arbutus* spp., and *Betula papyrifera*.

WESTERN AUSTRALIA

Elaine Davison, Department of Conservation and Land Management, Science Information Division, Manjimup Research Centre, Manjimup.

1. Softwood Plantations

There have been no major pathological problems in *Pinus radiata* or *P. pinaster* plantations during the past 9 months. Deaths of *P. radiata* have occurred in several plantations during the past year, especially in the last five months. Rainfall during 1994 was well below average, and there was no summer rainfall. These drought deaths follow a similar pattern to that seen in previous years.

2. Hardwood plantations

Eucalyptus globulus deaths have occurred in some plantations. Deaths are associated with low winter rainfall and a long dry summer.

Mycosphaerella cryptica has been confirmed from the plantations. Its level is low. *Aulographina eucalypti* has also been found in a few plantations. Future survey work will document the incidence and severity of these leaf pathogens.

3. Native Forests, Jarrah Forest

Following observations made in 1993 by G. Hardy (Murdoch University) that *P. cinnamomi* infects the stem and lignotuber of young (1 to 4 yr old) jarrah (*E. marginata*) and marri (*E. calophylla*) trees on rehabilitated bauxite pits and old dieback sites, E. O'Gara (Murdoch University) is investigating whether *P. cinnamomi* can invade undamaged, suberised jarrah stems.

The dieback resistant jarrah research programme is being continued by I. Colquhoun, Alcoa, M. Stukely, CALM, J. McComb, Murdoch University and I Bennett, Edith Cowan University. Two large field trials were established at Jarrahdale and will be used to compare the growth and survival of resistant clones, a susceptible clone and unselected seedlings. Further glasshouse screening has been undertaken by M. Stukely on half-sib seedlings derived from trees from long-term dieback 'graveyard' sites. A joint CALM/CSIRO project is being supported by RIRDC and Alcoa to determine genetic markers for dieback resistance in jarrah.

Material from the dieback resistant jarrah programme is being used in a number of studies by G. Hardy and his students at Murdoch University. D. Huberli examined the variation in pathogenicity of *P. cinnamomi* isolates in resistant and susceptible clones. T. Burgess is starting an ARC post doctoral fellowship on the effects of low oxygen levels and temporary inundation on the resistance of jarrah to *P. cinnamomi.*

Ecological work in the jarrah forest in relation to dieback sites is being undertaken by K. McDougal and G. Hardy. Aerial photography is being used to follow broad scale vegetation changes which have occurred during the past 40 years, and the occurrence and density of plant species is being compared on paired site.

4. Native Forest, Karri Forest

4.1 Rot and incipient rot studies.

Some of the past survey work has been written up as internal reports. A sawmill study by D. Donnelly, R. Rule and E. Davison (CALM) has shown that the incidence of rot and incipient rot was significantly greater in medium sawlogs from regrowth stands than in first grade sawlogs from virgin stands. The most frequent infection points were branches, borer galleries, and *Armillaria*/fire scars.

In a field survey the incidence and extent of incipient rot, rot, insect galleries and kino were assessed in 1 m billets from regrowth trees of similar age and management history (P. Hewett and E. Davison CALM). There were no significant differences in the extent of symptoms between community vegetation types. Incipient rot occurred in more dominant and co-dominant than sub-dominant and suppressed trees and was present both above and below crown break. Incipient rot and rot were most abundant at ground level. Where entry points could be recognised, incipient rot was most frequently associated with branches, but it was also associated with insect galleries. Insect galleries occurred both above and below crown break. They were most abundant at ground level on sub-dominant and suppressed trees, but were most abundant between 2 m and 6 m in the dominant and co-dominant trees. These differences reflected infestation by different species of borer. Kino was most abundant in more recently formed wood and was mainly associated with branches.

Further survey work is planned.

The results from past inoculation work have been analysed but not yet written up. A significant

observation is that axial spread of incipient rot in regrowth trees inoculated with *Stereum hirsutum* and *Hymenochaete* is correlated with sapwood width and time since inoculation (E. Davison and F. Tay CALM).

4.2 *Armillaria*

The *Armillaria* control experiment established by M. Pearce (Biotech International) and E. Davison (CALM) is being monitored. A second experiment is to be established this coming winter. Surveys of the extent of *Armillaria* in regrowth karri stands are being undertaken by CALM. Once identified, these stands will not be thinned until options for control are formulated.

5. Native Plant Communities - *Phytophthora*

A large grant to CALM from ANPWS and a smaller one from MERIWA have resulted in several research programmes being developed in conservation areas.

The role of *Phytophthora citricola* and its management in the jarrah forest and heathlands is being investigated by F. Bunny (CALM). The formation of oospores implies that this fungus may be difficult to recover from soil unless dormancy is first broken. Recoveries can be increased by up to 90 % if the soil samples are baited, then dried before being re-baited. Using this improved baiting method *P. citricola* was shown to be positively correlated with three forest tracks in the northern jarrah forest. A survey showed that recoveries are greater from road surfaces than from 30 m into adjoining symptomless forest. Recoveries from above an impeding layer in the soil profile were greater than from the soil surface.

Isozyme analysis by F. Bunny of *P. citricola* has shown that isolates fall into two subgroups. One subgroup is genetically uniform with all isolates belonging to the same electrophoretic type. This sub-group is confined to the jarrah forest of WA and includes an isolate from *E. sieberi* forest in NSW. The other sub-group contains six electrophoretic types and is widespread throughout the southwest of WA.

Phosphonate is being trialed by B. Komorek and B. Shearer (CALM) to control *P. cinnamomi* on *Banksia* spp. Several application methods have been used and aerial application is promising for remote areas. Studies on the rate of application and duration of protection show that 10% phosphonate applied at 60 l ha^{-1} protects plants for up to 2 years. Higher concentrations (20 % and 40 % at 60 l ha^{-1} have resulted in substantially higher foliar phosphonate. Phosphonate is distributed equally in the roots and shoots. Other treatment combinations include follow up applications to boost existing levels in the plants.

P. megasperma is the most common *Phytophthora* isolated from coastal heathlands in WA, where it may have a high impact on plant species contributing to habitat structure. S. Bellgard (CALM) has screened 26 isolated of *P. megasperma in vitro* for their sensitivity to phosphonate. The isolates fell into three groups: very sensitive, mildly sensitive and broadly immune. An aerial spraying trial of phosphonate has been carried out in two infested sites. After 16 months there was no difference in mortality between treated and untreated plants.

S. Bellgard has also carried out isozyme analysis of 88 *P. megasperma* isolates and has characterised 12 electromorphs. The majority of the isolates belong to two electromorphs found only in southwestern Australia. There was no correlation between morphological classification and allozyme classification. Representatives of the two local electromorphs have been used in pathogenicity tests on 5 year old stems of *Banksia baxteri.* All isolates caused lesions, electromorph I was most virulent.

R. Wills (CALM) is developing a GIS-based model as a basis for integrated management of *P. cinnamomi* in native plant communities. Because of its importance in the conservation of declared rare flora, Two People's Bay-Mt. Manypeaks is being used as the prototype area. Work over the past year has focussed on validating and improving available data, improving access to available corporate databases and obtaining additional data sets. In addition, a predictive model has been developed and is being refined.

I. Tommerup (CSIRO Division of Forestry) is working on biocontrol of *P. cinnamomi.* This work is partly funded by LWRRDC and Alcoa. The project entails investigations of the genetic basis of pathogenicity of *P. cinnamomi* and development of novel methods of biocontrol for application primarily in nature conservation areas. It may, however, be appropriate to develop some aspect of the technology for control of this pathogen in wildflower plantations and nurseries.

6. Diagnostic work

The formation of the Vegetation Health Service in CALM has resulted in all of the diagnostic work being done by one section. Between July 1994 and May 1995 814 samples were processed for *Phytophthora* identification, of these 272 were positive for *P. cinnamomi,* 4 for *P. cryptogea,* 4 for *P. citricola*, 2 for *P. megasperma* and 1 for *P. drechsleri.* There were 15 pine, eucalypt and sandalwood samples for general diagnosis during this time.

A research programme funded by MERIWA is investigating the use of isozymes for rapid identification of *Phytophthora* cultures.

7. Biopulping

M. Pearce (Biotech International) has been developing biological processes to assist in the pulping and bleaching of eucalypt wood. This includes the selection of lignin degrading fungi to use for treating wood chips, treatment of eucalypt kraft pulp with lignin degrading enzymes to assist in bleaching pulp to a high brightness, and pretreatment of eucalypt kraft with xylanase for bleach boosting.

CSIRO DIVISION OF FORESTRY, FOREST PATHOLOGY RESEARCH

Kenneth M. Old, CSIRO Division of Forestry, Canberra

The current emphasis of research is in four areas

1. Stem defect in regrowth stands

K.M. Old. M.J. Dudzinski, Yuan Zi Qing

Collaborators:
Victoria Department of Conservation and Natural Resources
University of Tasmania (Dr Caroline Mohamed)
Forestry Tasmania
Funding: CSIRO, DCNR, U. of Tasmania

2. Biocontrol of Phytophthora cinnamomi
I. Tommerup, M.J. Dudzinski, K.M. Old
Collaborators:
Murdoch University (Dr Phil O'brien, Dr Giles Hardy)
Monash University (Dr Andrew Davidson)
CALM (WA)
Funding: CSIRO, LWRRDC, ALCOA, CALM

3. Marker-aided selection for resistance to *P. cinnamomi*
Margaret Byrne
Collaborators:
CALM, ALCOA, Murdoch
Funding: CSIRO, RIRDC, ALCOA, CALM

4. Diseases of plantation-grown Acacias, Eucalypts and Casuarinas in SE Asia and northern Australia in collaboration with overseas counterparts
K.M. Old, M.J. Dudzinski
Collaborators:
Queensland Forest Research Institute
Victorian Institute for Horticultural Development
Royal Forestry Department (Thailand)
Forest Research Institute of Malaysia
Forestry Institute of Vietnam
Kerala Forest Research Institute
Bogor Agricultural University
Funding: CSIRO, QFRI, ACIAR, CIFOR

NEW ZEALAND

Peter Gadgil, Lindsay Bulman
NZ Forest Research Institute, Rotorua

Paul Bradbury, Ard Zandvoort
Principal Protection Officers, Ministry of Forestry, Christchurch and Rotorua

1. Introduction

All exotic forest plantations belonging to members of the Forest Owners' Association and to the Department of Conservation are inspected regularly according to the prescription laid down by the

Forest Health Advisory Committee. Additionally, a sample of small (<100 ha) plantations is also examined. Records of all inspections and sample collections are entered on the Forest Health Database and these records have been used to compile a list of the various damage - causing agents present in New Zealand exotic plantations in 1994-95. The list focuses on the major plantation species - *Pinus radiata, Pseudotsuga menziesii* and *Eucalyptus* spp.; other plantation species and minor pests and disorders of unknown aetiology are not included. The disorders are listed firstly under biological regions (map attached) and then under tree species. Notes by region follow the list.

Health, per se, is a subjective concept and it cannot be measured directly. Ill-health, on the other hand, is recognisable and can be measured objectively. The health of a population therefore can be judged by estimating the proportion of unhealthy individuals in that population. It is in this light that the data in this report should be evaluated.

Generally speaking, the New Zealand exotic plantations are healthy. In *Pinus radiata,* three diseases, Armillaria root-disease, Cyclaneusma needle-cast and Dothistroma needle-blight and one disorder, upper mid-crown yellowing are regionally important. The diseases can be controlled through silvicultural or chemical means and this is being done. Douglas fir *(Pseudotsuga menziesii)* has only one disease - Swiss needle-cast caused by *Phaeocryptopus gaeumannii* - which is present throughout the country. There are no economically sensible means of controlling it although there is a prospect of developing resistant breeds.

2. Notes on the list of disorders (Table 1)

a.Biological Regions: AK - Auckland; BP - Bay of Plenty; BR - Buller; CL - Coromandel; CO Central Otago; DN - Dunedin; FD - Fiordland; GB - Gisborne; HB - Hawkes Bay; MB - Marlborough; MC - Mid Canterbury; MK - Mackenzie; NC - North Canterbury; ND - Northland; NN - Nelson; OL - Otago Lakes; RI - Rangitikei; SC - South Canterbury; SD - Marlborough Sounds; SI - Stewart Island; SL - Southland; TK - Taranaki; TO - Taupo; WA - Wairarapa; WD - Westland; WI - Wanganui; WN - Wellington, WO - Waikato)

b.Disorder/Pest/Pathogen: Only the generic name of an organism is given. Leaflets are available on the more common pests and pathogens. A list of these is attached.

c.Severity:

H - High. More than 70% of the crown affected or tree mortality has been known to occur as a result of infection.
M - Moderate. 30-70% of the crown affected and some loss in growth can be expected.
L - Low. Less than 30% of the crown affected. Growth loss negligible.

d.Incidence:

WR - Widespread throughout the region.
WL - Widespread locally through individual forests.
SR - Scattered small groups of affected trees throughout the region.

L - Scattered small local groups.
I - Isolated few trees in one or a few locations.

When there is more than one record of a disorder, the severity and incidence notations are based on an average subjective value.

3. Regional notes

Northland and Auckland (ND, AK)

Armillaria root-disease, common in many parts of the country, is not a problem in these regions; Cyclaneusma needle-cast infection levels were moderately high; the disease has been favoured by the mild and wet autumn. Expression of symptoms of the needle-cast has also been earlier than usual with a lot more browning of the foliage than is normally seen. Dothistroma needle-blight has never been of any concern in the coastal forests and it only locally present in inland forests. The dry spring and summer in the Auckland region caused some direct damage and allowed an increase in *Sirex* activity, leading to some mortality in *Pinus radiata.* Possum damage is on the increase in Northland.

TABLE 1 - Disorders recorded on major plantation species in New Zealand from July 1994 to June 1995

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
AK	*Eucalyptus* spp.	*Mycosphaerella*	M	SL	3
	Pinus radiata	Deer damage	L	SL	2
		Cyclaneusma	M	WL	2
		Drought damage	L	SL	2
		Salt burn	M	WL	4
		Sirex	L	SL	2
BP	*Eucalyptus botryoides*	*Paropsis*	L	I	1
	E. nitens	*Mycosphaerella/Septoria*	M	SL	4
		Paropsis	M	I	1
		Possum damage	L	SR	4
	E. regnans	*Aulographina*	M	SL	3
		Hendersonia	L	SR	4
		Mycosphaerella	L	SR	4
		Gum emporor moth	L	WR	3
		Trimmatostroma	L	WR	4
	E. saligna	Phytophthora crown dieback	M	SL	3
		Mycosphaerella	L	WR	2
		Sawfly	L	SR	2
	P. radiata	*Armillaria*	M	WL	99

		Boron deficiency	L	SL	6
		Cicada damage	L	WL	6
		Cyclaneusma	M	WR	96
		Deer damage	L	WL	5
		Diplodia: dieback	L	SL	21
		whorl canker	L	SL	9
		Dothistroma	M	WR	112
		Helicoverpa	H	WL	22
		Hylastes/Hylurgus	L	SL	5
		Phosphorus deficiency	L	SL	12
		Possum damage	L	WL	130
		Resin bleeding	L	SR	26
		Rosellinia	L	SL	4
		Toppling	L	SR	32
		Upper mid-crown yellowing	L	WR	64

(contd)

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
BP	*Pseudotsuga menziesii*	Frost damage	M	SL	26
		Navomorpha	L	SL	4
		Phaeocryptopus	L	WR	6
		Possum damage	M	SL	4
		Stenopotes	L	WR	2
BR	*E. delegatensis*	*Eriococcus*	L	I	2
	P. radiata	*Armillaria*	H	SL	5
		Cyclaneusma	M	WR	5
		Dothistroma	M	WR	4
		Nutrient deficiency	L	SL	8
		Wind damage	M	SL	3
CL	*P. radiata*	*Armillaria*	M	I	2
		Cyclaneusma	M	WR	3
CO	*P. radiata*	*Cyclaneusma*	M	WL	2
		Upper mid-crown yellowing	M	SL	2
	Ps. menziesii	*Phaeocryptopus*	M	WR	2
		Tortricid damage	L	SL	2

DN	*Eucalyptus* spp.	*Mycosphaerella*	L	SR	4
	P. radiata	*Armillaria*	M	SL	3
		Cyclaneusma	M	WR	21
		Diplodia whorl canker	M	SL	21
		Dothistroma	M	WL	7
		Pineus laevis	L	SL	19
		Possum damage	M	SL	9
		Snow/wind damage	M	SL	17
		Toppling	L	SL	8
		Tortricid damage	L	SL	5
		Upper mid-crown yellowing	M	WR	54
	Ps. menziesii	*Phaeocryptopus*	M	WL	1
FD	*E. delegatensis*	*Platypus*	L	I	1

(contd)

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
	P. radiata	*Armillaria*	M	WL	16
		Cyclaneusma	M	WL	2
		Diplodia whorl canker	M	I	2
		Dothistroma	L	I	2
		Possum damage	M	SL	3
		Upper mid-crown yellowing	M	SR	22
	Ps. menziesii	*Phaeocryptopus*	L	WL	1
GB	*Eucalyptus* spp.	*Cercospora/Hendersonia*	L	SL	3
		Wind damage	M	WR	3
	P. radiata	Animal damage	M	SL	8
		Armillaria	H	I	2
		Cicada damage	L	I	2
		Cyclaneusma	L	WL	3
		Diplodia: top dieback	L	SL	2
		whorl canker	L	SL	2
		Dothistroma	M	WR	4

		Possum damage	L	WR	48
		Resin bleeding	L	SR	17
		Toppling	L	SR	4
		Upper mid-crown yellowing	M	WR	44
		Wind damage	M	WL	52
	Ps. menziesii	Wind damage	L	SL	2
HB	*Eucalyptus* spp.	*Aulographina/ Mycosphaerella*	M	SR	12
	P. radiata	*Armillaria*	H	SR	14
		Cyclaneusma	M	SR	5
		Diplodia dieback	M	SL	5
		Dothistroma	L	WR	6
		Hylastes/Hylurgus	M	SL	4
		Pineus laevis	L	I	2
		Possum damage	L	SL	3
		Resin bleeding	M	SL	2

(contd)

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
HB	*P. radiata*	Toppling	M	SL	5
		Upper mid-crown yelloing	M	WR	37
		Wind damage	M	SR	17
	Ps. menziesii	*Phaeocryptopus*	L	SR	2
KA		*No records of damage*			
MB	*Eucalyptus* spp.	*Ophelimus*	L	SL	1
		Sawfly	L	SL	4
MC	*Eucalyptus* spp.	*Ophelimus*	M	SL	3
	P. radiata	Diplodia dieback	L	SL	2
		Dothistroma	L	SL	3

MK		*No records of damage*			
NC	*P. radiata*	*Cyclaneusma*	L	I	1
		Dothistroma	L	SL	2
		Pineus laevis	L	SL	1
		Windthrow	M	SL	1
ND	*Eucalyptus* spp.	*Ophelimus*	M	SL	3
		Sawfly	M	SR	2
	P. radiata	*Cyclaneusma*	M	WR	7
		Dothistroma	L	WL	3
		Possum damage	M	SL	3
NN	*Eucalyptus* spp.	*Ophelimus*	M	SL	3
	P. radiata	*Armillaria*	H	SL	4
		Cyclaneusma	M	WR	10
		Diplodia dieback	M	SL	3
		Dothistroma	M	WR	12
		Lightning	H	SL	1
		Phosphorus deficiency	M	WL	3
		Pineus laevis	L	SL	2

(contd)

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
		Possum damage	L	SL	33
		Sirex	H	I	2
		Toppling	M	SL	5
	Ps. menziesii	*Phaeocryptopus*	M	WL	5
OL	*P. radiata*	*Pineus laevis*	L	I	2
		Possum damage	M	SL	2
		Upper mid-crown yellowing	M	SL	2
RI		*No records of damage*			

SC	*P. radiata*	*Dothistroma*	M	WL	3
		Hylastes	L	SL	1
SD	*E. saligna*	*Ophelimus*	L	SL	1
		Sawfly	L	SL	1
SI		*No records of damage*			
SL	*Eucalyptus* spp.	*Eriococcus*	L	SL	2
		Paropsis	L	SL	2
		Ophelimus	L	SL	2
	P. radiata	*Armillaria*	M	WL	10
		Cyclaneusma	M	WR	6
		Diplodia: dieback	M	I	2
		whorl canker	M	I	3
		Dothistroma	L	WR	10
		Pineus laevis	L	SL	8
		Snow damage	M	WL	6
		Tortricid damage	L	SL	4
		Upper mid-crown yellowing	M	WR	27
	Ps. menziesii	Animal damage	L	SL	3
		Phaeocryptopus	M	WR	8
TK	*P. radiata*	*Armillaria*	H	SR	2
		Cyclaneusma	M	WR	4
		Dothistroma	M	WR	17
		Possum damage	L	SL	9

(contd)

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
TO	*E. delegatensis*	*Aulographina*	L	SR	3
		Hendersonia	L	SR	3
		Mycosphaerella	M	SR	4
		Paropsis	L	SL	3
	E. fastigata	*Hendersonia*	L	SR	2
		Trimmatostroma	L	SR	3
	E. nitens	*Aulographina*	M	SR	3
		Cercospora	l	sr	2

		Eriococcus	L	SL	2
		Paropsis	M	SL	1
		Septoria	M	SL	1
	E. regnans	*Aulographina*	M	SR	6
		Hendersonia	L	SR	10
		Mycosphaerella	M	SR	7
		Sawfly	L	WR	4
		Trimmatostroma	L	SR	10
	P. radiata	Animal browsing	L	SL	8
		Armillaria	H	WL	76
		Boron deficiency	L	SL	6
		Botrytis	L	SL	6
		Cyclaneusma	M	WR	124
		Diplodia: dieback	L	SL	19
		whorl canker	L	SL	6
		Dothistroma	M	WR	131
		Frost damage	L	SL	22
		Helicoverpa	M	L	26
		Hylastes/Hylurgus	L	WR	21
		Phosphorus deficiency	M	SL	8
		Possum damage	M	WR	147
		Resin bleeding	M	SL	5
		Tortricid damage	L	SL	11
		Upper mid-crown yellowing	M	WR	200
		Wind damage	L	SL	17

(contd)

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
	Ps. menziesii	*Armillaria*	H	I	3
		Frost damage	L	SL	7
		Navomorpha	L	WR	8
		Phaeocryptopus	L	WR	6
		Tortricid damage	L	SL	2

WA	*E. botryoides*	*Ophelimus*	M	SL	2
	Eucalyptus spp.	Sawfly	L	SL	2
	P. radiata	*Cyclaneusma*	L	WR	1
		Possum damage	M	SL	5
		Resin bleeding	L	SL	3
		Upper mid-crown yellowing	M	WR	6
		Windthrow	H	I	4
WD	*Eucalyptus* spp.	*Aulographina/Hendersonia*	L	SL	2
		Mycosphaerella	L	SL	1
	P. radiata	*Cyclaneusma*	L	WR	3
		Dothistroma	M	WR	6
WI	*P. radiata*	*Armillaria*	H	I	1
		Cyclaneusma	L	WR	2
		Deer damage	M	I	2
		Dothistroma	H	WL	1
		Resin bleeding	L	SL	4
		Salt burn	L	SL	2
		Sirex	H	I	1
		Tortricid damage	L	SL	2
WN	*E. delegatensis*	*Mycosphaerella*	M	SL	1
	E. regnans	Gum emperor moth	M	SL	2
	P. radiata	*Armillaria*	H	SL	9
		Cyclaneusma	M	WR	2
		Diplodia dieback	M	I	1
		Phosphorus deficiency	M	SL	4
		Resin bleeding	L	I	3

(contd)

Biological region	Host species	Disorder/pest/pathogen	Average severity	Average incidence	No. of records
		Salt burn	L	WL	11
		Tortricid damage	L	SL	13
		Windthrow	L	SL	8

WO	*E. fastigata*	*Aulographina*	L	WR	1
	E. nitens	*Aulographina*	L	WR	1
	E. regnans	*Aulographina*	L	WR	1
		Hendersonia	L	WL	2
		Stereum	L	I	1
	P. radiata	*Armillaria*	H	SL	8
		Cyclaneusma	L	WR	5
		Dothistroma	M	WR	13
		Hylastes	L	WR	2
		Possum damage	L	SL	4
		Upper mid-crown yellowing	L	SL	2

Coromandel, Waikato, Bay of Plenty and Taupo (CL, WO, BP, TO)

Armillaria root-disease is common throughout these regions, mmostly in the form of chronic, non-lethal infection. Weather this season has favoured both Cyclaneusma needle-cast and Dothistroma needle-blight and levels of both diseases have risen. The usual symptom expression of *Cyclaneusma* infection mentioned above under Northland and Auckland is common in BP and TO and the disease level is expected to rise in the spring. Young stands of *P. radiata* oversown with lotus have been heavily infected by *Dothistroma* and will require spraying. There were local outbreaks of *Helicoverpa armigera* (tomato fruitworm) following a dryish spring and summer in stands oversown with lotus. The dry weather allowed large numbers of caterpillars to survive who moved on to the young pine trees (up to 4 years old) when they ran out of lotus, their favourite food source. There are two generations of *H. armigera* per year and usually it is the second generation that causes the damage but this season the first generation was responsible for most of the defoliation. Luckily, the weather and disease caused a collapse of the population and the expected additional damage from the second generation did not eventuate. Most trees have recovered from the defoliation. Possum damage is on the increase and upper mid-crown yellowing is common throughout the region.

East Coast, Gisborne and Hawkes Bay (GB, HB)

Armillaria root-disease and Dothistroma needle-blight are not common in these regions but Cyclaneusma needle-cast has been moderately severe. The unusual expression of *Cyclaneusma* infection is common on the East Coast. A strong north-west wind caused considerable local damage on the East Coast and isolated areas of *P. radiata* stands on north-west facing slopes have top dieback resulting from a combination of wind thrash and infection by *Diplodia*. Possum damage has been a problem in the Gisborne area and upper mid-crown yellowing is common in the regions.

Wairarapa, Wellington, Wanganui and Taranaki (WA, WN, WI, TK)

Dothistroma needle-blight in Taranaki is the only major disease of any concern in this area although Cyclaneusma needle-cast and upper mid-crown yellowing have caused problems locally.

Nelson and Marlborough (NN, MB, SD)

There is some Armillaria root-disease and Dothistroma needle-blight is present. Generally, levels of Cyclaneusma needle-cast were low to moderate. Symptom expression of the disease was late last season. Diplodia dieback, favoured by drought, was common on river bed sites in later summer. The eucalypt gall wasp, *Ophelimus* sp., was found on *Eucalyptus saligna* at the Port of Picton rail yard, the first record of this pest in the South Island. Eradication was not possible and by April, it had spread to other locations in Marlborough. The eucalypt sawfly *(Phylacteophaga froggatti)* has remained in Marlborough, despite attempts at eradication and the very efficient biological control agent, *Bracon phylacteophagus,* will be reintroduced. Lightning strikes were a feature during the year; one location had 300 trees affected.

Canbterbury and Westland (NC, MC, SC, BR, WD)

Armillaria root-disease is not a problem in Canterbury but it is common in Westland. Areas of cutover *P. radiata* which had been burnt prior to establishment were found to have 50-80% stump infection by *Armillaria* whereas unburnt areas showed only 20% stump infection. Increases in *Dothistroma* infection were noted in the Canterbury foothills and it continues to be a problem in wetter Westland. Cyclaneusma needle-cast disease levels were generally low in Canterbury and moderate on the West Coast.

Some Canterbury plains forests had a higher than usual incidence of *Diplodia* whorl canker. It is probable that infection occurred in the 1993-94 summer. Problems with the rapid growth of high GF *P. radiata* stock are becoming apparent. Usually, excessive top growth is to blame, leading to toppling. This is compounded by the trees often being planted on highly fertile sites. Soft or rubbery wood was found in *P. radiata* at several locations in Canterbury. Usually one or two-year-old trees had zones of abnormally low lignification which led to loss of rigidity. There is a suggestion that cold injury is a factor. Noticeable decrease in possum damage has been noticed in Canterbury forests after control operations. The eucalypt sawfly is thriving in the dry Canterbury conditions. The Bracon parasite has been introduced and should control the sawfly.

Otago and Southland (CO, DN, OL, SL, FD)

Armillaria root-disease and Dothistroma needle-blight are commmon throughout Southland. Cyclaneusma needle-blight infection levels were low in Otago and Southland. The bark beetle, *Hylurgus ligniperda,* was recorded for the first time south of the Waitaki river. The incidence and severity of upper mid-crown yellowing is increasing.